In August 2017 Vancouver Fraser Port Authority (VFPA) issued Trans Mountain a Project Development Permit for the expansion of the Westridge Marine Terminal as part of the Trans Mountain Expansion Project. Condition 36 of VFPA PER # 15-322 stipulates that:

“All general and physical activities related to the Project shall be conducted Monday to Saturday between the hours of 7:00 AM and 8:00 PM, except for non-motorized hand labour activities which do not increase the background noise levels within the surrounding community”.

The Noise Management Plan for Construction at Pump Stations and Terminals, Section 3.1 requires that Trans Mountain obtain written authorization from VFPA for any construction work outside of designated Westridge construction hours.

Pursuant to this commitment, Trans Mountain is seeking leave from VFPA to conduct welding work during night-time hours.

**Rationale for extended work hours request**

The Trans Mountain Expansion Project uses large prefabricated steel jackets that are set over four-pile dolphin groupings to provide the stiffness needed to resist the lateral forces anticipated while berthing the tanker ships the facility was designed to accommodate. These dolphin jackets are secured to the piles with 30-inch diameter shear lugs that are welded to both the jackets and the piles the jackets are set over. Figure 1, below, shows this shear lug connection.
Each jacket has 16 shear lugs that secure it to the four-pile dolphin pile group, with each pile having four shear lugs attached to it. Figure 1 shows a profile view of the dolphin jacket structure over the piles, and it also demonstrates a basic representation of the shear lugs’ relationship to the water at various tide elevations. Three of the four shear lugs on each leg of the dolphin jacket are submerged at tides above mean high water. The fourth lug on each jacket leg is situated above the local higher high tide level and will not be exposed to sea water submersion.

The resultant impact of the elevation of the shear lugs and their relationship to the tidal waters is that the welding and painting required to install the lugs can only be performed when tides are below 0.8 meters in Geodetic Elevation Datum (GD), which the project was designed with relation to. The nature of tidal elevations over the course of any given year dictates that tides are generally lower during the daytime hours throughout the spring & summer months. Conversely, they are higher during the daytime hours throughout the fall & winter months. A sample of typical summer and winter tides are shown below in Figure 2A.
Figure 2A – A Sample of a Weekly Tide Forecast Comparing Summer Month Tides (Top) vs. Winter Month Tides (Bottom) and Their Relationship to the Shear Lug Elevations. The Horizontal Red Lines Represent the Top & Bottom of the Shear Lug, and the Horizontal Yellow Line Represents the Elevation of the Work Access Platform for Performing the Shear Lug Installation Operations

Figure 2B – A Graphic Representation of the Elevations Depicted in Figure 2. This Shows the Shear Lugs’ and Work Platforms’ Relationships in to Tidal Elevations (given in both Geodetic Datum (GD) & the more common Chart (CD), or Mean Sea Level (MSL) Datum)
In Figure 2A, the yellow horizontal lines represent the elevation of the work platforms that will be used to install the shear lugs, while the lower and upper horizontal red lines depict the bottom and top elevations of the lower shear lugs, respectively. Further, Figure 2B shows those same elevations overlaid against a profile of a typical dolphin jacket. As demonstrated in this comparison, the available hours with tides conducive to shear lug installation between our current work shift constraints of 7:00 AM to 8:00 PM are significantly reduced during the winter months. Compounding this, data from an onsite tide analysis comparing forecasted tides to actual tides observed show that actual low tides are approximately 0.4m higher than those forecasted. This creates the potential that actual work windows may be reduced or delayed even more than anticipated when using published tide tables for a planning guide. A more in-depth analysis of forecasted tidal cycles over the course of a full year has shown that from mid-September to mid-March, the tidal cycles will have enough of an impact on the currently permitted working hours that welding efficiency will be reduced up to 70%. Considering that the welding surfaces will have to be cleaned after each tidal event that submerges an incomplete lug, inefficiency rates could climb even higher for days that include a tidal stoppage mid-shift, making it difficult for Trans Mountain to complete the welding work on schedule.

**Proposed Activities**

For the project, there are 24 individual jackets that are supported by a total of 384 shear lugs. Of those, 75% (288 lugs) are situated within the a tidal zone. In the most ideal conditions, it is anticipated that approximately two weeks of single 10-hour shifts are needed to complete the shear lug welding for a single jacket if a crew of eight welders are used along with a foreman and crane support. After the welding is completed, 8-10 working days are anticipated for coating finishes and final inspections.

In an effort to minimize the impacts that high tide cycles have on welding efficiency, especially during the winter months, KLTP requests that welding and weld preparation activities, as well as structure coating repairs & touch-ups, be allowed to commence outside the currently permitted working hours. Specific activities related to this work would include, but not be limited to:

- Operation Setup (crane hoists, barge movements, sound barrier installation)
- Fit-up for Shear Lugs (each will require custom fitting & coping)

*Figure 3 – The Temporary Shear Lug Installation Access Platform After Assembly. At Higher Tides, the Lower Platforms Shown will be Under Water.*
• Installation of Sound & Arc Flash Barriers (must be set up and taken down daily so it’s not torn out by tidal currents)
• Welding Preparation (grinding, surface cleaning after every high tide)
• Welding & Inspection
• Coating Finishing (containment setup, surface preparation (grinding or possible sandblasting), coating)

The anticipated equipment that will be required to complete this work includes, but is not limited to:
• 1 ea - Crane on Barge (i.e. DB Olympia, Liebherr 1130, Manitowoc 4100)
• 1 ea - Deck Winch for Spuds & Anchors
• 1 ea - Deck Generator, 36 kVA WhisperWatt – Diesel Powered
• Diesel Generators
  o 2 ea – 6 kW WhisperWatt (1 ea per Temporary Platform)
  o 1 ea – 150 kVA WhisperWatt
• 1 ea - 400 Amp Welder – Diesel Powered
• 1 ea - Light Plant – Diesel Powered
• 1 ea - 185 cfm Air Compressor – Diesel Powered
• 2 ea - Work Skiff with Outboard Motor

KLTP would actively manage any operation performed outside currently permitted working hours to minimize noise levels while maintaining reasonable operational efficiency. This commitment would include installing Echo Barrier (or similar) sound barrier around the engine compartment of any diesel equipment operating onsite and shutting equipment down to minimize sound while not in use for significant periods. Where possible, KLTP would also set up sound barrier around other operational areas that could potentially create noise, such as shear lug fit-up and custom trimming or grinding. KLTP would also create a Risk Analysis specific to noise created by onsite operations and implement specific measures that will require crews to manage their operation’s volume levels to maintain the lowest noise levels reasonable.

Assessment of potential offsite noise disturbances from the work
The following are the types of noise that are anticipated to arise from the work proposed for night shifts:
• Diesel Powered Equipment:
  • Barge crane;
  • Air compressor;
  • Generators; and
  • Welding Machines.
• Steel on Steel:
- Impulsive noise from hammer strikes for steel fittings or slag cleaning.
- Grinding for Weld Preparation

The Site Plan in Figure 4 below indicates the location on site where night welding activity would be conducted.

**POSSIBLE LOCATIONS OF OFF-HOURS WORK SHIFTS**

![Figure 4 – Site Plan Showing Locations Where Welding Operations May Be Required at Night](image)

**Proximity to receptors and neighbours that may be affected**

While the attached screening form confirms the WMT property boundary is immediately adjacent to residences, the distance from the nearest residence to the VFPA water lot boundary is about 150 m and the distance from the nearest residence to the planned work area is 500 m.
The terrain between the planned work area and the nearest residence consists of open gravel and paved yard sloping up to a treed buffer between the WMT property and adjacent residences. There is no ground or structure barrier blocking line-of-sight between the work area and residences; however, line of sight will be mostly blocked by trees, depending on the tree types – leaves may not yet be out on deciduous types.

While more than 100 homes are present within 500 m of the WMT property boundary, between 41 – 100 homes are located within 500 m of the planned work area.

Noise modelling was conducted to estimate the expected noise generated by welding activities at the closest sensitive receptors. This was completed using CadnaA modelling software which implements the widely recognized and accepted International Standards Organization standard ISO 9613. All potential sources listed above were included for the assessment scenario. The scenario includes one (1) derrick barge and one (1) temporary work platform used at any given time with a maximum of eight (8) welding operations simultaneously. Noise data used for the assessment was manufacturer supplied data, accepted noise calculation methods or representative sound measurements. The analysis includes the application of mitigation measures detailed below.

Table 1 below summarizes the results of the modelling exercise. The expected levels are below the Permissible Sound Level (PSL, as defined in BC OGC noise guideline). Note that the results for R3 are in line with the current evaluation process which is subject to change if the ambient levels are adjusted to reflect reality. If baseline levels are adjusted for R3, the activity will still be in compliance with BC OGC Noise Guidelines.

<table>
<thead>
<tr>
<th>Receptor</th>
<th>Nighttime PSL Limit (dBA)</th>
<th>Predicted Nighttime Welding Noise Levels (dBA)</th>
<th>Predicted Cumulative Nighttime Noise levels (dBA)</th>
<th>Below PSL?</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>51</td>
<td>43</td>
<td>48</td>
<td>Yes</td>
</tr>
<tr>
<td>R2</td>
<td>51</td>
<td>42</td>
<td>47</td>
<td>Yes</td>
</tr>
<tr>
<td>R3</td>
<td>56</td>
<td>45</td>
<td>52</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table Notes:

[1] Ambient noise level is assumed to be 5 dBA below the nighttime PSL limit as per BC OGC guidelines.
Based on the results above, the average sound level will be below the PSL. As per BC OGC Noise Guideline, there is not expected to be perceivable low frequency noise because the estimated dBC – dBA level is below 20 dB for all receptors. Based on the frequency makeup of the individual units, there is also not expected to be predominant tonal noise from the site.

Based on the nature of the work however, it can be expected that there will be some impulsive noise from steel on steel impacts that may be perceived in the community and at times greater than the PSL. Controls to limit potential for impulsive sounds are discussed below.

**Dates and times of proposed work**

Based on the tidal forecasts throughout the project, Trans Mountain anticipates needing to complete night welding work for the duration of the Project. However, the following months are most likely to see night-shift welding activity in any given year:

- September
- October
- November
- December
- January
- February
- March

**Proposed Mitigations to Minimize Disturbance**

Trans Mountain is proposing to put in place the following mitigation measures to minimize potential disturbance from night-time welding operations:

- Use Balloon Lights to minimize glare & the number of diesel engines powering light plants.
- Run all power from 2 different WhisperWatt (or equivalent) generators which have published running volumes of 65-70 dBA without additional shrouding
- Noise Shrouding for Diesel Engines (generators & crane)
- Noise Shrouding around operations where grinding or metal impacts will be present
- Shut down the crane during times where we know it won’t be needed in the next hour
- Limiting high impact noise with the potential for producing impulsive impacts in the community to behind shrouds where possible
- Include awareness training for all workers on potential disturbance from impulsive events.
- Offsite parking for employees working into the nighttime hours with scheduled shuttles between site and parking to minimize the effect of vehicle noise and headlights shining into adjacent neighborhoods.
Contact for Noise Complaints

1-866-514-6700
info@transmountain.com

Community Liaison and Notification
Trans Mountain will prepare a print notification for distribution to the surrounding City of Burnaby and District of North Vancouver neighbourhoods, as per the notification areas defined in the WMT construction communications plan submitted to VFPA in summer of 2017 (see Figures 5 and 6). The notification will be provided to the VFPA for review in advance of distribution which is to occur a minimum of 10 business days prior to the start of nighttime construction activities.

Trans Mountain will ensure notification materials include contact information for any related complaints or enquiries about the nighttime construction activities.

Enquiries and Complaints Process
Trans Mountain manages a general email address and phone number to respond to queries, concerns, complaints and questions. Building on this process, the Complaints Process (the Process) has been developed to create a clear process for the submission and management of construction-related complaints. The goal of the complaints process is to address stakeholder questions and concerns in a timely manner and meet regulatory requirements for providing a complaints process during construction. The Process builds on existing communication channels and internal accountability process to triage, track and resolve stakeholder concerns efficiently.

All complaints related to overnight activity at Westridge Marine Terminal will be directed to:

- Trans Mountain toll free info@ phone line and email (1.866.514.6700 and info@transmountain.com) during Business Hours (8:00 AM TO 4:30 PM)
- After hours complaints / emergency inquiries will be directed to **1.888.876.6711**

The complaints process will:

- Provide multiple communication channels to address varying stakeholder communication needs
- Offer mail, email, phone and voicemail access
- Ensure all inquiries and complaints receive timely complaint resolution and responses that are proportional to level of urgency
- Track and report on all inquiries and complaints, including those with immediate resolution

The Info@ phone and email is the primary point of contact that will be promoted with the community and online. However, Trans Mountain is prepared for info@ to triage complaints that could come from multiple points of contact and interface with communities. For example, commonly used communication channels used by the public include:

- Trans Mountain Expansion Project website (www.transmountain.com)
- Trans Mountain social media channels (e.g. Twitter)
- Media inquiry phone line and email (1.855.908.9734 and media@transmountain.com)
- 24 hour emergency line: (1.888.876.6711)

Figure 5: Notification Area – City of Burnaby
Figure 6: Notification area – District of North Vancouver
APPENDIX I – NOISE SCREENING WORKSHEET

This worksheet should be employed by one or more informed individuals representing the applicant in order to establish the potential to create noise impacts within surrounding areas. This screening procedure is opinion-based and largely qualitative in nature. Complete this worksheet marking each of the eight questions and submit to VFPA as part of the extended work hours request.

**Question 1 – Noise Levels Expected on Project Site**

Based on experience with similar construction operations, or on your best judgment, do you expect that noise levels within the project site will be:

<table>
<thead>
<tr>
<th>Noise Level</th>
<th>Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Low</td>
<td>☑</td>
</tr>
<tr>
<td>Low</td>
<td>☑</td>
</tr>
<tr>
<td>Moderate</td>
<td>☑</td>
</tr>
<tr>
<td>High</td>
<td>☑</td>
</tr>
<tr>
<td>Very High</td>
<td>☑</td>
</tr>
</tbody>
</table>

**Question 2 - Presence of Undesirable Characteristics**

Will any of the key activities create ongoing noise, indicate all that apply, which:

- are clearly tonal (hums, whirs, whines)
- are impulsive or have very rapid onset (bumps, bangs, material handling impacts, rail car shunting, compressed air release etc.)
- contains strong low-frequency content (e.g. large diesel engines, large fans or air compressors)

**Question 3 – Presence of High-Energy Impulsive Noise**

Will any activities create noise which could be classified as "High-energy Impulsive”? Examples could include the industrial use of explosives, explosive circuit breakers, or pile driving.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>☑</td>
</tr>
<tr>
<td>Yes</td>
<td>☑</td>
</tr>
</tbody>
</table>

**Question 4 – Hours/Days of Operation**

Will the extended hours schedule, check all that apply, be:

- Evening Shift [ 8 pm to midnight; weekdays ] ☑
- Evening Shift [ 8 pm to midnight; weekend ] ☑
- Night Shift [ midnight to 7 am; weekdays ] ☑
- Night Shift [ midnight to 7 am; weekend ] ☑

Would like to have the option to work Saturdays, don’t intend to work Sundays
**Question 5 – Proximity to Noise-Sensitive Areas**

How far is the nearest noise-sensitive land use (residences, schools, hospitals, passive parks etc.) from the property line of the project site?

<table>
<thead>
<tr>
<th>Distance</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>More than 1,000 m</td>
<td>[ ]</td>
</tr>
<tr>
<td>500 to 1,000 m</td>
<td>[ ]</td>
</tr>
<tr>
<td>250 to 500 m</td>
<td>[x]</td>
</tr>
<tr>
<td>125 to 250 m</td>
<td>[ ]</td>
</tr>
<tr>
<td>less than 125 m</td>
<td>[ ]</td>
</tr>
</tbody>
</table>

**Question 6 – Presence of Noise Shielding or Reflection**

Will buildings, structures and/or landforms partially or totally screen (that is, interrupt the line of sight and direct hearing) construction noise sources from nearby noise receptors? Here consideration should be given to the relative elevations of the noise sources, the noise receivers (ground and upper floors) and the intervening buildings and/or landforms.

<table>
<thead>
<tr>
<th>Shielding Type</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Substantial, continuous noise shielding</td>
<td>[ ]</td>
</tr>
<tr>
<td>Substantial, but not total, screening</td>
<td>[ ]</td>
</tr>
<tr>
<td>Intermittent shielding, e.g., row of smaller, non-adjointing buildings</td>
<td>[x]</td>
</tr>
<tr>
<td>Scattered shielding by objects, machinery, stockpiles</td>
<td>[ ]</td>
</tr>
<tr>
<td>No shielding potential</td>
<td>[ ]</td>
</tr>
</tbody>
</table>

**Question 7 – Existing Noise Environment**

How would you rate the existing noise environment in the vicinity of the project site?

<table>
<thead>
<tr>
<th>Noise Rating</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Very noisy (near busy highway, busy port, airport, heavy industry)</td>
<td>[ ]</td>
</tr>
<tr>
<td>Noisy (near busy arterial road, light industrial area, urban core)</td>
<td>[x]</td>
</tr>
<tr>
<td>Moderately noise (near collector road, suburban residential)</td>
<td>[x]</td>
</tr>
<tr>
<td>Quiet (suburban residential away from collector roads)</td>
<td>[x]</td>
</tr>
<tr>
<td>Very Quiet (rural residential, well away from industry or main roads)</td>
<td>[ ]</td>
</tr>
</tbody>
</table>

**Question 8 – Population Potentially Exposed to Project Noise**

Approximately how many residences are located within 500 m of the project site?

<table>
<thead>
<tr>
<th>Number of Residences</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5 or less</td>
<td>[ ]</td>
</tr>
<tr>
<td>5 to 15</td>
<td>[ ]</td>
</tr>
<tr>
<td>16 to 40</td>
<td>[x]</td>
</tr>
<tr>
<td>41 to 100</td>
<td>[ ]</td>
</tr>
<tr>
<td>More than 100</td>
<td>[x]</td>
</tr>
</tbody>
</table>

Note: The number of residences within 500 m of the proposed work location on site is 16 to 40.