BEFORE THE STATE OF WASHINGTON
ENERGY FACILITY SITE EVALUATION COUNCIL

In the Matter of: Application No. 2013-01 TESORO SAVAGE, LLC TESORO SAVAGE DISTRIBUTION TERMINAL	CASE NO. 15-001 SWORN PRE-FILED TESTIMONY OF KRISTEN WALLACE

I, Kristen Wallace, state as follows:

1. I swear under the penalty of perjury of the laws of Washington and the United States that the following statements are true and correct.

2. I am over eighteen years of age and am otherwise competent to testify in this case. My testimony is based upon my education, training, experience, professional qualifications, and understanding of the matters herein.

3. I am a Senior Manager with Ramboll Environ and have been practicing in the field of environmental noise for more than 20 years. I have conducted numerous noise studies of varying complexity including compliance determinations, impact assessments, and investigations of mitigation measures for a variety of proposed developments and actions for private developers and government agencies. My projects have included evaluations of noise from power generation facilities, mines, ports, industrial facilities, urban centers, municipal and county facilities, residential and commercial developments, and highway and transit sources. Results of these analyses have been included in documentation ranging from simple compliance assessment reports to monitoring and management plans, and various state (e.g., SEPA, CEQA) and National Environmental Policy Act ("NEPA") environmental impact statements/reports. A copy of my CV is attached as Attachment A

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4. The purpose of this affidavit is to provide testimony regarding the Tesoro Savage Petroleum Terminal LLC, d/b/a Vancouver Energy (hereinafter, "TSPT" or the "Applicant") Application for Site Certification ("ASC") for the Vancouver Energy Terminal (the "Project") and its compliance with WAC 463-60-532 on noise.

5. Based on my professional experiences and training, I have developed an expertise in noise impact analysis.

6. For the ASC, I reviewed the rules for conducting noise analyses contained in WAC 463-60-352, which describes the following elements to be considered as part of the noise analysis:

- Describe and quantify the background noise environment that would be affected by the Project;
- Identify and quantify the impact of noise emissions resulting from construction and operation of the Project, using appropriate state-of-the-art modeling techniques, and including impacts resulting from low frequency noise;
- Identify local, state, and federal environmental noise impact guidelines;
- Describe the mitigation measures to be implemented to satisfy WAC 463-62-030; and
- Describe the means the Applicant proposes to employ to assure continued compliance with WAC 463-62-030.

7. Consistent with the provisions of WAC 463-60-352, I considered the following elements in the noise analysis conducted for the ASC.

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8. I characterized the existing sound environment at representative receiving locations in the vicinity of the Project using sound level data collected by others[1] for a different project at Terminal 5.

9. I quantified construction and operation sound levels using appropriate state-of-the-art modeling techniques, and included consideration of low frequency noise with the following tasks: I calculated "typical" construction activity sound levels at distances representing the nearest and most affected receivers to the Project. For this assessment, I used representative construction equipment sound level data identified by the US EPA.;[2] I also estimated impact pile driving construction sound levels at nearby receivers using the CadnaA noise model (i.e., a state-of-the-art model)[3] and sound level data of pile driving activities I captured for previous projects. I then quantified operational sound levels using the CadnaA noise model to estimate the sound levels of on-site noise sources at nearby receptor locations. The noise source sound level and frequency spectrum were based on vendor-provided data, past measurements of similar equipment, federally-provided data, or published documents. I also evaluated low frequency noise from the Project based on the C-weighted sound levels of the model-calculated levels.

10. I identified local and state noise limits, as set forth in WAC 463-62-030, WAC 173-60, and Chapter 20.935 of the Vancouver Municipal Code. WAC 463-62-030

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[1] Wilson Ihrig and Associates. 2011. Noise Impact Study, Interim Report, Port of Vancouver, Terminal 5 Development, Noise Impact Assessment for future BHP Billiton Operations Potash Facility. July 6, 2011.

[2] US Environmental Protection Agency (EPA). 1971. Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances. December 31. Washington DC.

[3] DataKustik Gmbh. 2011. CadnaA Version 4.1.138. Munich, Germany. The CadnaA noise model incorporates topographic and site plan data to build 3-dimensional maps of the site and surrounding vicinity. CadnaA considers distance, topography, intervening structures, atmospheric conditions, and ground types when calculating attenuation of sound at distant receiving locations, using algorithms identified in ISO 9613.

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identifies the construction and operation noise standards for energy facilities and adopts by reference the maximum environmental noise levels identified in 173-60-040 applied to operation of facilities and exemptions to these limits identified in WAC 173-60-050. WAC 173-60 identifies noise limits applicable to operations, but exempts daytime construction activities from the limits if they occur between 7 AM and 10 PM. Chapter 20.935 of the Vancouver Municipal Code further restricts the hours allowed for construction to between 7 AM and 8 PM. Because there are no applicable noise standards or regulations applicable to low frequency noise in local, state, or federal code, we used guidance identified in published documents and ANSI Standard B133.8 to characterize potential noise impacts from low frequency noise.[4] There are no federal regulations that establish noise limits on the sound emanating from the proposed Project as it affects surrounding properties.

11. I identified mitigation to ensure compliance with the applicable regulations.

12. For the analysis conducted for the Preliminary Draft Environmental Impact Statement ("PDEIS"), I included the compliance assessment and construction noise evaluation conducted for the ASC (described above) and added a consideration of potential noise impacts due to project-related increases in noise compared to existing sound levels in the vicinity. This additional assessment considered the on-site noise sources considered for compliance and trains traveling to and from the site. Because there are no applicable regulatory limits for assessing increases over existing levels for this Project, I applied Federal Transit Administration ("FTA")/Federal Railroad

[4] ANSI Standard B133.8 Gas Turbine Installation Sound Emissions; Environmental Sound Survey and Noise Impact Assessment – Dairy Hills Wind Farm Project, Perry, NY. Hessler Associates, Inc. May 3, 2006; Aesthetic and Noise Control Regulations. Rule 802d of the Colorado Oil and Gas Conservation Commission(COGCC); PARTNER - Low Frequency Noise Study, April 6, 2007. Prepared by Kathleen K. Hodgdon, Anthony A. Atchley, and Robert J. Bernhard.

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Administration ("FRA") noise impact criteria and methodologies for characterizing the potential noise impacts due to increases.[5]

13. Using the noise regulations, impact criteria, and methodologies described above, I reached the following conclusions in the ASC and in the PDEIS regarding noise impacts related to construction and operation of the Project.

I. CONSTRUCTION NOISE IMPACTS

14. As identified in WAC 173-60-050, construction noise is exempt from the noise limits during daytime hours (i.e., between 7 AM and 10 PM), and construction would be limited to daytime hours to ensure compliance with the applicable regulations. In addition, to further mitigate the potential for construction noise impacts, the Applicant will, to the greatest extent feasible, schedule noisy construction activities to the more restrictive hours identified in Section 20.935.030(4) of the Vancouver Municipal Code (i.e., between 7 AM and 8 PM). If outdoor construction is required outside of these hours, the Applicant will consult with the City of Vancouver, will notify the Energy Facility Site Evaluation Council ("EFSEC") in advance, and will not conduct the work until EFSEC has reviewed and approved the planned activities.

15. At the residences nearest the Project (i.e, the Fruit Valley community residences near West 20th Street and Thompson Avenue, and a residence on Port of Vancouver property west of the site), estimated sound levels from both "typical" and impact pile driving activities are less than the measured existing sound levels and would be expected to result in minimal impact.

16. At the Jail Work Center ("JWC") and Tidewater Office Building, estimated sound levels during the nearest construction activities are higher than the existing

[5] FTA (Federal Transit Administration). 2006. Transit noise and vibration impact assessment. FTA-VA-90-1003-06. U.S. Department of Transportation, Federal Transit Administration. May 2006.

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measured levels. However, these calculations represent sound levels when construction activities are at the nearest point to these locations. Most of the construction activities would be much more distant from the JWC or Tidewater Office Building than the nearest activities considered, and the highest calculated sound levels from construction would be relatively short-term. Because the construction sound levels would be lower than those identified in the ASC and PDEIS during most of the construction period, because the nearest locations are in an industrial area where elevated levels are typical and expected, because the overall construction activities would be temporary, and because construction would be restricted to daytime hours, these activities are expected to result in minimal construction noise impacts to surrounding uses.

II. OPERATION NOISE IMPACTS

17. Sound levels from long-term operation of on-site noise sources would be subject to the noise limits identified in WAC 173-60-040. Model-calculated sound levels of the expected on-site sources demonstrate compliance with both the daytime and nighttime noise limits at the nearest residences to the site, at the JWC, and at the Tidewater Office Building. Sound levels from trains during delivery by surface carriers are exempt from the limits, but sounds from the locomotives and railcars during the unloading process are subject to the limits and were included in the compliance assessment.

18. Potential noise impacts due to increases over existing levels were considered in the PDEIS for sensitive receivers (e.g., residences and the JWC dormitories). Based on that analysis I concluded that operation of the Project would result in minimal increases over the existing sound levels in the Project vicinity and therefore have minimal potential to cause noise impacts. This portion of the assessment considered noise from delivery of the trains and from trains departing the site, although this noise is

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exempt from the noise limits. In the absence of applicable standards or regulations for assessing impacts from increases due to the Project, the impact assessment was based on FTA noise impact criteria to provide a useful and objective method for assessing potential noise impacts from increases in noise directly attributable to all sources associated with the Project. Using this methodology, I concluded that noise impacts due to increases would result in minimal impacts.

19. In the PDEIS, I also considered potential noise impacts from any increased rail volumes on rail lines in the State of Washington. That review concluded that any increase in overall train volumes on these mainlines would result in negligible to slight noise impacts.

20. Because the noise assessment found that the Project would both comply with the applicable WAC noise limits and result in negligible to slight increases in noise over existing sound levels even when operating at maximum capacity, I concluded no operational noise mitigation would be necessary.

III. REVISIONS PRESENTED IN FEBRUARY 2015 SUPPLEMENTAL ASC

21. After completing the work described above, additional information became available and I made the following revisions to our initial work. These revisions were incorporated in the February 2014 Supplement to the ASC, as well as the final revised ASC.

22. When conducting the noise assessment for the initial ASC, we had limited sound level data for the expected primary sources of noise. For most of the sources, we used sound level data from previous projects which, in our professional opinion, would be similar to the sources proposed for the Project. Subsequent discussions with the client and equipment representative resulted in more project-specific sound levels for some of the equipment. This was particularly so for the marine vapor combustion unit ("MVCU") for

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which we initially had very limited sound level data. Subsequent discussions also identified other sources of noise not considered initially, that were included in the later version of the noise analysis (e.g., idling locomotives and switch engines).

23. The initial analysis of noise for the ASC did not include a discussion of pile driving because it was unclear at the time of the initial analysis whether pile driving would be required. Once I discovered that pile driving would be necessary, I included a discussion of noise associated with impact pile driving in the February 2014 Supplement to the ASC.

24. The initial analysis used published guidelines for assessing potential impacts from low frequency noise. The subsequent analysis included additional guidance from an ANSI standard to provide a broader range of guidance.

25. The initial ASC included existing sound level data that Ramboll Environ did not have permission to use. Subsequent analyses used another source to characterize the existing sound levels in the project vicinity.

26. Notwithstanding these changes, my conclusions remained the same, specifically, the Project would both comply with the applicable WAC noise limits and result in negligible to slight increases in noise over existing sound levels even when operating at maximum capacity.

IV. RESPONSE TO DISCUSSION OF NOISE IMPACTS IN EFSEC DEIS

27. I reviewed the noise section of the Draft Environmental Impact Statement ("DEIS") and documented my findings in comments later incorporated into a comment letter on the DEIS submitted on the behalf of the Applicant. My review comments on the DEIS are relevant to my testimony here regarding the ASC's compliance with WAC 463-60-532 on noise because those comments identified significant errors in the DEIS.

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Anyone reviewing the DEIS might mistakenly conclude that the Project will have greater noise impacts than it will actually have.

28. Overall, the DEIS consideration of operational noise impacts and rail line noise impacts were similar to those provided in the PDEIS and drew similar conclusions to what I identified in the PDEIS. I agree with the DEIS conclusions that operation of the Project is expected to comply with the applicable noise limits and will result in slight to negligible impacts due to noise increases.

29. However, the DEIS discussion of construction noise used inappropriate noise standards and methodologies for considering construction noise impacts. The resulting conclusions in the DEIS regarding construction noise are grossly flawed.

30. The DEIS used a flawed approach to compare calculated construction noise levels to the State noise limits. As stated previously in my testimony, construction noise is exempt from the Washington State noise limits during daytime hours. The City of Vancouver does not identify noise limits, but adopts the Washington State noise limits and exemptions. Because construction activities would be limited to daytime hours, they are not subject to the noise limits identified in WAC 173-60-040. Furthermore, it is inappropriate to apply long-term operational noise limits to temporary construction activities.

31. The determination of moderate or major construction noise impacts presented in the DEIS is also flawed because it was partly based on comparing construction noise levels to the FTA's operational noise impact criteria. The FTA operational noise impact criteria used in the DEIS noise section are applicable to long-term operational noise, not temporary construction noise.

32. Additionally, although the DEIS implies that it used the FTA general assessment methodology for assessing construction noise, the DEIS did not follow the

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steps outlined in the FTA general assessment methodology regarding construction noise impact criteria, noise descriptors used to characterize the construction equipment sound, noise calculation techniques, or noise source sound levels. The FTA general assessment methodology specifies the following:

33. Construction noise levels are to be calculated as hourly Leqs, not Ldns. (*The DEIS characterized construction noise levels as L_{dns}, not L_{eqs}*).

34. Predictions are to be based on the two noisiest pieces of equipment expected to be used in each construction phase. (*The DEIS did consider the two noisiest pieces of equipment for each phase. It should be noted that the loudest piece of equipment the DEIS used was a jackhammer during foundation and erection phases. This single piece of equipment dominated the calculated construction noise levels and resulting discussions of potential impact, and it is doubtful that a jackhammer would be required during these phases. If required, it would be expected to be used for a very short duration in comparison to the overall schedule.*)

35. Full power operation for a time period of one hour is assumed (because most construction equipment operates continuously for periods of one hour or more at some point) (*The DEIS characterized construction noise levels over a 24-hour period using the L_{dn}, not over a 1-hour period that could be characterized with an hourly L_{eq}.*)

36. The equipment sound level at 50 feet is taken from Table 12-1 in the FTA manual. (*The DEIS used updated noise emission levels identified in the FHWA Roadway Construction Noise Model ("RCNM") because they are taken from more recent measurements of representative equipment.*)

37. All pieces of equipment are assumed to operate at the center of the project work area. (*The DEIS conservatively used the nearest point of construction to each receiving property, not the center.*)

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38. The suggested guidelines for assessing potential noise impacts using the general assessment method are an hourly L_{eq} of 90 dBA at residential uses and 100 dBA at industrial or commercial uses. Calculated construction noise levels using the general assessment methodology outlined above would not be expected to result in adverse community reaction. Calculated sound levels at or below these levels would, therefore, not be expected to result in significant noise impacts from construction. (*As noted previously, the DEIS inappropriately compared the calculated L_{dn} levels to the City/State operational noise limits and to the FTA operational noise impact criteria for assessing the potential for noise impacts.*)

39. Using the above flawed noise descriptors and methodology, the DEIS erroneously identified potentially significant noise impacts at both the Tidewater Office Building and the JWC during construction activities. After review of the DEIS, I considered the potential for construction noise impacts using the FTA's general assessment methodology referenced in the DEIS. A January 11, 2016 Memorandum ("Memorandum") (attached as Attachment B) identifies the process and expected results of the construction noise impact assessment if the DEIS had followed through on applying the appropriate FTA general assessment methodology. Specific elements and conclusions documented in the memorandum are summarized as follows:

40. I calculated the loudest expected hourly Leq.

41. The hourly Leq is the most useful and appropriate noise descriptor for this purpose for several reasons:

- The L_{eq} is used by federal agencies, including the FTA and FHWA, for assessing construction noise impacts.

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- It can be used to describe the noise level from operation of each piece of equipment separately and is easy to combine to represent the noise level from all equipment operating during a given period.
- Although it is often described as just an "average, the L_{eq} is in fact an "energy-average" in which higher peaks (which contain substantially more energy than lower sound levels) have much greater influence on the overall calculated L_{eq} level than a simple average would indicate.
- The L_{eq} has been found to closely track community response to noise.

42. The calculations in the Memorandum used the two noisiest pieces of equipment expected during the noisiest construction phase. I used the same phase and pieces of equipment identified in the DEIS, a jackhammer and derrick crane during foundation work. As noted above, the sound level of the jackhammer is much louder than all other equipment identified and is an unlikely piece of equipment to be used during foundation work. Therefore, this assumption can be considered extremely conservative.

43. I assumed that the two pieces of equipment would operate at maximum power for a full hour at the nearest possible location to the receiving location. Again, because the FTA methodology stipulates that the calculations should place the equipment at the center of the construction area, this assumption is extremely conservative.

44. The highest calculated construction sound level of 84 dBA at the Tidewater Office Building would be well below the 100 dBA suggested for industrial/commercial receivers and also well below the 90 dBA suggested by FTA for residential receivers, indicating that construction noise would result in a slight impact at this location, particularly given the conservative assumptions used in the calculations. Additionally,

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sound inside the office building would be reduced by more than 20 dBA by closed windows.[6]

45. The highest calculated construction sound level of 82 dBA at the JWC would be well below the suggested level of 90 dBA applied to residential uses, indicating that construction noise would result in a slight impact at this location, particularly given the conservative assumptions used in the calculations.

46. In summary, appropriate application of the FTA's general noise methodology demonstrates that construction impacts on the Tidewater Office Building or the JWC would be minimal.

V. TESTIMONY ON ISSUES THAT MAY BE RAISED BY OTHERS IN THE ADJUDICATION

47. Others may argue that World Health Organization ("WHO") noise guidelines should be considered when addressing construction noise. I strongly disagree. The WHO recommends *nighttime* sound levels of 30 dBA for interior sleeping spaces and 45 dBA outside of sleeping spaces as a general guideline. The WHO guidelines are idealized goals currently exceeded in many urbanized, residential neighborhoods. Furthermore, construction activities would not occur during nighttime hours. As such, they are inappropriate to use as a standard from which to compare temporary construction noise impacts.

48. I also disagree with any suggestion that the Applicant be required to contribute funds to a quiet zone designation for train noise. There are no identified significant noise impacts along the rail route from additional rail-related sources, including locomotive horns associated with the project. As a result, such a mitigation requirement would be unwarranted.

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[6] U.S. Department of Housing and Urban Development ("HUD"). The Noise Guidebook. U.S. Government Printing Office: 1991-281-930/54016.

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49. I would also disagree with any suggestions for additional noise modeling for areas adjacent to Vancouver Lake Park. Noise modeling has already been conducted at locations much nearer to the project site than Vancouver Lake, as described in the ASC, PDEIS, and in the Memorandum. This modeling confirms minimal noise impacts from construction and operation of the Project. Because sound levels continue to attenuate over distance, the project will not result in significant noise impacts at the more distant locations on Vancouver Lake.

50. Likewise, I would strongly disagree with the need for further modeling or mitigation for residents in the Fruit Valley community. The Fruit Valley area is fairly distant (over 7,000 feet) from the primary noise-producing portions of the Project (i.e, the unloading area at Terminal 5). Model-calculated sound levels of construction and operation of the Project are well below the WAC noise limits identified to protect these types of uses and are also lower than measured existing sound levels in the neighborhood.

51. Finally, I would disagree with anyone who suggests that the Project would cause significant noise impacts from train horns. My noise analysis fully considered the potential impact of train horns on nearby residential communities in reaching its conclusion that operational noise impacts would be minimal. Train horns are an existing source of noise in the Project vicinity. The nearest residences to the existing at-grade rail crossing of Thompson Avenue (i.e., residences near the intersection of West 20th Street and Thompson Avenue) are approximately 1,000 feet from that rail crossing, with some intervening industrial buildings. Trains currently use this line and sound the horn at this crossing. Thus, locomotive horns associated with the Project would not be a new source of noise. The PDEIS and DEIS did consider the impact of increased locomotive horn usage at this at-grade crossing when applying the FTA noise impact methodology and criteria. Minimal noise impacts were found.

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52. Additionally, noise impacts from train horns in the Fruit Valley residential neighborhood would not be significant. The nearest at-grade rail crossing to the Fruit Valley community is at Thompson Avenue, approximately 2,600 feet from the Fruit Valley community. Federal regulations require that horns sound at levels of 96 to 110 dBA measured at a distance of 100 feet. Locomotive horn noise would be reduced by approximately 28 dBA when compared to the sound level at a distance of 100 feet due only to distance attenuation, and the numerous intervening buildings would result in an additional reduction in locomotive horn sound levels. The PDEIS and DEIS did consider the impact of increased locomotive horn usage at this at-grade crossing when applying the FTA noise impact methodology and criteria. Minimal noise impacts were found.

VI. CONCLUSION

53. As described in detail in the ASC, in the PDEIS, in Memorandum, and in my testimony above, my assessment of noise impacts related to the Project indicates that construction and operation of the Project would result in minimal noise impacts to the communities and businesses in the Project vicinity.

54. I have attached the following exhibits to my testimony:

Attachment A: *Curriculum Vitae* of Kristen Wallace

Attachment B: Ramboll Environ memorandum, *Vancouver Energy DEIS Review – Calculations to Consider Construction Noise for DEIS*, January 11, 2016

[Signature on the Following Page]

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DATED this 10th day of May, 2016.

Kristen L Wallace
Kristen Wallace, Declarant

STATE OF Washington)
)
COUNTY OF Snohomish

Kristen Wallace, being duly sworn upon oath, deposes and says: The foregoing testimony is true, correct and complete to the best of my knowledge, information and belief and is given subject to the laws of perjury in the State of Washington.

GIVEN under my hand and official seal this 10th day of May, 2016.

Notary Public
State of Washington
CYNTHIA A WAGENER
My Appointment Expires Feb 12, 2017

NOTARY PUBLIC in and for the State of:
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Residing at: 21203 58th Ave W. Mountlake Terrace, WA 98043
My Commission Expires: 2/12/2017
Cynthia A. Wagener
Printed Name of Notary:
Cynthia A. Wagener

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ATTACHMENT A

KRISTEN WALLACE

Manager 10, Ramboll Environ

Summary of Experience / Expertise

Kristen Wallace has more than 20 years of experience managing and conducting environmental noise studies. These studies have included compliance determinations, impact assessments, and investigations of mitigation measures for a variety of proposed developments and actions for private developers and government agencies. Projects have included evaluation of noise from power generation facilities, mines, ports, industrial facilities, urban centers, and highway and transit sources. The results of these analyses have been included in documentation ranging from simple compliance assessment reports to monitoring and management plans, various state (e.g., SEPA, CEQA) and National Environmental Policy Act (NEPA) environmental impact statements/reports, and Environmental and Social Impact Assessments (ESIA) as required by International Finance Corporation (IFC) projects.

CONTACT INFORMATION

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EDUCATION

1988-1992
MS, Aerospace Engineering
University of Cincinnati, Cincinnati, Ohio, United States

1984-1988
BA, Mathematics and History
College of Idaho, Caldwell, Idaho, United States

EXPERIENCE

Vancouver Energy Distribution Terminal, Washington, USA

Completed the noise section for the Washington Energy Facility Site Evaluation Council (EFSEC) application and currently conducting the ongoing environmental noise impact assessment for inclusion in the Preliminary Draft EIS. Conducted extensive noise modeling using CadnaA of both on-site sources and on and off-site train activities to evaluate compliance with regulatory limits and the potential for noise impacts.

Gateway Pacific Terminal, Washington, USA

Primary noise analyst for the environmental noise impact and mitigation analyses for the Gateway Pacific Terminal, a proposed multi-commodity export/import facility in northwest Washington. Modeled sound levels used the CadnaA model to consider future project-related sound levels to identify potential impacts and mitigation measures. The evaluation extensively considered rail and locomotive noise, including the use of wayside warning horns in lieu of locomotive-mounted warning horns.

B Street Pier Shore Power Project, Port of San Diego, California, USA.

Conducted the environmental noise impact and mitigation analysis for the proposed addition of a shore power facility on the B Street Pier in San Diego. The noise assessment included

identification of relevant noise regulations, estimation of project-related sound levels at the nearest sensitive receivers, and assessment of various noise mitigation measures. Results of the analysis were included in a Negative Declaration prepared pursuant to the requirements of CEQA.

Terminal 5 Cargo Wharf Rehabilitation, Berth Deepening, and Improvements Project, Washington, USA
Currently conducting an environmental noise impact assessment for improvements to and proposed expanded operations of a container terminal and intermodal yard at the Port of Seattle Terminal 5. The study includes source sound level measurements and noise modeling using the CadnaA model to consider several potential alternatives, each considering increased density of usage and increased throughput of TEUs. The results of the analysis will be included in a SEPA Environmental Impact Statement (EIS) for the project.

Dominguez Oil Field Development Project, California, USA
Analyzed potential noise impacts associated with a proposed new oil production facility and associated pipelines at an industrial site in Dominguez, California. The noise impact analysis included noise modeling of the construction and operation of the facility using CadnaA and evaluation of the effectiveness of noise mitigation. Results of the analysis were included in a noise section intended for inclusion in the Draft EIR.

Rialto Renewable Energy Center (RREC) Project, California, USA
Conducted the noise impact assessment for a proposed biomass energy production facility. The noise analysis included sound Puyallup Tribal Terminal, SSA Marine, Port of Tacoma, WA. Primary noise analyst for the environmental noise impact and mitigation analysis for the proposed Puyallup Tribal Terminal, a new container facility within the Port of Tacoma. Measured existing ambient sound levels in the potentially affected area and source noise sound levels for equipment and processes in use at the existing facility. Used the CadnaA noise model to consider future project-related sound levels to identify potential impacts and mitigation measures.

Hyperion Treatment Plant Digester Gas Utilization Project (DGUP), California, USA
Analyzed potential noise impacts associated with updating power generation capabilities to utilize digester gas at the Hyperion Treatment Plant (HTP) in Los Angeles. The impact assessment included noise modeling and the evaluation of potential noise mitigation measures. Documented the results of the study in a format suitable for preparation of the Mitigated Negative Declaration (MND). Subsequently updated the noise analysis for inclusion in a Draft EIR for the project.

Puyallup Tribal Terminal, Washington, USA
Conducted the environmental noise impact and mitigation analysis for the proposed Puyallup Tribal Terminal, a new container facility within the Port of Tacoma. Measured existing ambient sound levels in the potentially affected area and source noise sound levels for equipment and processes in use at the existing facility. Used the CadnaA noise model to consider future project-related sound levels to identify potential impacts and mitigation measures.

Southwest Harbor Redevelopment EIS, Port of Seattle, Washington, USA
Evaluated the environmental noise implications of the cleanup and redevelopment of a shipyard into a container handling facility. Analyses included extensive background sound level measurements, source noise tests with simulated operations that included container trains, and extensive noise modeling and calculations. Modeled the noise reduction benefits of various noise barriers on and around the facility property. Results were incorporated into the NEPA EIS and presented to and discussed with interested citizens at numerous neighborhood meetings.

PROFESSIONAL AFFILIATIONS AND ACTIVITIES

Institute for Noise Control Engineering, Member

ATTACHMENT B

January 11, 2016

MEMORANDUM

To: Tadas Kiselius, VNF
CC: Irina Makarow, BergerABAM

Project No: 29-33275E

From: Kristen Wallace

Project Name: Vancouver Energy DEIS Review

Subject: Calculations to Consider Construction Noise for DEIS

This memo documents the methods and results of additional construction noise calculations conducted using the FTA general method guidelines identified in the FTA Transit Noise and Vibration Impact Assessment manual (FTA 2006). These calculations demonstrate that proper application of the FTA guidelines leads to a conclusion that construction would not result in significant noise impacts.

BACKGROUND

The DEIS identified potential "moderate to major" noise impacts from both typical construction activities, pile driving, and jet grouting activities due to noise that would be received at the JWC and the Tidewater office building. The DEIS cited FTA general guidelines methodology as the basis of the construction noise assessment. The DEIS did not, however, properly apply the FTA methodology, which led to erroneous results and conclusions. Ramboll Environ, therefore, revisited the construction noise calculations following the FTA general assessment methodology as described below.

FTA GENERAL ASSESSMENT

The FTA general assessment methodology specifies the following:

- Construction noise levels are to be calculated as hourly L_{eq}s, not L_{dn}s.
- Predictions are to be based on only the two noisiest pieces of equipment expected to be used in each construction phase.
- Full power operation for a time period of one hour is assumed (because most construction equipment operates continuously for periods of one hour or more at some point).
- Free-field conditions are assumed and ground effects are ignored.
- Emission level at 50 feet is taken from Table 12-1 in the FTA manual.
- All pieces of equipment are assumed to operate at the center of the project work area (or the roadway centerline in the case of a guideway or highway construction project).
- Suggested guidelines for potential noise impacts using the general assessment method are that an hourly L_{eq} of 90 dBA at residential uses and 100 dBA at industrial/commercial or lower would not be expected to result in adverse community reaction. Calculated sound levels at or below these levels would, therefore, not be expected to result in significant noise impacts from construction.

EX 0101-TSS

Application of FTA General Assessment Calculations to Typical Construction Activities

Ramboll Environ applied the steps identified above to typical construction activities expected with the proposed project, with the revisions noted below.

- Table 3.9-5 of the DEIS identifies the two loudest pieces of equipment during each phase of typical construction. The DEIS used a 1971 EPA document on construction noise (EPA 1971), to identify the loudest potential equipment per phase. [1] Table 3.9-5 identifies the Erection phase as the loudest phase, with the two loudest pieces of equipment being a derrick crane and a jack hammer.
- Table 3.9-5 of the DEIS used the maximum sound levels identified in the FHWA's 2006 *Roadway Construction Noise Model* (RCNM) instead of the levels identified by FTA's general assessment guidelines. The levels identified by FTA are from EPA's 1971 document referenced above. It is appropriate to use the FHWA levels since construction equipment sound levels have been reduced since 1971, and the 2006 FHWA levels are likely to more accurately reflect current construction equipment sound levels. The levels used for these calculations include the derrick crane (with a maximum sound level of 89 dBA at 50 feet) and the jack hammer (with a maximum sound level of 81 dBA at 50 feet).
- Sound levels of full power operation for a time period of one hour were estimated by assuming that the maximum sound level could occur over the full hour and would represent the worst-case hourly L_{eq}. The reference hourly L_{eq} for the Erection phase, including both the derrick crane and jack hammer is 89.6 dBA at 50 feet.
- Free-field conditions were assumed and ground effects ignored. For this estimate, we used a simple distance calculation that assumes that sound from the construction equipment dissipates over distance by 6 dBA for every doubling of distance from the source.
- The FTA general assessment guidance states that all pieces of equipment should be assumed to operate at the center of the project, or centerline, in the case of a guideway. Instead, Ramboll Environ used the more conservative (i.e., nearer) distances identified in the DEIS of 100 feet to the Tidewater Office Building, 400 feet to the JWC, and 3,000 feet to the Fruit Valley residential area.

Using the above assumptions and techniques, the calculated worst-case, typical construction sound levels at the Fruit Valley residences, the JWC dormitories, and the Tidewater Office Building are 54, 72, and 84 dBA, respectively. The calculated levels of 54 and 72 dBA at locations representing residential locations are much lower than the 90 dBA suggested in the 2006 FTA manual to avoid adverse community reaction. Similarly, the calculated level of 84 dBA at the Tidewater Office Building (a commercial receiver) is much lower than the 100 dBA suggested in the 2006 FTA manual to avoid adverse community reaction.

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[1] U.S. Environmental Protection Agency, "Noise from Construction Equipment and Operations, Building Equipment and Home Appliances," NTID300.1, December 31, 1971.

Because the calculated hourly L_{eq} levels are much lower than the construction noise impact levels suggested in the FTA manual, no significant noise impacts would be expected during typical construction activities.

Application of FTA General Assessment Calculations to Impact Pile Driving and Jet-Grouting Activities

Applying the same general assessment methodologies and impact criteria discussed above to potential pile driving and jet grouting activities results in the following:

- The two loudest pieces of equipment during impact pile driving would be the pile driving (with a maximum sound level of 101.3 dBA at 50 feet) and crane (with a maximum sound level of 80.6 dBA at 50 feet). Using the very conservative assumption that the maximum level occurs during the entire hour, the total hourly L_{eq} from impact pile driving activities is estimated to be 101.3 dBA at 50 feet).
- The total hourly L_{eq} from jet grouting (with a maximum level of 85 dBA at 50 feet) and a concrete batch plant (with a maximum level of 83 dBA at 50 feet) is 87.1 dBA, which is much lower than impact pile driving.
- Because it is the loudest of the two activities, we focused this assessment using the impact pile driving hourly L_{eq} of 101.3 dBA at 50 feet.
- Free-field conditions were assumed and ground effects ignored. For this estimate, we used a simple distance calculation that assumes that sound from the construction equipment dissipates over distance by 6 dBA for every doubling of distance from the source.
- The pile driving equipment was conservatively assumed to operate at the nearest point of pile driving to each receptor location. The distances considered were 3,000 feet to Fruit Valley residences, 450 feet to the JWC dormitories, and 700 feet to the Tidewater Office Building.

Using the above assumptions and techniques, the worst-case, conservative calculated pile driving hourly L_{eq} levels at the Fruit Valley residences, the JWC dormitories, and the Tidewater Office Building are 66, 82, and 78 dBA, respectively. The calculated levels of 66 and 82 dBA at the Fruit Valley and JWC locations representing residential locations are much lower than the 90 dBA suggested in the 2006 FTA manual to avoid adverse community reaction. Similarly, the calculated level of 78 dBA at the Tidewater Office Building (a commercial receiver) is much lower than the 100 dBA suggested in the 2006 FTA manual to avoid adverse community reaction.

Because the calculated hourly L_{eq} levels are much lower than the construction noise impact criteria suggested in the FTA manual, no adverse community reaction would be expected, any noise impacts would be minor, and no significant noise impacts would be expected during either pile driving or jet grouting activities.