MEMO

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Robin Taylor, MRM, EP - Senior Environmental Assessment Manager
Hemmera Envirochem Inc.
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Subject: **Fraser Grain Terminal Ltd - Lighting Assessment**

Dear Robin Taylor,

DMD & Associates Ltd were retained as qualified lighting professionals by Hemmera Envirochem Inc. to provide an Impact Statement for the proposed lighting for the Parrish & Heimbecker Fraser Terminal (the Project). For this Impact Statement, we reviewed the potential for impacts of proposed exterior lighting on adjacent residential areas and general areas off site additional to that already included in the CMC Lighting Plan. We have reviewed the CMC Engineering and Management lighting plans for the Project:

- Drawings #1419-G-05-700 rev1 to -710 rev (1); and
- Drawings #1419-G-05-720 rev 1 and -721 rev (1).

Our assessment of the lighting plan included general lighting design, light trespass and light pollution to review consistency with the Port of Vancouver Project and Environmental Review (PER) Guidelines Lighting (July 2015). The drawings were reviewed to determine if they contained the following information:

- Location of all current and proposed exterior lighting fixtures on the premises, as well as the location of the proposed power source;
- Type of illuminating devices, fixtures, lamps, supports, reflectors, and other devices – including the cut-off characteristics;
- Lamp source type (e.g. high pressure sodium, LED, etc.), lumen output, and wattage;
- Expected change in wattage for site;
- Mounting height with distance noted to the nearest property line for each fixture, with orientation noted;
- Types of timing devices used to control the hours set for illumination, as well as the proposed hours when each fixture will be operated;
- Cumulative lighting data for the overall lighting installation including design power consumption, average illumination and uniformity levels.

The PER Guidelines reference lighting specifications and consideration of best practices and applicable legislation, such as:

- *Illuminating Engineering Society of North America (IESNA) Lighting Handbook and RP-33 Lighting for Exterior Environments National Building Code of Canada;*
- *Canada Occupational Health and Safety Regulations;*
- *International Safety Guide for Oil Tankers and Terminals (ISGOTT).*

The lighting design includes:

- Lighting standards and codes used for the lighting design are defined on drawing 1419-G-05-700 (1) to -710(1) and listed below;
- Roadway Lights – Stanchion Mount (80W LED) referred as Type 1 or 2 Roadway Light mounted on 9.1m pole which light the roadways (Drawings 1419-G-05-700 (1) and -704(1));
- Floodlights - Stanchion-mounted lights (610W LED) referred to as Type 3A floodlights on the 20m high poles which light the Container Storage Area (Drawing 1419-G-05-700 (1) and -704 (1));

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- Floodlights – Stanchion Mount (610W LED) (referred to as Type 3B and 3C floodlights) mounted at 25m above grade on the walkway to light the ships to aid in loading and unloading activity (Drawing 1419-G-05-702 (1));
- Wall Mount Down Lights - Mounted on structures or stanchions (21W LED) referred to as Type 4, 5, 6, 7 and 8 to light galleries, walkways, landings, and platforms and rail receiving areas (Drawing 1419-G-05-700(1) to -710(1);
- Lighting Controls - Exterior lighting will be operated at Exterior-Emergency lighting levels in hours of darkness. Full lighting levels will be turned on only as required for night-time activity and will be controlled via switching. Emergency lighting will be controlled via dawn-to-dusk photocell. When repairs are required, portable task lighting will be provided.

To assess potential light trespass impacts on local residents, it is appropriate to define the level of spill light (lux) off site at local residences and any defined areas of environmental sensitivity. Spill light level limits are defined in Table 26.5 in the IESNA Lighting Handbook (Tenth Edition). For this site, local residences were determined to be a LZ 3 Lighting Zone. This LZ limits spill light to 3 Lux For less in the vertical plane at a local residence. Based on our assessment of the lighting design, the CMC lighting design and layout meets the required lighting levels for the Port Facility while minimizing potential off-site effects of light pollution and light trespass impacts through the following:

- The luminaires proposed are very energy efficient (LED sources), have good optics, glare control, are aimed downwards and well away from residents;
- Lighting controls (as defined above) for the luminaires meet industry lighting practices; and
- The majority of the lighting is wall mount type and is mounted very close to area of activity, of low wattage (21W LED) and directed downwards.

Site and area lighting operations follow lighting standards and codes, as defined on the CMC drawings, and are consistent with industry practice. These are:

- IES LIGHTING HANDBOOK 10th EDITION (ILLUMINATION ENGINEERING SOCIETY)
- SOR/86-804 CANADA OCCUPATIONAL HEALTH AND SAFETY REGULATIONS
- NATIONAL BUILDING CODE OF CANADA (SECTION 3.2.7. LIGHTING AND EMERGENCY POWER SYSTEMS)
- BC FIRE CODE (SECTION 6.5 EMERGENCY POWER SYSTEMS AND UNIT EQUIPMENT FOR EMERGENCY LIGHTING)
- WORKSAFE BC (PART 4.64 TO 4.69 ILLUMINATION)
- OSHA STANDARD 1926.56 (OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION - WORKSITE LIGHTING)

Light sources which have the most potential off-site light trespass impacts are the stanchion mounted lights (Type 3A, 3B and 3C) for the Container Storage Area and Shipping Area Upper Levels and the floodlights located on the walkway that illuminate the ships. These lights are aimed downward and away from residences located 250 m away from the site. Given the distance of site lighting from local residences, light trespass due to the project site is likely to be consistent with the LZ3 Lighting Zone definition and therefore not a significant factor. We note that South Fraser Perimeter Road is located between the Project and the residences, which is illuminated according to TAC standards for a four-lane expressway.

Urban sky-glow is a factor that can impact our view of the night sky and can affect sensitive receptors (e.g., wildlife) and their behaviour. Species potentially sensitive to light as reviewed by

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Hemmera in their Biophysical Assessment for the Project. The majority of fixtures shown defined on the project lighting drawings have optical systems to limit up-light[1] and where floodlights are proposed, shields and visors have been added as per the recommendations in IESNA RP-33 Lighting Exterior Environments. Light will be reflected off surfaces, such as pavement and steel structures, and redirected into the sky, however this is common for lighting installations. The lighting design is effective in minimizing sky-glow to the greatest extent practical.

Based on our review of the CMC lighting design, the drawings meet PMV requirements for content. It is DMD's conclusion that the CMC lighting design and proposed operation of the P&H Fraser Terminal is consistent with industry practice and minimizes potential for adverse lighting effects due to the Project to the greatest extent practical.

We trust that this report is satisfactory to your requirements.

Yours sincerely,

Don McLean, President

[1] Uplight – The percentage of lumens distributed above the luminaire between 90 and 180 degrees vertical (IESNA RP-33-14)