Appendix F – Noise Supporting Information

Contains:

- 2023 Noise Memorandum (AECOM)

AECOM

Technical Memorandum

Noise

FINAL

Z-Best Composting Facility Expansion and Upgrade

Prepared for:

County of Santa Clara

Department of Planning and Development

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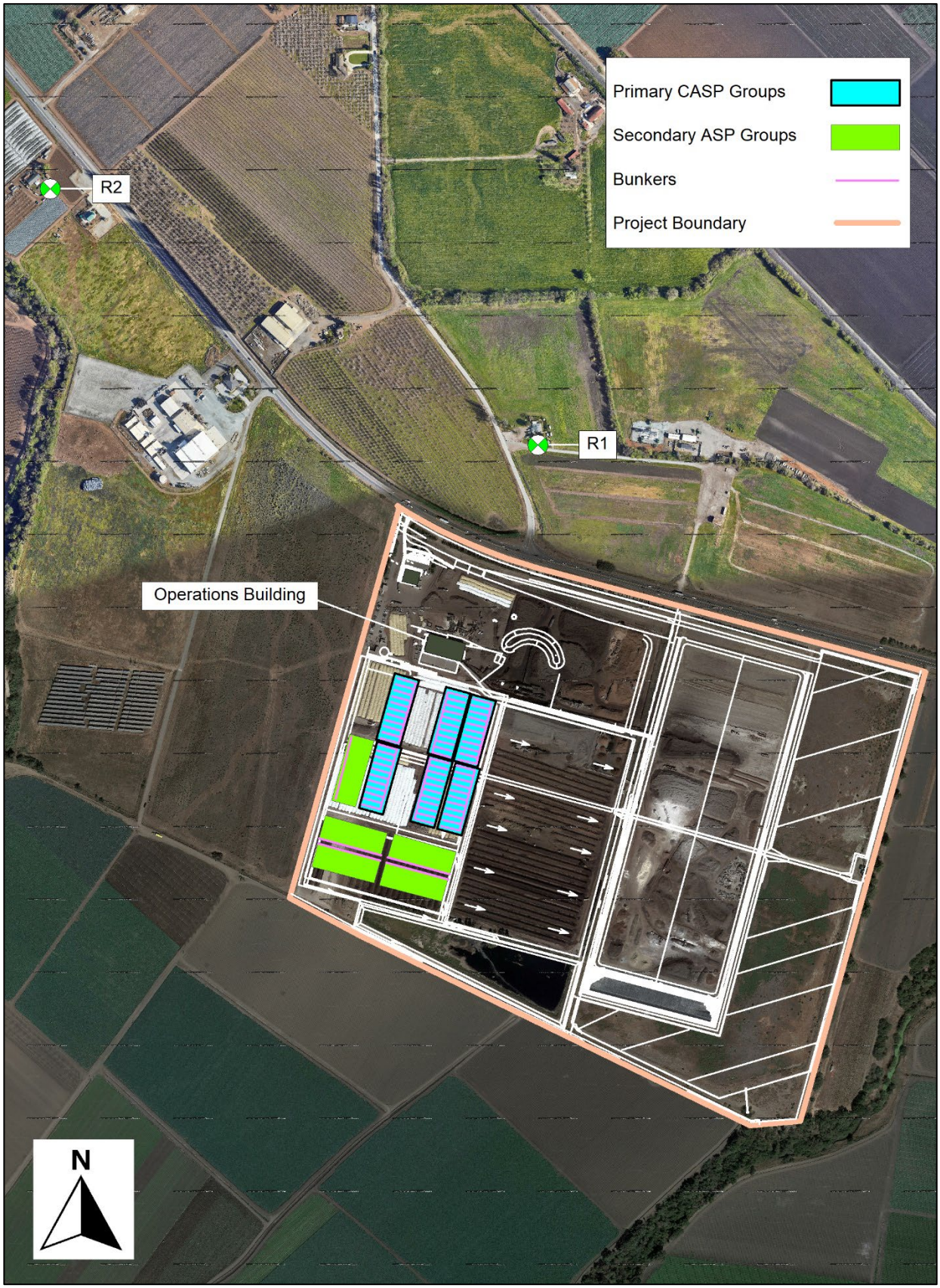
Project Introduction

This Technical Memorandum assesses the noise effects from the proposed Z-Best Composing Facility Expansion and Upgrade Project (project). The project proponent, Zanker Road Resource Management Ltd., has applied to the County of Santa Clara for a modification of its Use Permit, and an Architectural Site Approval, for the Z-Best Composting facility at 980 State Route 25 (SR 25) in an unincorporated area approximately 5 miles southeast of Gilroy, California. The proposed modification would allow an upgrade to the Z-Best facility's existing municipal solid waste (MSW) composting process from the current windrow method to an aerated static pile (ASP) process and associated modifications to existing operations and site conditions to accommodate the new processing technology. The purpose of the proposed project is to enable faster and more efficient composting.

The proposed technology and operations modifications would enable Z-Best to increase its current permitted MSW composting capacity from 1,500 tons per day (tpd) with up to 15 days per year at 2,500 tpd, to 2,750 tons per day with up to 20 days per year at 3,500 tpd. The additional capacity is consistent with State of California CalRecycle goals to increase waste diversion from landfills and a partial remedy for addressing regulations imposing restrictions on placing organic materials in landfills. Z-Best is not proposing to modify its existing green waste composting operations or green waste intake volume as part of the proposed project.

Although the facility generates noise and vibration from current operations, the project would increase the scale of activities performed at the site by introducing additional on-site and off-site truck trips, operation of additional on-site material manipulation and transport equipment (e.g., loaders and excavators), and additional on-site stationary noise sources (e.g., shredder, conveyors, and aeration fans). Figure 1 shows the proposed project layout superimposed on aerial imagery of the study area and nearest residential receptors (worst-case noise-sensitive land uses).



Map data: Google 2022©, Engineered Compost Systems 2022

Figure 1 Proposed Project Area and Worst-Case Noise-Sensitive Receptors

Acoustics and Vibration Terminology

A summary of relevant fundamental concepts and a glossary of terms related to noise and vibration are provided in Attachment A.

Existing Land Uses and Noise Environment

Land uses surrounding the project property are agricultural. The noise-sensitive receptor most vulnerable to both on-site construction and operational noise is a single-family residence (R1) approximately 650 feet north of the northern project property line. This property is considered most vulnerable to project noise and vibration due to its proximity to project construction work areas, site driveways, and proposed stationary noise sources. Receptor R2 represents another single-family residence that is most vulnerable to traffic noise effects due to its proximity to project-related truck trips on Highway 25. Therefore, R1 was identified as the worst-case noise-sensitive receiver for the on-site facility construction and operation noise impact assessment, and R2 was identified as the worst-case noise-sensitive receptor for the traffic noise impact assessment.

Due to greater relative distance and reduced sensitivity to noise and vibration, other properties surrounding the project will receive less contribution from, and be less affected by, project-generated noise and vibration. Therefore, other properties surrounding the project do not need to be considered for impact assessment if the single-family land uses identified as R1 and R2 are determined to be not impacted. If either of the studied receptors are determined to be impacted by either noise or vibration, the scope of studied receptors would expand to include other receptors in the vicinity to identify the extent of impacts and requirements for mitigation.

Baseline Noise Measurements

A baseline sound level measurement was conducted by Edward L. Pack Associates, Inc. for 24 hours on December 19, 2016[1]. The baseline measurement was performed with a Larson Davis 812 sound level meter and was conducted approximately 150 feet from the residential receptor location along the edge of Bolsa Road (R1). The measured sound data at this location is summarized in Table 1. The primary observed noise source at the residential measurement location was traffic on Highway 25, with the maximum sound levels due to traffic on Bolsa Road. As shown in Table 1, the lowest 1-hr Leq values during the daytime (7:00 AM to 10:00 PM) and the nighttime (10:00 PM to 7:00 AM) were 59 and 54 dBA, respectively. WJV Acoustics, Inc. conducted verification noise measurements at the same two locations as part of their 2018 peer review of the Edward L. Pack Associates report[2].

[1] Noise Assessment Study for the Proposed Z-Best Products Food Waste Static Aeration Composting Facility Modification, Jeffrey K. Pack, July 24, 2019, Project No. 48-073-R2
[2] Noise Study Peer Review, Z-Best Products Facility Modification. Santa Clara County, California. August 6. 2018.

Table 1. Summary of Measured Sound Levels near Receptor R1

	Existing Ambient Sound levels, dBA					
Time	L_{eq}	L_{max}	L_2	L_8	L_{25}	L_{50}
7:00 AM	64	84	73	65	63	62
8:00 AM	64	86	71	65	62	61
9:00 AM	61	82	68	63	60	58
10:00 AM	61	87	68	62	59	57
11:00 AM	62	86	70	63	59	56
12:00 PM	59	81	65	61	57	55
1:00 PM	61	83	68	63	60	58
2:00 PM	62	84	70	62	60	58
3:00 PM	64	89	73	64	60	59
4:00 PM	65	84	74	68	62	60
5:00 PM	65	84	74	70	63	60
6:00 PM	63	81	72	65	62	60
7:00 PM	62	81	66	64	62	61
8:00 PM	60	79	65	62	61	59
9:00 PM	60	85	64	62	60	58
10:00 PM	61	93	64	61	59	57
11:00 PM	56	79	61	59	56	53
12:00 AM	54	71	60	59	56	52
1:00 AM	54	73	61	58	55	51
2:00 AM	56	79	63	60	57	53
3:00 AM	58	74	63	64	59	57
4:00 AM	61	77	65	64	62	60
5:00 AM	63	84	67	65	63	61
6:00 AM	63	83	70	65	63	61
Quietest Daytime Hour (12:00 PM)	59	81	65	61	57	55
Quietest Nighttime Hour (1:00 AM)	54	73	61	58	55	51

Source: Noise Assessment Study for the Proposed Z-Best Products Food Waste Static Aeration Composting Facility Modification, Jeffrey K. Pack, July 24, 2019, Project No. 48-073-R2

Regulatory Setting

Construction Noise Regulations

Santa Clara County Noise Ordinance

Santa Clara County Code of Ordinances Title B – Regulations, Division B11 – Environmental Health, Chapter VIII, Control of Noise and Vibration (Santa Clara County 2022) regulates noise within unincorporated areas of the County and on County-owned or operated land. Section B11-154(b)(6) prohibits the following in relation to construction/demolition noise:

a. *Operating or causing the operation of any tools or equipment used in construction, drilling, repair, alteration or demolition work between weekdays and Saturday hours of 7:00 p.m. and 7:00 a.m., or at any time on Sundays or holidays, that the sound therefrom creates a noise disturbance across a residential or commercial real property line, except for emergency work of public service utilities or by variance. This section will not apply to the use of domestic power tools as specified in Subsection 11.*

b. *Where technically and economically feasible, construction activities will be conducted in a manner that the maximum noise levels at affected properties will not exceed those listed in the following schedule:*

    i. *Mobile equipment. Maximum noise levels for nonscheduled, intermittent, short-term operation (less than ten days) of mobile equipment:*

    - *Single- and Two-Family Dwelling Residential Areas:*
        - *75 dBA: 7am to 7pm daily except Sundays and legal holidays.*
        - *50 dBA: 7pm to 7am daily and all day Sundays and legal holidays.*
    - *Multifamily Dwelling Residential Areas:*
        - *80 dBA: 7am to 7pm daily except Sundays and legal holidays.*
        - *55 dBA: 7pm to 7am daily and all day Sundays and legal holidays.*
    - *Commercial Areas:*
        - *85 dBA: 7am to 7pm daily except Sundays and legal holidays.*
        - *60 dBA: 7pm to 7am daily and all day Sundays and legal holidays.*

    ii. *Stationary equipment. Maximum noise levels for repetitively scheduled and relatively long-term operation (periods of ten days or more) of stationary equipment are as follows:*

    - *Single- and Two-Family Dwelling Residential Areas:*
        - *60 dBA: 7am to 7pm daily except Sundays and legal holidays.*
        - *50 dBA: 7pm to 7am daily and all day Sundays and legal holidays.*
    - *Multifamily Dwelling Residential Areas:*
        - *65 dBA: 7am to 7pm daily except Sundays and legal holidays.*
        - *55 dBA: 7pm to 7am daily and all day Sundays and legal holidays.*
    - *Commercial Areas:*
        - *70 dBA: 7am to 7pm daily except Sundays and legal holidays.*
        - *60 dBA: 7pm to 7am daily and all day Sundays and legal holidays.*

Construction Vibration Regulations and Guidance

Santa Clara County Noise Ordinance – Vibration Annoyance

Section B11-154(b)(7) of the County Noise Ordinance also prohibits operating or permitting the operation of any device that creates a vibrating or quivering effect that:

a) Endangers or injures the safety or health of human beings or animals;

b) Annoys or disturbs a person of normal sensitivities; or

c) Endangers or injures personal or real properties.

The ordinance defines the vibration perception threshold as “the minimum ground or structure borne vibrational motion necessary to cause a normal person to be aware of the vibration by direct means as, but not limited to, sensation by touch or visual observation of moving objects. The perception threshold will be presumed to be a motion velocity of 1/100 inches per second over the range of one to 100 Hz.”

California Department of Transportation – Vibration

The California Department of Transportation (Caltrans) Transportation and Construction Vibration Guidance Manual (Caltrans Manual) (Caltrans 2020) provides guidance for the analysis of vibratory impacts generated by transportation and construction projects by providing thresholds for structural damage and human perception/annoyance. Table 2 below shows a curated list of damage thresholds from the Caltrans Manual, as applicable to various receptors and vibratory source types.

Table 2. Maximum Vibration Levels for Construction Equipment for Potential Damage and Annoyance (PPV in/sec)

	Potential Damage Thresholds	
Structure Type	**Transient Sources**	**Continuous/Frequent Intermittent Sources**
Historic and some old buildings	0.5	0.25
Older residential structures	0.5	0.3
New residential structures	1.0	0.5
Modern industrial and commercial buildings	2.0	0.5

Source: Transportation and Construction Vibration Guidance Manual (Caltrans 2020), Tables 19 and 20.

As shown in Table 2, vibratory activities have the potential to result in structural damage when vibration levels exceed 0.25 to 2 PPV in/sec as applicable to the source type and receptor characterization.

Construction & Operational Vibration

Construction activities can generate ground-borne noise and vibration of varying degrees based on the construction activity and equipment, soil conditions, and distance to vibration-sensitive structures or land uses. Vibration associated with project construction activities would occur most notably during major ground-disturbing activities, such as site grading. The piece of construction equipment generating the strongest vibration would be the dozer which, per the FTA Manual, can generate a vibration level of up to 0.089 PPV in/sec at 25 feet. With the closest residential structure as close as 1,200 feet from the potential operation of dozers used during grading, vibration was assessed at this distance using Equation 7-2 from the FTA Manual. At approximately 1,200 feet, a dozer will result in a vibration level of 0.0003 PPV in/sec at the closest residential unit which is well below the perception threshold of 0.01 PPV in/sec vibration perception threshold.

Vibration generated on-site during project operation would be negligible and thus, dismissed from this study due to the relative distances to vibration-sensitive receptors. Vibration associated with facility operations would occur most notably during the use of excavators when transporting materials around the facility. An excavator can generate a vibration level of up to 0.076 PPV in/sec (comparable to the

reference vibration level of a loaded truck in the FTA Manual). With the closest residential structure as close as 780 feet from the potential operation of excavators, will result in a vibration level of 0.0004 PPV in/sec at the closest residential unit which is well below the perception threshold of 0.01 PPV in/sec vibration perception threshold.

Operational Noise Regulations

Santa Clara County Noise Ordinance

Santa Clara County Code of Ordinances Title B – Regulations, Division B11 – Environmental Health, Chapter VIII, Control of Noise and Vibration (Santa Clara County 2022) regulates noise within unincorporated areas of the County and on County-owned or operated land.

Section B11-152 Exterior Noise Limits regulates noise sources by establishing sound level thresholds at property lines in Santa Clara County. These limits, which vary by land use type and time of day, are shown in Table 3.

Table 3. Santa Clara County Noise Ordinance, Exterior Noise Limits

Receiving Land Use Category	Time Period	Noise Level (dBA)
One- and Two-family residential districts	10 p.m. to 7 a.m. 7 a.m. to 10 p.m.	45 55
Multiple-family Dwelling	10 p.m. to 7 a.m. 7 a.m. to 10 p.m.	50 55
Commercial	10 p.m. to 7 a.m. 7 a.m. to 10 p.m.	60 65
Light Industrial	Any time	70
Heavy Industrial	Any time	75

Source: Santa Clara County Noise Ordinance

This section of the code includes the following text to accompany this table:

No person may operate or cause to be operated any source of sound at any location within the unincorporate territory of the County or allow the creation of any noise on property owned, leased, occupied or otherwise controlled by the person, which causes the noise level when measured on any other property either incorporated or unincorporated, to exceed:

1. *The noise standard for that land use specified in table B11-152 of this section* (Table 3 above) *for a cumulative period of more than thirty (30) minutes in any hour; or*
2. *The noise standard plus five (5) dB for a cumulative period of more than fifteen (15) minutes in any hour; or*
3. *The noise standard plus ten (10) dB for a cumulative period of more than five (5) minutes in any hour; or*
4. *The noise standard plus fifteen (15) dB for a cumulative period of more than one minute in any hour; or*
5. *The noise standard plus twenty (20) dB or the maximum measured ambient level, for any period of time.*

If the measured ambient level exceeds the allowable noise exposure standard within any of the first four (4) noise limit categories above, the allowable noise exposure standard shall be adjusted

> *in five (5) dB increments in each category as appropriate to encompass or reflect said ambient noise level. In the event the ambient noise level exceeds the fifth noise limit category, the maximum allowable noise level under this category shall be increased to reflect the maximum ambient noise level.*

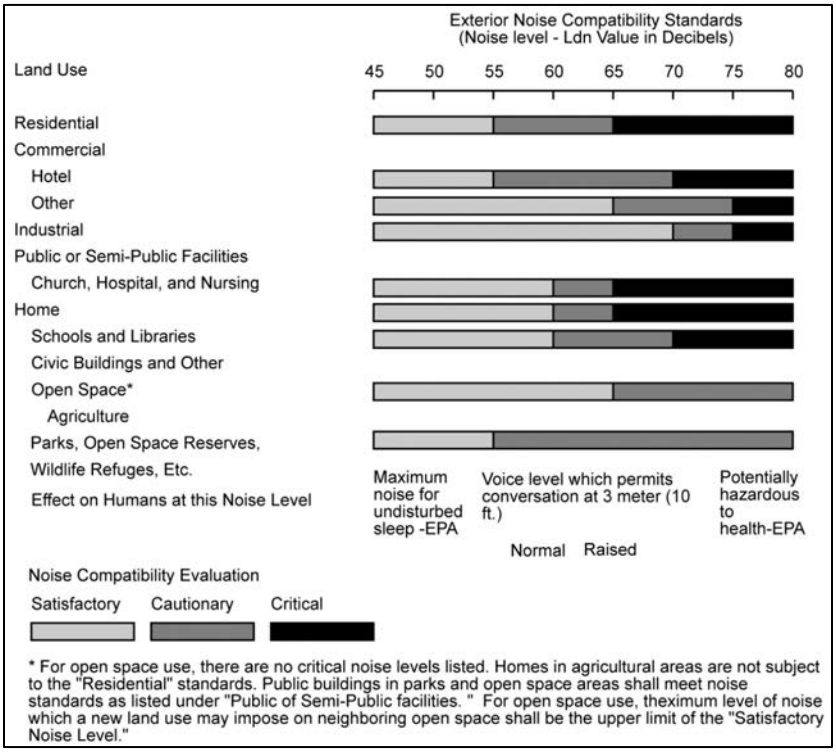
Since the lowest measured 1-hr L_{eq} ambient daytime (59 dBA) and nighttime (54 dBA) sound levels at measurement R1 exceed the allowable noise exposure standard in Table 3 (55 and 45 dBA, respectively), the exterior noise limits were adjusted per ordinance guidance in five (5) dB increments to encompass the ambient noise levels. Table 4 summarizes the adjusted single-family residential exterior noise limits applicable to noise-sensitive receptors for this project.

Table 4. Santa Clara County Noise Ordinance, Adjusted Exterior Noise Limits (L_{50})

Receiving Land Use Category	Time Period	Noise Level (dBA)
One- and Two-family residential districts	10 p.m. to 7 a.m.	55
	7 a.m. to 10 p.m.	60

Santa Clara County General Plan

The Safety and Noise section of the County's general plan summarizes goals and policies related to the safe siting of land uses within areas of elevated or harmful noise levels. Figure 2 shows the noise compatibility standards for each land use type by defining the criteria for satisfactory, cautionary, or critical exposure to existing noise levels.



Source: County of Santa Clara 1994 General Plan

Figure 2 Noise Compatibility Standards for Land Use in Santa Clara County

Although the project will not be introducing any new land use to the study area that would be held to general plan policies, these noise levels are important in characterizing the existing noise environment at studied noise-sensitive receptors.

Construction Noise and Vibration Assessment

Construction Noise Prediction and Results

Project construction phasing would include the following:

- Site Grading (duration of approximately 78 days)
- Site Trenching (duration of approximately 53 days)
- Above ground mechanical, concrete, and utility work (duration of approximately 69 days)

Construction would occur Monday through Saturday from 7 a.m. to 4 p.m. . General construction efforts would occur, on average, approximately 1,200 feet from the façade of the existing residential structure at R1 (measured from the approximate center of the construction area).

The construction noise assessment was conducted using construction prediction methodologies based on FTA manual. Utilization factors for construction equipment (or the percentage of time in a given hour that a piece of equipment is operating at maximum power) as recommended for FTA detailed assessments, were also included in the calculations to help accurately predict construction noise levels during the various construction phases. The compliance assessment for this analysis focused on predicted 1-hour L_{eq} levels. Project construction noise was estimated for construction phases by considering the quantities of contributing sound sources and calculating their aggregate sound propagation to the studied nearest receptor location.

The key assumptions for this analysis included in this method are as follows:

- Free-field conditions and no attenuation factors
- For a given construction phase, the two loudest pieces of construction equipment are assumed to operate—on average—from the same source point location at the general geographic centroid of the Project site or stationed range.
- Each piece of equipment or vehicle is assigned a reference L_{max} value at a reference distance (e.g., 50 feet), and an “acoustical usage factor” (AUF) that the Federal Highway Administration (FHWA) Roadway Construction Noise Model (RCNM) User’s Guide (FHWA 2006) describes as an estimated portion of a construction operation time period when the L_{max} value can be expected.

Table 5 provides a list of equipment types anticipated to operate during the various project construction phases along with their reference maximum sound level, usage factor, and calculated 1-hour L_{eq}. Since reference sound levels for the listed construction equipment are presented as maximum sound levels (i.e., the maximum sound level the equipment would produce at any moment in time, or L_{max}), the usage factor is applied to account for the fact that equipment is not continuously operated in a full-throttle condition throughout its use. Thus, typical usage factors for each type of construction equipment were applied to reference maximum sound levels to arrive at average hourly sound levels. L_{max} values and usage factors provided herein are generally based on a combination of the RCNM User’s Guide and the FTA Manual.

Table 5. Proposed Project Construction Equipment Reference Sound Pressure Levels

Anticipated Project Construction Equipment	L_{max}, dBA at 50 Feet[1]	Usage Factor	Resulting 1-Hour L_{eq}, dBA at 50 Feet[2]
Compactor	83	0.2	76
Concrete Finisher[3]	73	0.5	70
Concrete Pump Truck	81	0.2	74
Dozer	82	0.4	78
Front-End Loaders	79	0.4	75
Grader	85	0.4	81
Paver	77	0.5	74
Scraper	84	0.4	80
Tractors (Excavator)	81	0.4	77
Water Truck	74	0.4	70

Source: FHWA RCNM 2006, FTA 2018

1. L_{max} values are based on representative equipment in RCNM ("Actual Measured" levels) and the FTA Manual.
2. 1-Hour L_{eq} values are calculated by applying the usage factor (reductive adjustment) to the momentary L_{max} reference noise level.

   Reference L_{max} value based on RCNM <25kVA generator set.

Individual hourly noise levels generated by Proposed Project construction equipment would range from 70 to 81 dBA, L_{eq} at 50 feet from the equipment. Following a combination of procedures suggested in the FTA Manual for the general and detailed assessment of construction noise, Table 6 calculates the combined construction noise level generated by the two loudest pieces of equipment operating during each construction phase.

Table 6. Combined Construction Noise Levels per Construction Phase

Construction Phase/Activity	Two Loudest Pieces of Equipment in Phase	Combined 1-hour L_{eq}, dBA at 50'	Combined 1-hour L_{eq}, dBA at Nearest Receptor R1 (1,200')	Applicable Daytime County Threshold[2] (dBA)
Grading	Grader / Scraper	84	56[1]	60
Trenching	Front End Loader / Tractor (Excavator)	79	52[1]	60
Paving	Concrete Pump Truck / Paver	77	49[1]	60

Notes:
1. Calculated using distance measured from the geometric center of the overall project area to receptor (approximately 1,200') and an acoustical attenuation rate of 6 decibels per doubling of distance from the source.
2. Single-family residential daytime threshold for stationary equipment is conservatively applied to all phases due to mobile equipment being operated for more than 10 days, per the definition of "stationary equipment" in County Ordinance. Construction activities would only occur during daytime periods; therefore, nighttime thresholds are not applicable.

Table 6 shows that project construction activities will not exceed Santa Clara County's construction noise criteria of 60 dBA, L_{eq} at the nearest noise-sensitive receptor. Since construction activities are not expected during nighttime hours as restricted by the Santa Clara County's noise ordinance, construction activities are not predicted to generate adverse effects at any adjacent noise-sensitive properties.

Operational Noise Assessment

The main operations at the facility under proposed project conditions would include the following[1,2]:

- Trucking (9:00 AM to 3:00 PM and 8:00 PM to 7:00 AM): Large semi-tractor trailer and dump trucks enter and exit the facility from Highway 25, get weighed at the scale, and washed.
- Transporting of composted materials to the screening area (6:00 AM to 6:00 PM).
- Screening (12:00 AM to 11:00PM).
- Grinding of non-compostable wood waste and compost overs (7:00 AM to 4:00 PM Monday through Friday, 7:00 AM to 11:00 AM Saturday).
- Finish Loading (6:00 AM to 5:00 PM): Final products are removed from the facility using a loader to load trucks.
- Non-compostable Transport (6:00 AM to 5:00 PM)
- Bunker loading and unloading (24-hours operation)
- Primary and Secondary Aeration Fans (24-hour operation). Aeration fans supporting the primary covered aerated static pile (CASP) will operate in one of two modes (positive and negative pressure modes) depending on material air flow needs. Fans supporting the secondary ASP will operate only in positive pressure mode.

Sources:

1. Noise Assessment Study for the Proposed Z-Best Products Food Waste Static Aeration Composting Facility Modification, Jeffrey K. Pack, July 24, 2019, Project No. 48-073-R2

2. Email communications with Z-Best on October 12 and 25, 2022 and response to request for information.

Traffic Noise Prediction

Existing daily traffic volumes from facility operation amounts to approximately 182 car trips per day and 208 truck trips per day traveling on Highway 25, primarily in the early morning or daytime hours (i.e., generally between the hours of 3 a.m. and 6 p.m.). During peak season operations[3], the proposed project would increase these quantities to 246 car trips and 314 truck trips per day, with the bulk of additional truck trips occurring at night, between 8 p.m. and 4 a.m. Under the proposed project operations, truck trips would be re-distributed to avoid any truck trips during peak traffic hours (7 a.m. to 9 a.m. and 3 p.m. to 8 p.m.).

The closest noise-sensitive receptor (R2) to Highway 25 is a single-family residential building on the south side of Highway 25 and west of the project site, approximately 220 feet from the highway centerline. The existing and future with-project 24-hour day-night noise level (L_{dn}) was calculated at this receptor using the Federal Highway Administration Traffic Noise Prediction Model Version 2.5. Data used in this calculation included existing (2019) annual average daily traffic volumes and truck mixes for this segment of Highway 25 from the Caltrans database and hourly existing and peak-season traffic volumes from the Hexagon Transportation Consultants, Inc. Z-Best Traffic Operations and Site Access Analysis memorandum. Traffic volumes used in this analysis are provided in Attachment B.

Table 7 compares the predicted existing and future with-project traffic noise levels at receptor R2.

[3] Peak season operations are anticipated to occur up to 20 days per year but are used for modeling purposes to be conservative.

Table 7. Comparison of Predicted Traffic Noise Levels (L_{dn}, dBA)

Receptor ID	Existing Traffic Noise Level	Future With-Project Traffic Noise Level	Change due to Project
R2	66	67	+1

Both existing and future with-project traffic noise levels at the receptor are within the “Critical” noise range for residential land use compatibility, meaning the existing noise environment at the receptor is already above preferred County guidelines. Due to the critical nature of the existing noise environment, many municipalities will place a higher value on potential increases in noise level (i.e., worsening an unwanted condition).

Although the project would result in an approximately 5-times increase in heavy truck traffic accessing the site during the nighttime hours, the resulting overall noise level increase at the worst-case receptor will be only 1 dB (imperceptible) on account of contributions from the substantial existing non-project traffic on Highway 25.

Operational Noise Prediction

The noise generating operations at the facility and corresponding operation schedules are described at the beginning of the Operational Noise Assessment section.

Table 8 provides the noise sources included in the acoustic model, corresponding quantity, and reference A-weighted sound power levels.
The primary and secondary aeration fan systems are designed to provide either negative or positive pressure. When the fans operate in the positive pressure mode, the noise generated is greater due to the non-ducted inlet of each primary zone fan that is otherwise not used during the negative pressure scenario.

Based on information provided by Engineered Compost Systems, each zone fan, on average, will use negative aeration, with a ducted inlet and outlet, for 17 days. The zone fans will then use positive aeration, with a ducted outlet only, for 1 day. Therefore, the positive aeration scenario was considered in the acoustic model to represent the worst-case noise generating mode of operation for the aeration fans.

Table 8. Modeled Noise Sources

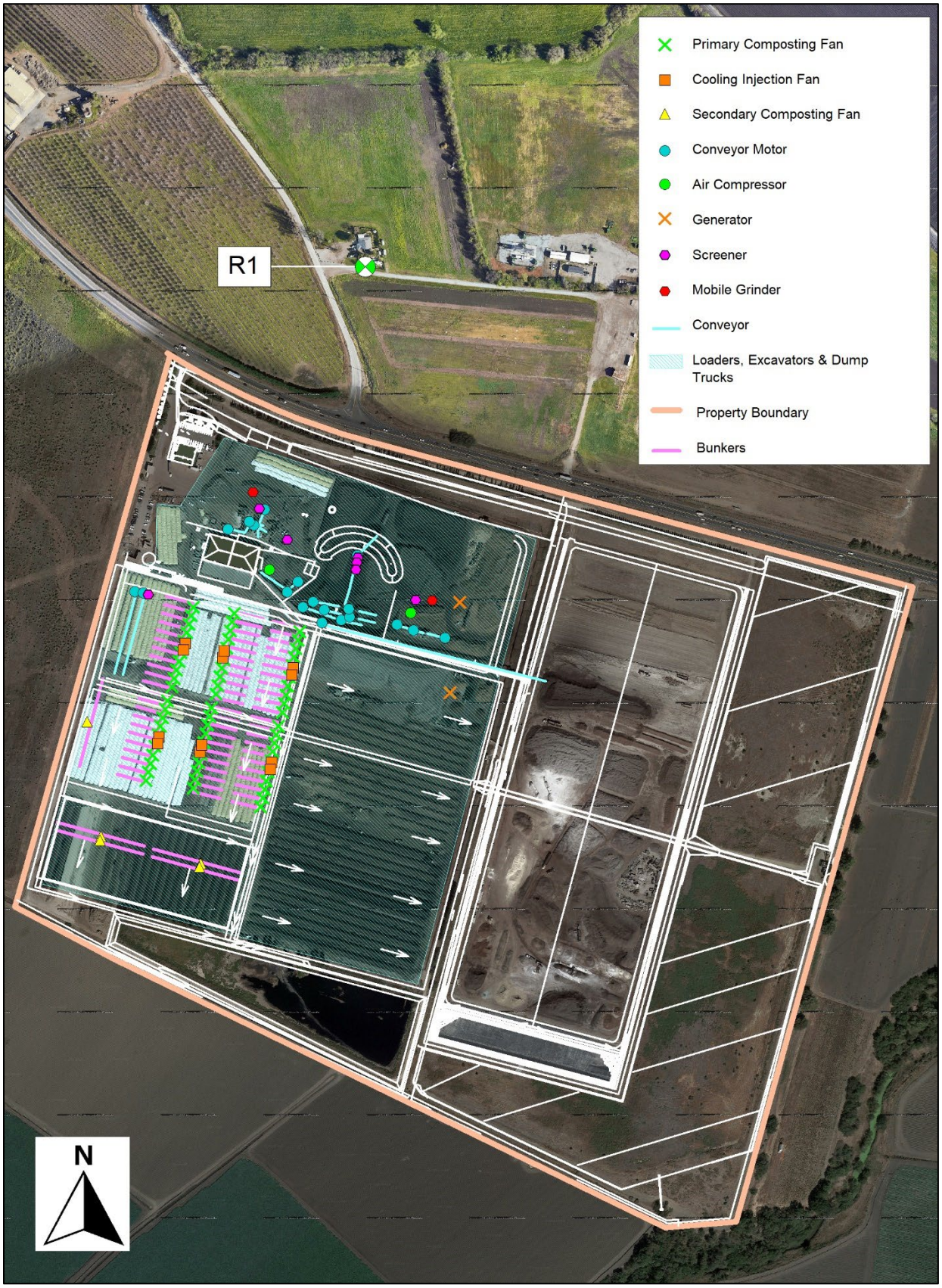
Equipment Name	Quantity Modeled	Reference A-Weighted Sound Power Level (dBA)
Air Compressors	2	93
Conveyers	21	92
Conveyer Motors	19	105
Cooling Inject Fans	12	93
Dump Trucks	3	109
Excavators	4	115
Generators	2	110
Loaders	11	117
Mobile Grinders	2	115
Primary Composting Fans (Positive Aeration)	60	102
Screeners	7	105
Secondary Zone Fans	5	102

Operational Noise Modeling Results

The CadnaA® Noise Prediction Model (Version 2022) was used to estimate the propagation of sound from project operations, and thereby to predict SPL at various distances from the project area, including representative noise-sensitive receptors selected for the ambient sound survey. CadnaA is a Windows-based software program that predicts and assesses sound levels near industrial sound sources and is based on ISO 9613-2 algorithms for the calculation of sound propagation (ISO 1996). The software can accept sound power levels in octave-band center frequency resolution to describe the multiple sound propagation sources of the site processes or activity to be modeled. The calculations account for classical sound wave divergence plus attenuation factors resulting from air absorption, basic ground effects, and barrier/shielding. The advantage of using CadnaA is that it can handle the three-dimensional sound propagation complexity of considering realistic intervening natural and human-made topographical barrier effects, including those resulting from terrain features and structures, such as multi-story buildings.

Additional CadnaA model configuration settings and operations noise analysis assumptions were as follows: 10 degrees Celsius outdoor temperature, 70 percent relative humidity, calm wind conditions (less than 0.5 meters per second), one order of acoustic reflections, and a ground absorption co-efficient of 0.5 representing a conservative mixture of hard and soft ground surfaces. These assumptions were selected as they represent conservative meteorological conditions for sound propagation that are expected to occur at the project site.

Figure 3 shows the primary facility noise sources included in the acoustic model.
Table 9 shows predicted project operational sound levels for both daytime and nighttime facility operations at receptor R1.



Map data: Google 2022©, Engineered Compost Systems 2022

Figure 3 Distribution of Modeled Noise Sources Assumed for Project Operations

Table 9. Predicted Proposed Facility Operational Sound Levels (dBA)

Noise-Sensitive Receptor ID	Predicted Daytime (7:00 AM – 10:00 PM) Sound Level	Applicable Daytime Noise Limit	Predicted Nighttime (10:00 PM – 7:00 AM) Sound Level	Applicable Nighttime Noise Limit	Compliant With Noise Limits?
R1	58	60	54	55	Yes

As shown in Table 9, the predicted daytime and nighttime operational noise levels are below the applicable noise limits.

Conclusion and Recommendations

Project construction and operations were assessed for noise and vibration impacts to sensitive receptors in the project vicinity. No applicable noise or vibration impact thresholds were exceeded when assessing project construction noise, construction vibration, and operational noise, and no noise mitigation beyond standard construction noise reduction practices is recommended. The predicted operational sound levels at the closest noise-sensitive receptor are considered conservative since the predictive noise model assumed flat topography at the project site. However, the project site will typically have compost piles in the northern section of the facility that would shield the noise generated by most sources south of these piles which would result in lower sound levels at the studied receptor.

References

Santa Clara County, California, 2022, Code of Ordinances, Title B – Regulations, Division B11 – Environmental Health, Chapter VIII – Control of Noise and Vibration

Santa Clara County General Plan, 1994, Book B, Safety and Noise, Rural Unincorporated Area Issues and Policies

Edward L. Pack Associates. Inc. 2019. Noise Assessment Study for the Proposed Z-Best Products Food Waste Static Aeration Composting Facility Modification. Project No. 48-073-R2

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Federal Highway Administration (FHWA). 2006. FHWA Roadway Construction Noise Model User's Guide. FHWA-HEP-05-054.

Federal Transit Administration (FTA). 2018. Transit Noise and Vibration Impact Assessment Manual. FTA Report No. 0123.

WJV Acoustics, Inc. 2018. Noise Study Peer Review, Z-Best Products Facility Modification, Santa Clara County, California. August 6. 2018.

Attachment A

Glossary of Acoustical Terminology

- **Sound** – For this analysis, sound is a physical phenomenon generated by vibrations that result in waves that travel through a medium, such as air, and result in auditory perception by the human brain.
- **Noise** – Noise typically is regarded as unwanted or disruptive sound. Whether something is perceived as a noise event is influenced by the type of sound, the perceived importance of the sound, and its appropriateness in the setting, the time of day, and the type of activity during which the noise occurs and the sensitivity of the listener. Local jurisdictions may have legal definitions of what constitutes “noise” and such environmental parameters to consider.
- **Frequency** – Sound frequency is measured in hertz (Hz), which is a measure of how many times each second the crest of a sound pressure wave passes a fixed point. For example, when a drummer beats a drum, the skin of the drum vibrates a number of times per second. When the drum skin vibrates 100 times per second, it generates a sound pressure wave that is oscillating at 100 Hz, and this pressure oscillation is perceived by the ear/brain as a tonal pitch of 100 Hz. Sound frequencies between 20 and 20,000 Hz are within the range of sensitivity of the best human ear.
- **Amplitude or Level** – Amplitude is measured in decibels (dB), using a logarithmic scale. A sound level of zero dB is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal conversational speech has a sound level of approximately 60 dB. Sound levels above approximately 110 dB begin to be felt inside the human ear as discomfort and eventually pain at 120 dB and higher levels. The minimum change in the sound level of individual events that an average human ear can detect is about 1 to 2 dB. A 3 to 5 dB change is readily perceived. A change in sound level of about 10 dB is usually perceived by the average person as a doubling (or if decreasing by 10 dB, halving) of the sound’s loudness.
- **Sound pressure** – Sound level is usually expressed by reference to a known standard. This document refers to sound pressure level (SPL), which is expressed on a logarithmic scale with respect to a reference value of 20 micropascals. SPL depends not only on the power of the source, but also on the distance from the source and the acoustical characteristics of the space surrounding the source.
- **Sound power** – Unlike sound pressure, which varies with distance from a source, sound power (and its counterpart sound power level) is the acoustic power of a source, typically expressed in watts.
- **A-weighting** – Sound from a tuning fork contains a single frequency (a pure tone), but most sounds heard in the environment do not consist of a single frequency and instead are composed of a broad band of frequencies, differing in sound levels. The method commonly used to quantify environmental sounds consists of evaluating all frequencies of a sound according to a weighting system that reflects the typical frequency-dependent sensitivity of average healthy human hearing. This is called “A-weighting,” and the measured decibel level is referred to as dBA.
- **Equivalent sound level (L_{eq})** – Environmental noise levels vary continuously and include a mixture of noise from near and distant sources. A single descriptor, L_{eq} may be used to describe such sound that is changing in level from one moment to another. L_{eq} is the energy-average sound level during a measured time interval. It is the “equivalent” constant sound level that would have to be produced by a single, steady source to equal the acoustic energy contained in the fluctuating sound level measured.
- **Community noise equivalent level (CNEL):** The CNEL is the energy average of the A-weighted sound levels occurring during a 24-hour period, with 5 dB added to the A-weighted sound levels occurring between 7 p.m. and 10 p.m. and 10 dB added to the A-weighted sound levels occurring between 10 p.m. and 7 a.m.

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	110	Rock band
Jet flyover at 1,000 feet		
	100	
Gas lawnmower at 3 feet		
	90	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	80	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawnmower, 100 feet	**70**	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	**60**	
		Large business office
Quiet urban daytime	**50**	Dishwasher in next room
Quiet urban nighttime	**40**	Theater, large conference room (background)
Quiet suburban nighttime		
	30	Library
Quiet rural nighttime		Bedroom at night, concert hall (background)
	20	
		Broadcast/recording studio
	10	
	0	

Source: Caltrans 2013

Figure A-1. Typical Indoor and Outdoor Sounds and Their Corresponding dB Levels

Attachment B

Traffic Tables

Hexagon Traffic Table 4 (Existing and Future Facility Traffic - Hourly)

	Existing Project-Only				Future Peak Season Project-Only				*Change in Volume with Project*			
	Daytime		Nighttime		Daytime		Nighttime		Daytime		Nighttime	
	Auto	Trucks	Auto	Trucks	Auto	Trucks	Auto	Trucks	Auto	Trucks	Auto	Trucks
ADT	137	169	45	39	185	276	61	246	48	107	16	207
Avg Hourly	9	11	5	4	12	18	7	27	3	7	2	23
	% Traveling west based on Hexagon Figure 2				% Traveling west based on Hexagon Figure 3							
Avg Hourly	4	9	2	4	6	15	3	23	2	6	1	19
	% Traveling east based on Hexagon Figure 2				% Traveling east based on Hexagon Figure 3							
Avg Hourly	5	2	3	1	6	3	3	5	2	1	1	4

Caltrans AADT on Highway 25 (2019)				
Vehicle AADT Total	AADT for MT	AADT for HT	% MT	% HT
27900	961	855	3.4%	3.1%

Existing Average Hourly Traffic - Assuming Standard Day/Night Distribution (85/15) - Theoretically includes existing car/truck traffic

Day Vehicle	Volume
Auto	1478
MT	54
HT	48
Night Vehicle	**Volume**
Auto	435
MT	16
HT	14

Existing Hourly Traffic - Adjusted to remove project traffic traveling east of site (Hexagon Fig 2 Split), Final volumes for existing scenario

Day Vehicle	Volume	
Auto	1473	
MT	54	**no Medium Trucks associated with project*
HT	46	
Night Vehicle	**Volume**	
Auto	432	
MT	16	**no Medium Trucks associated with project*
HT	13	

Future Hourly Traffic - Adjusted to remove project traffic traveling east of site (Hexagon Fig 3 Split), Final volumes for future scenario

Day Vehicle	Volume	
Auto	1475	
MT	54	**no Medium Trucks associated with project*
HT	52	
Night Vehicle	**Volume**	
Auto	433	
MT	16	**no Medium Trucks associated with project*
HT	33	

Receiver ID	Existing Day	Existing Night	Existing Ldn	Future Day	Future Night	Future Ldn	Change in Level
R2	+64.10	+58.80	+66.48	+64.20	+59.90	+67.25	+0.77