City of Richmond

Report to Development Permit Panel

To:	Development Permit Panel	**Date:**	February 13, 2018
From:	Wayne Craig Director, Development	**File:**	DP 16-741741
Re:	**Application by Vancouver Airport Fuel Facilities Corporation (VAFFC) for a Development Permit at 15040 Williams Road**		

Staff Recommendation

That a Development Permit be issued which would permit the construction of a Marine Terminal Facility for aviation/jet fuel delivery at 15040 Williams Road on a site zoned "Industrial (I)" and partially designated as an Environmentally Sensitive Area (ESA).

Wayne Craig
Director, Development
(604-247-4625)

WC:DB
Att. 5

Staff Report

Origin

The Vancouver Airport Fuel Facilities Corporation (VAFFC) has applied to the City of Richmond for permission to develop a Marine Terminal Facility for aviation/jet fuel delivery at 15040 Williams Road on a site zoned "Industrial (I)" and that is partially designated as an Environmentally Sensitive Area (ESA). The site is currently vacant.

The proposed use conforms to the existing "Industrial (I)" zoning and the subject site does not require rezoning.

Background

This application was initially reviewed by the Development Permit Panel at the meeting on October 11, 2017, but was referred back to staff. The application was subsequently reviewed by the Development Permit Panel at the meeting on November 29, 2017 (see Attachment AA for both reports), but was referred back to staff a second time under the following referral motion:

That Development Permit DP 16-741741 be referred back to staff to:

1. ***Investigate opportunities to expand the area of on-site planting particularly at the northwest portion of the site in addition to the proposed three-meter wide planting strip adjacent to the Williams Road RMA;***

2. ***Explore further opportunities to increase the total area of proposed on-site planting considering the extent of foreshore area that will not be planted to accommodate the loading facility;***

3. ***Review the advice given by the applicant regarding the viability of planting in the site's intertidal ESA in relation to similar projects which City staff have had direct experience in, including:***

   (a) soliciting additional opinion from third party experts in the field regarding opportunities as well as constraints for enhancement in the site's intertidal ESA;

   (b) considering a financial compensation package for habitat enhancement in other areas if intertidal ESA planting is not feasible in the subject site; and

4. ***Review the design and scope of the proposed viewing platform with the Parks Department to determine whether the type and size of the viewing platform should be revised.***

This supplemental report is being brought forward to:

- Provide a response to the referral.
- Provide a summary of the revisions made to the development proposal.
- Provide the revised Development Permit considerations.
- Present the revised Development Permit for Development Permit Panel consideration.

The applicant worked with staff to revise the proposal to address the Panel's referral comments regarding expanded planting in the northwest triangle portion of the site, increasing the area and size of planting in other portions of the site, adding an intertidal bench marsh enhancement and offering a revised cash in lieu contribution for future off-site trail enhancements and the future development of a recreational staging area at the foot of Williams Road.

Attachments to this report include the following:

- Attachment AA: Original Staff Reports to Development Permit Panel (Reports dated September 20, 2017 and November 9, 2017).
- Attachment BB: Revised Offsite Staging Area and Trail Enhancement Cost Estimate
- Attachment CC: Revised Landscape Cost Estimates
- Attachment DD: Peer Review Summary Letter (Pottinger Gaherty and Northwest Hydraulics)
- Attachment EE: Revised Development Permit Considerations

The revised plan submission and the updated Development Permit are provided after the above attachments.

Development Information

Please refer to this Staff Report and the revised Development Permit plans that accompany this report for:

- Responses to the Development Permit Panel referral motion of November 29, 2017 and a summary of the revisions made to the proposal to address the Panel's concerns.
- The revised description and cost estimate for the proposed off-site staging area and trail enhancements.
- The revised plan sets and updated landscaping costs.
- The revised Development Permit Considerations.

Please refer to the original Staff Report dated September 20, 2017 (Attachment AA) for information pertaining to:

- Background information on the project objectives, external agency approvals, and surrounding development.
- The Marine Terminal Project Description.
- Biologist's Environmental Assessments for ESA and RMA.
- The Arborist's Report and Assessment.
- The Proposed Public Trail and Dike Alignments and Covenant Requirements.
- Transportation Requirements.
- CN Rail Reviews.
- Flood-Plain Covenant Requirements.
- Servicing and Frontage Improvement Requirements.
- Financial Impacts.
- The Development Application Data Sheet.

Responses to Panel Comments

1. ***Development Permit Panel Comments: Investigate opportunities to expand the area of on-site planting, particularly at the northwest portion of the site, in addition to the proposed three-meter wide planting strip adjacent to the Williams Road RMA.***

   Response:

   - The VAFFC have increased the planting to the area of the property north of the CN Right-of-Way (ROW) bisecting the property so that virtually all of the non-operational space in this area will be planted.
   - Planting has been substantially increased in the north triangle area.
     - An additional 1,210 m^2 of planting has been added to now encompass an additional 25% of the total area of the north triangle. Note: Triangle site area is approximately 4,900 m^2. Areas in the triangle previously committed to RMA and landscape planting total approximately 1,040 m^2. Approximately 46% of the entire triangle area will be planted in total.
   - Based on their operational review, they indicate that the proposed area of planting will now occupy the maximum available space for planting; after allowing for the minimum space required for facility operational and maintenance activities at the north triangle area of the site, including:
     - Safe accessible roadway access parallel to the Savage Road ROW is required to access the backflow preventer building and to provide inspection access to the pipeline routing.
     - Minimum operational land to the southeast of the new proposed planting area for operational and maintenance requirements including marine response equipment. The VAFFC indicates this area will be used for equipment storage.

2. ***Development Permit Panel Comments: Explore further opportunities to increase the total area of proposed on-site planting, considering the extent of foreshore area that will not be planted to accommodate the loading facility.***

   Response:

   - The revised proposal substantially increases the planting in the triangle area north of the CN ROW.

     The VAFFC indicate that they have reviewed plant sizes and density and increased both in the north triangle area and elsewhere on the site in accordance with best practices with the objective of maximizing the survivability of the plants.

     Pot sizes of shrubs are now a minimum of #2 pot, up from #1 pot, groundcovers all now #1 pot, up from a 10 com pot, and tree sizes have been increased to the largest reasonably available sizes. Conifers are all specified as 3.0 m. height which will be a balled and burlaped condition, rather than container grown. Plant size changes are noted on the attached drawing L0.05

3. ***Development Permit Panel Comments: Review the advice given by the applicant regarding the viability of planting in the site's intertidal ESA in relation to similar projects which City staff have had direct experience in, including:***

Response:

- The VAFFC team has reviewed all aspects of planting within the foreshore intertidal area within the operational area of the facility and has determined that an intertidal bench planting area may be accommodated. They state that the proposed approach balances several important objectives:
    - Maintaining facility operations and site geotechnical requirements.
    - Avoiding impacts to future dyke improvements.
    - Improving the vegetation's chance of survival.
- The City of Richmond Engineering Department has reviewed the proposed bench design in relation to the dike and not believe the bench will affect the operation of the dike. The bench will be reviewed further as part of the detailed design via the Servicing Agreement for the dike and the foreshore riprap.
- The VAFFC indicates that the effect of river current velocities and passing vessel waves has also been considered in the design of the bench planting area in this location on the Fraser River.
- They state that by cutting back the top of the riprap banking by a maximum of 4 m, a bench 2 m in width by approximately 100 m in length can be engineered and constructed within the restructured riprap slope where the existing dock is to be removed.
    - Because the riprap slope to the north and south of this area steepens as it transitions into the existing riprap grades, the bench planting cannot be extended without impairing the facility infrastructure and destabilizing the steeper riprap slopes.
    - The bench cannot be expanded to the south because of the water lot allowance and unacceptable encroachment on the navigation channel safety setbacks
    - The bench cannot be expanding to the north because it would push the slope back into the existing upland area of the site which would impair the design of the marine structures and other shore side facilities, as well as encroach on the dike.
    - The bench cannot be expanded to the east or west because these areas must be kept clear of the mooring line zones. Mooring lines are dragged across the slope when vessels are arriving and departing and so any plantings there would be damaged.
- The planting area can be constructed within a redesigned riprap slope by creating a bench lined with geotextile and filled with a cobble/ gravel substrate to a thickness of 0.5 m.
- Based on the location of the salt wedge in this particular location of the river, the following species would be suitable for planting. This zone of the river is characterized as a brackish marsh (salt water/freshwater mix).
    - Baltic Rush (Juncus Balticus) (Preferred)
    - Lyngbye's Sedge (Carex Lyngbyei)

- Common Cattail (Typha Latifolia)
- Common Rush (Juncus Effuses)

- The VAFFC team of Fisheries Biologists have reviewed the proposed bench and believe the bench, combined with the increased habitat area from the removal of the existing wharf, will be a substantial gain.
- As noted in previous Development Permit Application material, the Department of Fisheries and Oceans Canada has reviewed the project design and is of the opinion that the construction of the facility will cause no serious harm to fish or fish habitat, and that no authorization or offsetting is required.

a. Soliciting additional opinion from third party experts in the field regarding opportunities, as well as constraints for enhancement in the site's intertidal ESA.

Response:

Per the Development Permit Panel's referral, third party expert's review was sought by City staff to provide an assessment of the proposed intertidal enhancement. A Project Manager and a Restoration Ecologist with Pottinger Gaherty Environmental Consultants Ltd. (PGL) and a Geomorphologist with Northwest Hydraulics Consultants (NHC) undertook a review of relevant background documents and the intertidal enhancement plan in the context of the site's specific hydraulic conditions. An on-site meeting was held on February 2, 2018, involving relevant members of the proponent's consulting team, PGL, NHC and City staff providing an opportunity to examine the conditions at the site and query specific assumptions with regard to the proposed intertidal bench marsh design, installation and function. A summary comment letter has been submitted by the peer review consultants (Attachment DD) providing their assessment and recommendations on the proposed enhancement project.

The expert's peer review key findings and recommendations are as follows:

1. They conclude that the bench marsh will improve the overall foreshore habitat and should be looked at favourably.
2. They recommend moving the intertidal bench to a higher position on the riprap slope so that it is located closer to or just below the mean annual high tide level (for technical reasons related to the amount of inundation depths).
3. They note that this site has inherent challenges, but indicate that careful engineering designs and implementation of an adaptive management approach should provide the best possible means to reduce/address these challenges.
4. The three plant species indicated each have individual characteristics, but are acceptable if an adaptive management strategy is in place and the monitoring period is extended to five years from three years. Planting densities proposed are within the acceptable standards.
5. The marsh bench should be lined with a geotextile material to help retain the substrate.
6. To prevent damage to the new planting by geese, they have recommended the installation of a temporary (two to three growing seasons) fence around the bench marsh planting.

7. The review provides an outline of an adaptive management strategy process and recommends the proponent submit a detailed success monitoring plan for the monitoring period.
8. PGL has also provided their opinion (via follow-up email) that additional approvals from Fisheries and Oceans should not be necessary, as the project will not cause serious harm to fish as defined under the Fisheries Act, provided that construction occurs during the least risk windows (July 16th through February 28th of each year).

PGL's summary report has been reviewed and agreed to by the proponent. Modifications to the design and placement of the bench marsh will be addressed via the Servicing Agreement. Securities for the five-year monitoring and the requirement for submission of an adaptive management/detailed success monitoring plan have been added to the Development Permit Considerations.

b. Considering a financial compensation package for habitat enhancement in other areas if intertidal ESA planting is not feasible in the subject site.

Response:

- As the VAFFC has proposed a feasible intertidal planting bench within the new rip rap structure an additional financial compensation package is not required.

4. ***Development Permit Panel Comments: Review the design and scope of the proposed viewing platform with the Parks Department to determine whether the type and size of the viewing platform should be revised.***

Response:

As requested by the Development Permit Panel, the previously proposed observation platform was revisited by Park staff and subsequently with the proponent. Parks staff have indicated that:

a. The Williams Road end is considered secondary to the south end of the No. 7 Road Canal, just 1 km. to the northeast. That is a priority location for a significant waterfront staging area and pier because:
   i. It is at the junction of the future north/south No. 7 Road Canal Trail (planned to span the island as well as provide a connection around Fraser Port) and the Waterfront Trail.
   ii. Near the junction with the No. 7 Road Canal, there is a generous foreshore area of City-owned Lot K, plus the dike row, which allows for a large area to develop a waterfront amenity.
   iii. City ownership of the water lot means that it would not be encumbered by a water lot lease from the Province.
   iv. The City-owned Lot E, the lot immediately northeast of Lot K, will now be developed for a major shipping terminal; which means that the south end of the No. 7 Road Canal will be the east terminus of the riverfront trail system. We understand that that adjacent development is providing a cash contribution to a pier/staging area that is planned to be located in the vicinity.

b. The east end of Williams Road is considered to be a secondary staging area that is intended to:
   i. Provide a resting and viewing area similar to the amenity at the east end of Steveston Highway.
   ii. Since Williams Road is not a connector to other parts of the trail system, it does not require any significant wayfinding signage, but could be an opportunity for interpretive signage.

Based on Development Permit Panel's feedback and the considerations noted above, Parks recommends that the staging area/lookout at the end of Williams Road provide views to the river, and include:

- A timber deck that is approximately 75 m^2 in area with a kick rail along the river-facing edge.
- Be located approximately 2 m back from the top of the rip rap bank in order to allow for riparian planting along the top of the dike that will act as a buffer between the deck and rip rap bank.
- Four benches with backs and arm rests.
- Planter cut-outs in the deck that equal a total of approximately 20 m^2 in order to break up the size of the deck and create outdoor "rooms".
- A 2 m width strip of foreshore/native planting along the top of the bank that equals approximately 45 m^2.

In addition, Parks staff have recommended widening a portion of the public trail to the west of the subject site from 2 m to 3 m with habitat enhancement/native planting along the river-facing side of the trail. The widened trail would be more in keeping with trail standards elsewhere in the community and would facility improved multiuse of the pathway.

A conceptual layout of the Williams Road staging area, a diagram showing the approximate location of the trail enhancement area, and the detailed cost estimate for both works are provided in Attachment BB.

Including a 20% contingency the staging area and trail enhancements will total $204,210. These modifications and the associated cost estimate have been reviewed and agreed to by the proponent as a voluntary cash-in-lieu payment. The contribution has been included in the Development Permit Considerations.

Analysis

Summary of the Revisions Made to the Development Proposal

The following is a brief summary of the changes incorporated into the applicant's revised plan submission from the previous submission reviewed by the Development Permit Panel on November 29, 2017:

1. Added 1210 m^2 of new upland planting in the triangle area north of the CN Rail. This planting will be secured for $169,090 including monitoring and 10% contingency through the Development Permit Considerations. The additional planting are has been added to the habitat balance sheet.

2. Re-designed the foreshore riprap to accommodate a new 200 m^2 intertidal bench marsh.
3. Increased the sizes of previously proposed groundcover, shrub and tree selections throughout the site – typically by one standard size increase.
4. Increased landscape cost estimates incorporating the upsizing of plant selections and the new planting areas mentioned above (see Attachment CC). On-site planting/contingency estimates have increased from the November, 2017 estimate by $67,004.85. Off-site planting/contingency estimates have increased from the November, 2017 estimate by $5,151.30. ** The combined increase is approximately $72,156.15.
5. Provision of a cash-in-lieu contribution of $204,210 toward a future staging area at the end of Williams Road and off-site trail upgrades.
6. The proponent's habitat balance sheet now indicates a total gain of 3,491 m^2 of terrestrial habitat and 3,800 m^3 of aquatic habitat.

** Note that off-site security amounts may be adjusted via the terms of the standard Servicing Agreement.

Staff Assessment of the Modified Submission

This revised submission significantly increases the amount of upland planting north of the CN Rail, makes possible an intertidal bench marsh, increases the overall plant/tree selection sizes across the site, and more than triples the contribution to off-site recreational upgrades. All of this is in addition to the vegetation monitoring, trail and dike Statutory Right-of-Ways (SRWs), dike construction and off-site Servicing Agreement works previously committed. The progression of modifications to the landscape plans are cloud outlined and dated on the revised plan submission.

Staff believe this submission to be a substantive and sincere attempt to address both the Panel's concerns and their operational needs at the site. Engineering staff reviewed the proposed modifications to the foreshore rip rap and have indicated that it is acceptable and will not affect the function or performance of the foreshore armourment or the integrity of the proposed dike structure.

Revised Development Permit Considerations

As a result of the changes incorporated into the revised submission, the Development Permit Considerations were adjusted as follows:

1. On-site landscape securities have been increased by 65% from $361,248.80 to $597,344.55.
2. Security for the five-year adaptive management/detailed success monitoring plan implementation for a total of $38,224.00 has been added to the Considerations.
3. The triangle planting area has been added to the areas required to be monitored.
4. The cash-in-lieu contribution of $204,210 for the future staging area and off-site trail upgrades has been added to the Considerations.
5. The intertidal bench marsh and the triangle planting area have been added to the required legal agreement; prohibiting their abandonment or removal without City approval.
6. Off-site ESA/RMA securities (estimated at $23,861.00 plus a 10% contingency of $2,386.10**) have been added to the Servicing Agreement requirements to be addressed prior to Building Permit Issuance.

   ** Note that off-site security amounts may be adjusted via the terms of the standard Servicing Agreement.

The revised Development Permit Considerations are provided in Attachment EE.

Conclusions

In response to the Development Permit Panel's referral motion of November 29, 2017, the applicant has undertaken a fresh review of their site in order to respond to the Panel's comments. Staff believe that the modified submission now merits consideration by the Development Permit Panel.

David Brownlee
Planner 2
(604-276-4200)

DB:blg

Attachments:
Attachment AA: Prior Staff Reports to Development Permit Panel
(Reports dated September 20, 2017 and November 9, 2017)
Attachment BB: Revised Offsite Staging Area and Trail Enhancement Cost Estimate
Attachment CC: Revised Landscape Cost Estimates
Attachment DD: Peer Review Summary Letter (Potter Gaherty and Northwest Hydraulics)
Attachment EE: Revised Development Permit Considerations

Attachment AA

Prior Staff Reports to Development Permit Panel

- Report Dated Sept. 20, 2017: Reviewed By DPP Oct. 11, 2017
- Report Dated Nov. 9, 2017: Reviewed By DPP Nov. 29, 2017

City of Richmond

Report to Development Permit Panel

To:	Development Permit Panel	**Date:**	November 9, 2017
From:	Wayne Craig Director, Development	**File:**	DP 16-741741
Re:	**Application by Vancouver Airport Fuel Facilities Corporation (VAFFC) for a Development Permit at 15040 Williams Road**		

Staff Recommendation

That a Development Permit be issued which would permit the construction of a Marine Terminal Facility for aviation/jet fuel delivery at 15040 Williams Road on a site zoned "Industrial (I)" and partially designated as an Environmentally Sensitive Area (ESA).

Wayne Craig
Director, Development
(604-247-4625)

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Staff Report

Origin

The Vancouver Airport Fuel Facilities Corporation (VAFFC) has applied to the City of Richmond for permission to develop a Marine Terminal Facility for aviation/jet fuel delivery at 15040 Williams Road on a site zoned "Industrial (I)" and that is partially designated as an Environmentally Sensitive Area (ESA). The site is currently vacant.

The proposed use conforms to the existing "Industrial (I)" zoning and the subject site does not require rezoning.

Background

This application was initially reviewed by the Development Permit Panel at the meeting on October 11, 2017 (Attachment A), but was referred back to staff under the following referral motion:

1. ***That DP-16-741741 be referred back to staff for the applicant to work with staff to:***
   - ***(a) review the proposed mitigation, compensation and enhancement scheme for shoreline ESA based primarily on existing ESA condition in the subject site and investigate opportunities for additional on-site ESA planting;***
   - ***(b) review the proposed compensation/enhancement planting scheme for the shoreline ESA and consider introducing more mature and substantive planting;***
   - ***(c) consider introducing some planting in the intertidal ESA in addition to the proposed removal of existing and development/construction of new structures and shoreline within the shoreline and intertidal ESA;***
   - ***(d) investigate opportunities for further on-site ESA compensation and enhancements especially within the shoreline ESA and other areas along the proposed public trail and in the northern portion of the site in addition to the proposed off-site ESA enhancements; and***
   - ***(e) consider installing on-site signage to inform and provide interpretation to the public regarding the works and enhancements done on the subject site to protect and preserve the natural environment; and***
2. ***That staff review the adequacy of the pedestrian viewing platform cash-in-lieu contribution and report back.***

This supplemental report is being brought forward to:

- Provide a response to the referral.
- Provide a summary of the revisions made to the development proposal.
- Provide the revised Development Permit considerations.

- Present the revised Development Permit for Development Permit Panel consideration.

The applicant worked with staff to revise the proposal to address the Panel's referral comments regarding the compensation/enhancement planting plans for the site and the addition of an interpretive signage package for the public trail. Staff have also reviewed the observation platform cost estimate and a detailed breakdown is included in this report.

Attachments to this report include the following:
Attachment A: Original Staff Report to Development Permit Panel (dated September 20, 2017).
Attachment B: Professional Opinion Memo from Hatfield Consultants.
Attachment C: Revised Landscape Cost Estimates With Breakdowns.
Attachment D: Sketch plans and Cost Estimates for the Proposed Public Observation Platform.
Attachment E: Revised Development Permit Considerations.

Development Information

Please refer to this report and the revised Development Permit plans (Attachment A) that accompany this report for:

- Responses to the Development Permit Panel referral motion and the revisions made to the proposal to address the specific concerns identified.
- Sketch plans and cost estimates for the proposed public observation platform.
- Revised Landscaping Installation Costs.
- Revised Development Permit Considerations.

Please refer to the original staff report dated September 20, 2017 (Attachment B) for information pertaining to:

- Background information on the project objectives, external agency approvals, and surrounding development.
- The Marine Terminal Project Description.
- Biologist's Environmental Assessments for ESA and RMA.
- The Arborist's Report and Assessment.
- The Proposed Public Trail and Dike Alignments and Covenant Requirements.
- Transportation Requirements.
- CN Rail Reviews.
- Flood-Plain Covenant Requirements.
- Servicing and Frontage Improvement Requirements.
- Financial Impacts.
- The Development Application Data Sheet.

Staff Comments

Staff's opinion is that the revised scheme attached to this report has satisfactorily addressed the Development Permit Panel's referral of October 11, 2017. Based on the applicant's responses the application may now be reconsidered.

Responses to Panel Comments

Panel Comment: ***Review the proposed mitigation, compensation and enhancement scheme for shoreline ESA based primarily on existing ESA condition in the subject site and investigate opportunities for additional on-site ESA planting.***

VAFFC Response: "Additional ESA compensation areas totaling 702 m^2 (7,556 ft^2) have been added in the northeast and southwest extents of the site."

The VAFFC response provides two new shoreline ESA planting areas to the site plan (refer to Plan #15). The first is a new 352 m^2 shoreline ESA planting area with additional trees, shrubs and herbs at the southwest corner of the site. The second is a new 350 m^2 shoreline ESA planting area with short shrubs and herbs at the northeast corner of the site.

Additional rationale comments are provided in the professional opinion memo provided by Hatfield Consultants (Attachment B). The plan modifications are highlighted in the revised plan set.

Panel Comment: ***Review the proposed compensation/enhancement planting scheme for the shoreline ESA and consider introducing more mature and substantive planting.***

VAFFC Response: "New ESA compensation areas include some larger plants, as well as new landscaping areas outside of the ESA."

The VAFFC's revised planting plan increases the pot sizes primarily for the coniferous trees in the Shoreline ESA. They've advised that the deciduous trees are better planting in smaller sizes but higher concentrations to out compete invasive species. Larger trees (both coniferous and deciduous) have also been incorporated within the non-ESA/non-RMA planting areas.

Additional rationale comments are provided in the professional opinion memo provided by Hatfield Consultants (Attachment B). The plan modifications are highlighted in the revised plan set.

Panel Comment: ***Consider introducing some planting in the intertidal ESA in addition to the proposed removal of existing and development/construction of new structures and shoreline within the shoreline and intertidal ESA.***

VAFFC Response: "VAFFC has explored intertidal planting with its engineering and environment experts and concludes that this option is not viable. VAFFC contends that the significant effort to offer further compensation areas and landscaped areas (cumulatively representing approximately 15% of the total property area) should satisfy the overall need for enhancement of the site."

The VAFFC's biologist's analysis indicates that the likelihood of a successful planting and survival within the Intertidal ESA along the site's waterfront is low given, for example, the site's hydraulic conditions, high velocity river flows and other factors that would affect the viability of the vegetation planting. In addition, they point out that the integrity of the proposed rip-rap

revetment would be impacted by substantive vegetation growth as it would compromise the long-term erosional protection intended by the engineering design of the bank structures.

Additional rationale comments are provided in the professional opinion memo provided by Hatfield Consultants (Attachment B). The plan modifications are highlighted in the revised plan set.

Panel Comment: ***Investigate opportunities for further on-site ESA compensation and enhancements especially within the shoreline ESA and other areas along the proposed public trail and in the northern portion of the site in addition to the proposed off-site ESA enhancements.***

VAFFC Response: "VAFFC has offered further enhancement of upland areas adjacent to the public trail and along the Williams Road Riperian Management Area (RMA). Additional areas totaling 645 m^2 (6,943 ft^2) have been added which brings the total landscaping commitment to approximately 2,053 m^2 (22,098 ft^2)".

Three additional non-ESA/non-RMA planting areas are proposed by the VAFFC. The first is a new trailside area in the northeast corner of the site. The second planting area involves a new 3 metre wide strip adjacent to the Williams Road RMA. The third area is a 1.5 m widening of one side of the proposed vegetation planting strip adjacent to the public trail.

Additional rationale comments are provided in the professional opinion memo provided by Hatfield Consultants (Attachment B). The plan modifications are highlighted in the revised plan set.

Panel Comment: ***Consider installing on-site signage to inform and provide interpretation to the public regarding the works and enhancements done on the subject site to protect and preserve the natural environment.***

VAFFC Response: "As part of the trail enhancements, VAFFC will include interpretive signage along the trail corridor and at strategic viewing locations. VAFFC will design the signage to City standards and commit a total of $5,400 plus 20% contingency to complete these installations."

In consultation with Parks staff the estimate is based on cost estimates for three large information signs. The final package makeup could vary in terms of the number of signs and the agreed upon context for each sign as will be determined through the Servicing Agreement.

Panel Comment: ***That staff review the adequacy of the pedestrian viewing platform cash-in-lieu contribution and report back.***

Staff Response: A detailed cost breakdown for the proposed observation platform (refer to Attachment D), as provided by the applicant's contractor, has been reviewed by Parks Department staff.

The design is essentially a short treated wood frame construction platform with a protective wooden handrail at its perimeter. The platform will sit atop wood footings to provide an overlook to the Fraser River and would be similar to observation platforms used in various locations in Richmond. The platform would not be intended to project out significantly from the dike and would not extend past the high water mark. The basic design is shown in Attachment D.

The detailed estimate, shown in Attachment D, includes an allowance for benches and signage and a 20% contingency allowance. Parks Department staff reassessed the proposed conceptual design and the associated cost breakdown and have determined it to be acceptable for the general location.

Analysis

Summary of the Revisions Made to the Development Proposal

Modifications made to the development proposal submission reviewed by the Development Permit Panel on October 11, 2017 are summarized as follows:

1. Two additional ESA compensation areas totalling 702 m^2 (7,552.27 ft^2) have been added along the site's shoreline (See Plan #15). Overall, the on-site ESA compensation proposed in the revised submission has increased from 344 m^2 to 1,046 m^2 (3,702.8 ft^2 to 11,259 ft^2). No changes were made to the off-site ESA landscaping area which remains at 144.6 m^2 (1,556.5 ft^2).

2. 59 additional trees and 2,458 additional shrubs have been added on-site. Tree pot sizes for approximately 10% of the ESA/RMA trees and have been increased from a 5 or 10 pot size to a 15 pot size. The trees increased in size were primarily conifers within the ESA and RMA areas. The quantity and size changes are reflected in the landscaping plans species listings provided in Plan #24.

3. The request to consider planting in the intertidal rip-rap area was undertaken, but the professional opinion given is "that planting within the intertidal ESA is not supported based on the proposed engineering design criteria." The revised submission makes no changes to the previous submission on this issue.

4. An additional 645 m^2 (6,942.7 ft^2) of non-ESA/RMA landscaping has been added via a new 400 m^2 (4,305.6 ft^2) trailside planting area in the northeast corner of the site and a new 3 m wide planting strip adjacent to the Williams Road RMA north of the CN Rail (refer to Plan #15).

   The east side of the pedestrian trail landscaped area has been widened by 1.5 m; increasing the east side planting strip to 3.0 m in width. When combined with the landscaping on the adjacent terraced slope, this adds 660 m^2 (7,104.2 ft^2) of landscaping to this area (refer to Plans #15 – #20).

   Collectively the non-ESA/RMA planting additions total approximately 1,305 m^2 of new material over and above that shown in the October 11, 2017 submission.

5. Based on estimates provided by Parks Department staff, the proponent has agreed to a signage package that will cover the placement of several interpretive signs along the proposed pedestrian trail. The commitment is for $5,400 plus a 20% contingency (total = $6,480). This figure includes graphics design and installation of the signs and has been reviewed and accepted by Parks staff. The contribution has been added to the Development Permit considerations. The detailed design and installation of the interpretive signage is included in the Servicing Agreement requirements included in the Development Permit considerations.

6. A revised cost estimate for the on-site landscape areas adjacent to the trail buffer and expanded on-site non ESA/RMA landscaping shows an increase from the original submission of $29,903.50 to $99,177.10 – inclusive of a 10% contingency and three years of monitoring. The revised cost estimate with details is provided in Attachment C. Staff's opinion is that the revised planting addresses the Panel's concerns regarding addition planting considerations.

7. A revised cost estimate for the on-site and off-site ESA and RMA habitat landscaping plus the on-site trail and buffer strip landscaping increases from $241,168.70 to $283,167.50 – inclusive of a 10% contingency, three years of maintenance and three years of monitoring. The revised cost estimate with details is provided in Attachment C.

Overall Summary of Landscaping Area Changes

The table below shows the overall changes to the proposed landscaping areas between the Development Permit submission of October 11, 2017 and the revised Development Permit submission.

Landscaping Area	Oct. 11, 2017 Submission (m^2)	Revised Submission (m^2)	Change (m^2)
Marine Terminal ESA/RMA	1,144.8	1,846.8	+702
Trail Buffers	748	748	0
Terraces + Expanded Trail Buffer		660	+660
On-site Non ESA/RMA	0	645	+645
Off-site ESA/RMA	434.4	434.4	0
Combined Totals	2,327.2	4,334.2	+2,007

Revised Development Permit Considerations

Based on the revised submission, the Development Permit Considerations were adjusted as follows:

- The landscape security for the on-site landscaping has been increased from $250,078.40 to $361,248.80 (inclusive of 10% contingency and monitoring costs) based on the revised cost estimate submissions from the Landscape Architect (dated October 31, 2017). Additional landscape securities (estimated at $19,178.00 plus 1,917.80 contingency) for the off-site ESA/RMA landscaping will be addressed through a Servicing Agreement.

- The additional non-ESA/nonRMA landscaping areas (on-site trailside landscaping [400 m^2], the expanded trail buffer and slope planting [660 m^2] and the planting strip adjacent to the Williams Road RMA [245 m^2] have been included in the areas to be monitored by a Qualified Environmental Professional (QEP) for 3 years.

- An additional voluntary contribution of $6,480.00 for interpretive signage has been added to the Development Permit Considerations.

The revised Development Permit Considerations are provided in Attachment E.

Conclusions

The VAFFC has responded to all of the issued identified in the Development Permit Panel's referral motion of October 11, 2017. The VAFFC's revised proposal incorporates a number of significant modifications to the Marina Terminal proposal to address the issues identified by the Panel and staff. Staff believe the proponent's modified proposal to be generally in compliance with the City's Environmentally Sensitive Area Development Permit Guidelines as applicable to the subject site.

On this basis, staff recommend that the Development Permit be endorsed and issuance by Council be recommended.

David Brownlee
Planner 2
(604-276-4200)

DCB:blg

List of Attachments:
Attachment A: Original Staff Report to Development Permit Panel (report dated September 20, 2017).
Attachment B: Professional Opinion Memo from Hatfield Consultants.
Attachment C: Revised Landscape Cost Estimates With Breakdowns.
Attachment D: Sketch plans and Cost Estimates for the Proposed Public Observation Platform.
Attachment E: Revised Development Permit Considerations.

ATTACHMENT A

City of Richmond

Report to Development Permit Panel

To:	Development Permit Panel	**Date:**	September 20, 2017
From:	Wayne Craig Director, Development	**File:**	DP 16-741741
Re:	**Application by Vancouver Airport Fuel Facilities Corporation (VAFFC) for a Development Permit at 15040 Williams Road**		

Staff Recommendation

That a Development Permit be issued which would permit the construction of a Marine Terminal Facility for aviation/jet fuel delivery at 15040 Williams Road on a site zoned "Industrial (I)" and partially designated as an Environmentally Sensitive Area (ESA).

Wayne Craig
Director, Development

DCB:blg
Att. 5

Staff Report

Origin

The Vancouver Airport Fuel Facilities Corporation (VAFFC) has applied to the City of Richmond for permission to develop a Marine Terminal Facility for aviation/jet fuel delivery at 15040 Williams Road on a site zoned "Industrial (I)" and that is partially designated as an Environmentally Sensitive Area (ESA). The site is currently vacant.

The proposed use conforms to the existing "Industrial (I)" zoning and the subject site does not require rezoning.

To accommodate the proposed Marine Terminal Facility one or more Servicing Agreements will be required at Building Permit stage. The Servicing Agreement(s) will include the design and construction of approximately 350 m of new dikes across the subject site, design and construction of a new publically accessible trail and associated landscaping through the site, design and construction of utility and frontage works and off-site ESA and Riparian Management Area (RMA) landscaping as outlined in this DP plan submission.

Development Information

The VAFFC is currently working on a Vancouver Airport Fuel Delivery project involving three main components:

- A "Fuel Receiving Facility" for fuel storage on Port of Vancouver owned lands on the north side of Williams Road (Richmond Key 42267) (currently under construction).
- A 13 km (8 mile) long underground pipeline running from the Fuel Receiving Facility to the aviation tanks at the Vancouver Airport on Sea Island.
- A "Marine Terminal" for off-loading aviation/jet fuel from vessels at 15040 Williams Road.

The applicant's stated intent for the Fuel Delivery project is to "secure and enhance the present and future aviation fuel delivery to the Vancouver International Airport".

The overall project has been reviewed under a five year harmonized Federal and Provincial environmental review led by the BC Environmental Assessment Office (BCEAO) and was awarded an Environmental Assessment Certificate (EAC) in December, 2013. The Environmental Assessment Office attached 64 conditions to the EAC which it felt are in the public interest and "will prevent or reduce potential adverse environmental, social, economic, heritage or health impacts of the project, such that no significant residual adverse effects are expected". Key issues addressed in the 64 EAC conditions include:

- Development and implementation of a Construction Environmental Management Plan (CEMP);
- Implementing a Traffic Management Plan;
- Retaining the Services of an Environmental Monitor;
- Developing and implementing an Operations Environmental Management Plan (OEMP);
- Fisheries, Aquatic and Surface Water Quality;

- Fuels, Chemical and Materials Storage and Handling;
- Vegetation and Wildlife;
- Air Quality;
- Noise;
- Social and Economic issues;
- Spill Prevention, Preparedness and Emergency Response;
- Accidents or Malfunctions; and
- Fire Prevention, Preparedness and Emergency Response.

The VAFFC obtained a construction permit from the Port of Vancouver in February 2016, allowing them to begin construction of the Fuel Receiving Facility on Port of Vancouver property on the north side of Williams Road.

A permit has also been issued to the VAFFC (April 3, 2017) by the BC Oil and Gas Commission, authorizing it to construct and operate a pipeline to transmit jet fuel as described in their application to the Commission and allowing it to utilize a waterlot lease under Provincial jurisdiction adjacent to the subject site. Note that the fuel storage facility on Port Metro Vancouver lands and the pipeline are not part of this Development Permit application.

With regard to the subject Development Permit application the City's jurisdiction is limited primarily to the subject site and the immediate surroundings with the specific focus on the project's implications to the protection of the natural environment, its ecosystems and biological diversity as authorized under the Local Government Act (2015). The City's Official Community Plan outlines the Development Permit Guidelines for Environmentally Sensitive Areas and form the framework for assessing the development proposal.

A separate report, prepared by City Engineering staff, will be presented for Council's review and consideration of a Municipal Access Agreement (MAA) which is required for those portions of the proposed pipeline to be located on City land.

Development Permit Application Requirement

A portion of the Marine Terminal site has a designated 'intertidal' and 'shoreline' Environmentally Sensitive Area (ESA) that will be impacted by the proposed Marine Terminal development and a Development Permit (DP) is therefore required.

Impacts to Riparian Management Area features arising from the Marine Terminal development will also be addressed through the proposed DP. The primary focus of this Development Permit is to ensure that the environmental impacts to the ESA and RMA features are identified and acceptable mitigation, compensation and enhancement actions are incorporated into the proposed development plan in accordance with the Official Community Plan's Development Permit guidelines for Environmentally Sensitive Areas.

Marine Terminal Project Description

The subject site, located at 15040 Williams Road, covers an area of approximately 40,468.56 m^2 (10 ac.), including 31,241.73 m^2 (7.72 ac.) of land and a 9,226.83 m^2 (2.28 ac.) area in the Fraser

River covered by a Provincial water lot lease. The site is bisected by a 30 m (98.4 ft.) wide CN Rail right-of-way (ROW).

The portion of the site north of the CN Rail ROW is currently proposed to contain only limited infrastructure including, an underground fuel delivery pipe to carry fuel from the subject property to YVR, an underground potable water pipe line and a small shed structure to house a water meter and a backflow preventer.

The portion of the site south of the CN Rail ROW abuts approximately 300 linear metres (984 ft.) of the Main Arm of the Fraser River and is proposed to contain the primary infrastructure of the Marine Terminal facility – some of which will extend out over the water and into the Provincial water lot lease area. Any structures within the Provincial water lot are outside City jurisdiction. The water lot falls under the jurisdiction of the BC Oil and Gas Commission (OGC) under a Provincial interdepartmental working agreement for projects regulated by the OGC.

The purpose of the Marine Terminal facility is to allow marine vessels to dock and safely transfer aviation/jet fuel from the vessels to the fuel receiving facility being built on Port of Vancouver property on the north side of Williams Road (Richmond Key 42267). The fuel is proposed to be transferred from the Marine Terminal facility to the fuel receiving facility by pipelines that will cross under Williams Road. According to the VAFFC's submission to the BC Environmental Assessment Office, the Marine Terminal facility will receive approximately one fuel barge each week. The standard barge will have an average capacity of between 30 to 40 million litres of fuel. When in operation, the Marine Terminal facility will have up to approximately 10 employees on site.

The proposed Marine Terminal site was previously used as a scrap metal storage and transfer facility. The previous owner partially filled the property and constructed a wharf, allowing vessels to moor and transfer scrap metal to and from the site. The VAFFC intends to undertake the following actions to repurpose the site:

- Removal of an existing 30 m x 120 m wharf and concrete filled piles at the waterfront.
- Re-grading of the foreshore and intertidal zone.
- Upland seismic stabilization in the form of ground densification within the ESA.
- Construction of new berthing and mooring structures for a range of marine vessels.
- Install pile-supported containment structures upstream and downstream of the proposed vessel moorage area.
- Construct fuel uploading arms, piping and manifold to transfer fuel from vessel to pipeline to the fuel receiving facility on Port Metro Vancouver's property on the north side of Williams Road.
- Install both Municipal and river water fire pump systems for redundant supply of fire protection water to both the Marine Terminal and fuel receiving facility.
- Install six buildings or enclosures, totalling approximately 205.94 m^2 (2,216.7 ft^2) in area to provide a control room/washroom, a fuel lab, an electrical house, fire pumps and hydro foam storage for fire suppression.
- Install a utility dock for dedicated full time spill response vessels.

- Install a containment and treatment system for storm run-off and contained transfer areas.
- Install perimeter landscaping and fencing.

The development proposal includes:

- The provision of a pedestrian trail accommodated within a 6 m wide right-of-way (ROW) through the site;
- The design and construction of a 4.7 m high dike and an associated 7.5 m wide ROW that will connect to existing City dikes on the adjacent properties to the east and west of the subject site;
- A$62,000 cash donation is also proposed for the construction of a pedestrian observation platform to be located on "Lot K" east of Williams Road and overlooking the Fraser River; and
- Environmental enhancements and compensation planting are proposed to address the anticipated impacts to environmental features within the designated ESA and RMA areas.

The Development Permit considerations include the requirements for registration of the various right-of-way agreements and the proposed cash donation for the pedestrian observation platform.

One or more Servicing Agreements will be required for various works, including utility connections (water services with backflow prevention device, storm sewer outfall with an oil and grit separator), dike design and construction, off-site riparian area improvements and ESA compensation, trail design and construction. These Servicing Agreements will be addressed under separate applications and will need to be entered into prior to Building Permit issuance. The requirements for the Servicing Agreements are included in the Development Permit considerations.

Please refer to the attached Development Application Data Sheet (Attachment 1) for a comparison of the proposed development data with the relevant bylaw requirements.

Background

Development surrounding the subject site is as follows:

To the north is:

- A 30.45 ha (75.24 ac.) "Industrial (I)" zoned parcel owned by the Fraser River Port Authority (aka Port Metro Vancouver). Most of that site is vacant except for the south western corner, which is currently under construction to accommodate the VAFFC "fuel receiving facility".
- An 11.77 ha (29.08 ac.) "Industrial (I)" zoned parcel owned by Ecowaste Industries. That site is part of a 15 to 20 year redevelopment project approved under Development Permit (DP 11-566011 - issued January 23, 2017).

To the east is:

- A City-owned waterfront parcel known as "Lot K". The lot is zoned "Industrial (I)" and is approximately 7.05 ha (17.41 ac.) in size. It includes a segment of the City's dikes.

To the west is:

- The continuation of the 30 m (98 ft.) wide CN Rail right-of-way. There are currently no rail lines within the right-of-way.

- A vacant 2.65 ha (6.56 ac.) City-owned lot zoned "Light Industrial (IL)".
- A vacant 3.64 ha (9 ac.) City-owned waterfront lot zoned "Entertainment & Athletics (CEA)". This property contains both a segment of the City's dike system and a recreational trail.

To the south is:

- The Main Arm of the Fraser River.

Rezoning and Public Hearing Results

A rezoning is not required to accommodate the proposed uses on the subject property, as they conform to the site's existing "Industrial (I)" zoning.

Staff Comments

The proposed scheme attached to this report has satisfactorily addressed the environmental and site planning issues and other staff comments identified as part of the review of the subject Development Permit application. In addition, it complies with the intent of the applicable sections of the Official Community Plan (OCP) and is in compliance with the "Industrial (I)" zone. No variances are requested for this application.

Analysis

Environmentally Sensitive Area Designations (ESA)

The City's Official Community Plan (OCP) identifies the subject site as having both an 'Intertidal' ESA and a 'Shoreline' ESA. The 'Intertidal' ESA runs along the site's interface with the Fraser River extending from the average high water mark outward 30 m into the river. The 'Shoreline' ESA runs along the site's interface with the Fraser River but extends landward 30 m into the site. These two ESA types are described by the City as follows:

'Intertidal': Applicable to coastal areas within 30 m (98.43 ft.) (seaward) of the high water mark which are influenced by waves, tides, and other processes along the Fraser River of Strait of Georgia. This area can include mudflats, vegetated estuarine or salt marsh communities and developed shorelines with riprap, docks and pilings. The intertidal is important for fish and wildlife and particularly for fish such as juvenile salmon. They are also important for dike protection.

'Shoreline': Applicable to coastal areas within 30 m (98.43 ft.) landward of the high water mark with environmental values related to their association to the Fraser River and Straight of Georgia. This is a marine riparian zone that typically includes the crest and back slope of the perimeter dike, as well as developed or natural areas landward of the dike. Shoreline areas are important for fish and wildlife within forests and other ecosystems within the shoreline area. They also serve to filter contaminants and sediments and help protect Richmond's dikes.

Biologist's ESA Assessment

The biologist's ESA assessment indicates that the Marine Terminal property has undergone significant alterations by the previous owners. They note that the 'intertidal' ESA area was "green coded" (i.e. low productivity habitat) under the Fraser River Estuary Management Program (FREMP). The biologist assessed the intertidal ESA as having a low diversity of

habitats (no mudflat, marsh or sandflat) and only small patches of poor quality habitat and a high level of invasive plant cover.

With regard to the 'shoreline' ESA area, the biologist's assessment is that this area is largely devoid of vegetation with the majority of the existing vegetation consisting almost entirely invasive plant species. The sole exception to this assessment is a 208 m^2 patch of native Red Alder and Black Cottonwood saplings near the south-western area of the site which the report indicates "constitutes marginal wildlife habitat". As confirmed by the arborist, none of these trees are bylaw-sized trees (i.e. 20 cm or greater diameter) and will be removed.

No Provincially designated plant or animal 'species at risk' were identified in the biologist's assessment of the Marine Terminal site.

City staff concur with the biologist's assessment of the RMA and ESA conditions at the subject site.

Riparian Management Areas (RMA)

As part of the City's 2006 Riparian Response Strategy, and in consultation with the Department of Fisheries and Oceans, a 5 m (16.4 ft.) wide Riparian Management Area (RMA) setback was established along a minor watercourse fronting the subject site within the Williams Road ROW to the north of the site. A similar designation was not assigned to the minor watercourse along the Savage Road ROW south of Williams Road, however, discussions between staff and the applicant's biologist have resulted in an agreement to note the area along the Savage Road ROW between the CN Rail ROW and Williams Road as an "inferred RMA" effectively treating this area as a minor RMA also requiring a minimum 5 m (16.4 ft.) wide setback. The RMA areas are shown on Plan #12 in the applicant's submission package.

Biologist's RMA Assessment

A registered professional Biologist was hired by the proponent to assess the baseline bio-inventory environmental conditions at the Marine Terminal site and provide recommendations on habitat impact mitigation, compensation and enhancement in accordance with the City's Official Community Plan.

Assessment reports (Hatfield Consultants, July 2016, November 2016, December 2017, February 2017, June 2017) were submitted for the subject property assessing both the Riparian Management Areas (RMA) and the Environmentally Sensitive Areas (ESA).
With regard to the RMA, the biologist indicates that the watercourse adjacent to Williams Road is a non-fish-bearing, ephemeral and highly disturbed drainage ditch with opportunity for improvement. Their environmental inventory shows that Red Alder trees encompassed an area of approximately 276 m2, approximately 29.3% of the Williams Road RMA. Himalayan Blackberry and non-native herbs cover approximately 332 m^2 and remnant infrastructure materials over an area of approximately 198 m^2 within the RMA. The reports note that an existing solid barrier fence installed overtop of lock blocks by the previous owner approximately 2.5 m from the high water mark (HWM) limits the amount of vegetation that could otherwise occur within the 5 m RMA setback.

The Savage Road "inferred RMA" was also identified as an ephemeral drainage ditch, lacking fish and having no connectivity to fish-bearing habitat. The reports indicate that this narrow RMA area is highly disturbed, comprised primarily of Himalayan Blackberry and bordered by reed canary grass and non-native herbs. Red Alder trees cover approximately 107 m^2 primarily on the east side of the ditch within the Savage Road RMA. Similar to the situation along Williams Road, the existing fence along the Savage Road RMA is also located about 2.5 m from HWM and again reduces the effective RMA setback area by half.

Impacts to the Site's RMAs and ESAs from the Proposed Development

As proposed, the Marine Terminal development is anticipated to result in the following impacts to the RMA and ESA features:

a) RMA (riparian areas along Savage Road and Williams Road)
   - Removal of the existing property fence and the underlying concrete blocks.
   - Re-grading of the two RMA areas (with retention of the existing trees).
   - Installation of a new property fence outside the RMA 5 m buffer.

b) Intertidal ESA (area extending 30 m below the high water mark (HWM))
   - Removal of the existing bulkhead wharf.
   - Re-grading of the riverbed below the HWM to a 2:1 slope.
   - Recovering the bank with clean, coarse armour (rip rap).
   - Re-grading most of the banks north and south of the existing wharf and replacement of the concrete rubble with clean, coarse armour (approximately 75% of the river frontage will be improved (cleaned and stabilized).
   - Installation of infrastructure into the water area to provide for the moorage of vessels, offloading of fuel, and various safety and containment measures. The biologist indicates that the in-water infrastructure (an unloading platform with spill containment, berthing and mooring dolphins and a utility boat dock) will total approximately 0.29 ha of the project footprint – much of this occurring in the same location as the existing wharf which is proposed to be removed. In-river structures will be supported by steel pipe piles and will have concrete and steel decks.

c) Shoreline ESA (upland area within 30 m of the HWM)
   - Excavation of top soil and replacement with clean, imported fill landward of the top of bank.
   - Compaction and stabilization using stone columns.
   - Removal of the 208 m^2 (2,239 ft^2) of native tree saplings as a result of the need to undertake seismic compaction and stabilize the site.
   - Portions of the site will be raised to approximately 4.7 m GSC for dike installation and flood protection.

Proposed Compensation and Enhancements for RMA and ESA Impacts

a) RMA
   - Establishing a new property fence at a minimum of 5 m setback from the RMA.
   - Re-grading the RMA to remove invasive vegetation and create better growing areas for re-vegetation.
   - Re-vegetation of the new 5 m wide RMA with native vegetation.

- The net compensation will be an approximate 2 for 1 replacement/enhancement for both RMA areas (Williams Road and Savage Road) for a total of 1,090.6 m^2 enhanced RMA.

b) Intertidal ESA
- Restoration of approximately 36,000 m^3 of the Fraser River flowing water environment as a result of the removal of the existing wharf.
- Re-grading of the water interface in place of the existing wharf will create a narrow intertidal band along the shoreline providing new microhabitats for small aquatic plants, fish and invertebrates.
- The biologist indicates that upgrading the bank armour will benefit for small aquatic life forms.
- A total of 283 linear metres of the intertidal ESA foreshore will be improved.
- Staff asked the VAFFC to consider additional foreshore habitat enhancements (e.g. bench marshes) at the subject site or on nearby intertidal areas. After a more detailed review was undertaken by a professional Biologist it was determined that the developer's proposed modifications to the foreshore/intertidal area will, of themselves, provide intertidal and sub-tidal habitat gains and improvement to habitat conditions at the site in comparison to the baseline situation. On this basis, no further foreshore enhancement works were sought. The Biologist's assessment is provided in Attachment 4.

c) Shoreline ESA
- Compensation for the anticipated loss of 208 m^2 of tree saplings from the shoreline ESA is proposed to be undertaken both on-site, with the installation of:
  - Approximately 344.0 m^2 of native riparian shrubs and ground cover vegetation in the north-eastern corner of the site adjacent to the Fraser River.
  - An additional 144.6 m^2 of native trees, riparian shrubs and ground cover vegetation to be installed in two off site locations on adjacent City-owned lands to the south west of the subject property.
  - The combined 488.5 m^2 of compensation will result in a 2.34 for 1 enhancement/replacement by area with more than 70% of the compensation occurring on-site.
- Registration of legal agreements on Title for the on-site portions of the RMA and ESA enhancement/compensation areas is included in the Development Permit (DP) considerations to ensure these areas are retained. The DP considerations also include a requirement for submission of securities in the amount of $82,049 to ensure that the required ESA and RMA landscaping is installed to the satisfaction of the Director of Development.
- Submission of securities in the amount of $54,252.00 for three years of maintenance and $8,712.00 for monitoring with annual reporting by a Qualified Environmental Professional (QEP) for both the on-site and off-site ESA, RMA and trail enhancement areas is included in the Development Permit considerations.
- As proposed, landscaping plans for the ESA, RMA, the public trail buffer planting and the additional planting adjacent to the proposed pedestrian trail includes approximately 340 trees, 2016 shrubs and 4,760 ground cover plants. All selections will be species native to the area.

A balance sheet summary of the anticipated impacts and compensation/enhancements is provided on Plan #25 of the applicant's submission plans.

Arborist Report

As part of the required base-line assessment of the Marine Terminal site, the proponent contracted with uTree Environmental Consultants to undertake an assessment of the trees on and around the property that may be affected by the project. The submitted arborist's report has the following findings:

a. On-site Trees

The arborist's report indicates that there are no bylaw-sized (i.e. > 20 cm) trees present on the Marine Terminal site. The report indicates that a small stand of non-bylaw sized Alder sapling trees will be impacted by the development. Compensation for these trees is addressed in the Environmentally Sensitive Area (ESA) section earlier in this report as the stand is located within a designated ESA.

b. Off-site Trees

The arborist's report identifies 37 off-site Alder, Cottonwood and Birch trees located along Williams Road and within the Savage Road ROW. Most of these trees are within the City's designated Riparian Management Areas (RMA). The report indicates that these trees are "all young and show good vigour despite historical damage by ditch cleaning, wind and other factors". All these trees are recommended to be retained.

The report also comments on a mature stand of trees treed area on City owned land outside the south-western corner of the Marine Terminal property. Many of these mature trees are up to 24 m (80 ft.) tall and their condition ranges from good to dead. The report recommends mitigation measures in this stand for safety reasons before any work can begin on-site on the dike/trail in the vicinity of this stand.

c. Arborist Recommendations

The arborist recommends the installation of tree protection fencing for the off-site trees being retained, pruning and limb removal in the vicinity of the off-site dike/trail areas to be under supervision of a certified arborist, invasive vegetation removal within the tree protection area by hand only and activity within the drip line of retained trees to be done under the supervision of a Qualified Environmental Professional (QEP) or a certified arborist. The report also recommended the removal of four dead / hazardous trees from the City's tree stand at the south-western corner of the Marine Terminal site.

d. Staff Review

Parks staff reviewed the arborist's findings and are in agreement with them. Parks staff have authorized the removal of four hazardous dead and leaning cottonwoods from the City owned tree stand at the south-western corner of the Marine Terminal site due to concerns of crew safety.

The arborist's recommendations regarding protective fencing and the supervision by a QEP or certified arborist have been incorporated into the Development Permit considerations.

ESA Guideline Checklist

The applicant was asked to respond to an Environmentally Sensitive Areas DP Guideline checklist. The intent of the checklist is to provide an overview of the anticipated ESA impacts and the proposed compensation/enhancement, as well as to ensure that the overall objectives of the City's ESA Strategy are being achieved. The guidelines address both the intertidal and shoreline areas and include aspects such as maintaining ecological processes, minimizing shade coverage from structures, requiring environmental assessments and implementing mitigation measures, providing safe access to the public, restoration of degraded habitat, etc.

A copy of the applicant's responses is provided in Attachment 2. Staff's assessment is that the applicant's proposed compensation and enhancement plan adequately addresses the City's ESA DP guidelines.

Construction Environmental Management Plan

One of the 64 conditions of the Environmental Assessment Offices' (EAO) Environmental Assessment Certificate (EAC) requires the proponent to prepare and implement a Construction Environmental Management Plan (CEMP). The CEMP is a requirement of the EAO and has been approved by them for this project. There is no requirement for Municipal approval of the 200 plus page document however the CEMP has been provided to, and has reviewed by, the City's Environmental Sustainability Department and the Engineering Department. City staff do not have any specific concerns with the CEMP as it relates to the Development Permit.

The CEMP is required to include the following:

- Accidents or Malfunctions Management Plan;
- Air Quality and Dust Control Management Plan;
- Archaeological Management Plan;
- Contaminated Sites Management Plan;
- Fuels, Chemicals and Materials Storage and Handling Plan;
- Noise Management Plan;
- Spill Prevention and Emergency Response Plan;
- Surface Water Quality/Fisheries Protection and Sediment Control Plan;
- Vegetation and Wildlife Management Plan; and
- Waste Management Plan.

The intent of the CEMP is to ensure that construction activities will comply with the EAC.

Proposed Public Trail

The VAFFC had originally proposed a public trail alignment around the perimeter of the subject site. Because of the concerns raised by City staff with regard to the trail crossing over the CN Rail ROW, an alternative alignment a-top the proposed dike alignment near the waterfront was suggested to the applicant. The VAFFC reviewed this proposal in terms of the implications to the anticipated future operations of the site and the attendant safety concerns to the public and the facility. The VAFFC also reviewed the proposed waterfront trail location with Transport Canada; the agency responsible for reviewing and approving safety and security measures for port related activities and were advised by Transport Canada that a trail located at the waterfront would be a significant concern for both pedestrian safety and site security.

The VAFFC subsequently submitted a detailed rationale statement examining and assessing each of the alignment options for the trail location (see Attachment 3). The VAFFC ultimately concluded that a trail alignment in proximity to the shoreline would not be viable and instead, proposed an alternative alignment for the trail running parallel to the CN Rail right-of-way, as a compromise between the options of going across the CN Rail line and around the subject site or locating the trail across the subject site's waterfront. The proposed alternative alignment paralleling the CN Rail right-of-way has been reviewed and accepted by City Park's staff.

The revised pedestrian trail alignment is proposed to be accommodated within a 6 m wide right-of-way with public right-of-passage. The right-of-way would be designed to accommodate a 3 m wide limestone pathway with 1.5 m wide vegetated strips along both sides. The proponent will be responsible for the trail construction to the City's standards. After the usual maintenance period, on-going maintenance and liability of the trail will transfer to the City. Conceptual planting plans and cross sections for the trail are include in the Development Permit plans (see Plans #18 – 20), but minor modifications may occur through the required Servicing Agreement for the trail's design and construction.

Both the trail right-of-way registration and the requirement to enter into a Servicing Agreement for the construction of the trail are included in the Development Permit considerations. Requirements for submission of trail landscape securities in the amount of $105,065.40 are also included in the DP considerations.

In recognition of the City's desire for direct access to the waterfront for viewing, the proponent has also agreed provide a voluntary cash contribution of $62,000 toward the future construction of a pedestrian observation platform to be located on "Lot K" east of Williams Road and overlooking the Fraser River. The proponent has submitted a conceptual design for the viewing platform which was reviewed and approved by Parks staff. Actual construction of the viewing platform will occur in conjunction with future dike improvement works along the Lot K area. The cash contribution for the viewing platform is also included in the Development Permit considerations.

Dike Provision and Foreshore Covenant Requirements

The current Marine Terminal proposal will result in the subject site being raised, seismically stabilized and a new 4.7 m high dike being constructed within a 7.5 m wide right-of-way (see Plan # 3 for the proposed dike alignment). The dike will be designed to accommodate the future raising of the dike to 5.5 m elevation, the height recommended by the Province. Buildings will be required to be setback a minimum of 7.0 m from the dike right-of-way. Registration of a legal agreement establishing the right-of-way and obligating the applicant to enter into a Servicing Agreement for the design and construction of the dike are included in the Development Permit considerations. The Development Permit considerations also include a requirement for discharge of the existing foreshore maintenance covenant (BG 285960) and registration of a new legal agreement to ensure that the newly reshaped river bank and armament is maintained and will not be altered without City approval. Maintenance of the foreshore armament will be the proponent's responsibility. Both the dike construction and the foreshore armament will be subject to the City's and the Provincial Diking Authority's satisfaction.

Transportation Issues

A traffic impact study was undertaken by Tetra Tech (final version dated Jun 29, 2017). The Marine Terminal portion of the study includes information on: the type and number of vehicles expected to access the facility, the time of day vehicles access the site, anticipated travel routes and the number of vehicles generated by employees at any given time. As a result of study, modifications were made to the development plans to ensure that all parking and loading needs will be appropriate for the site and that vehicle accesses and fronting roadways are able to accommodate the anticipated vehicle movements. The study indicates that the proposed Marine Terminal will only generate a minimal amount of traffic with less than 20 cars per day and a maximum of one truck (less than 5 tonnes in size) per day.

Based on the traffic impact study the proposed development will provide:

- A single vehicle access to Williams Road.
- Four regular parking spaces.
- One handicapped parking space.
- One Class 1 bicycle space and three Class 2 bicycle spaces.

The City's Transportation staff reviewed and concurred with the submitted traffic impact study's recommendations for the Marine Terminal.

As proposed, the development will comply with the relevant parking and loading provisions of Zoning Bylaw No. 8500.

In addition to addressing the parking and loading provisions, an on-site location has been designated for garbage and recycling containers and has been reviewed and accepted by staff.

CN Rail Review

As the CN's rail corridor runs through the site, the applicant was requested to seek comment on the proposed development from CN Rail.

CN Rail is still undertaking their detailed review of the proposed development plan to "ensure that it is compliant with all Transport Canada Rules and Regulations related to crossings and construction adjacent to a rail corridor", but has provided a letter (dated August 28, 2017) confirming "at this point, that we are not opposed to VAFFC's development, and that a technical solution in compliance with all applicable regulations and standards can be developed."

Based on CN Rail's response, a requirement has been included in the Development Permit considerations that, prior to Building Permit issuance, the proponent is to submit a final sign-off letter of from CN Railway, to the satisfaction of the City's Director of Transportation and the Director of Engineering, for the VAFFC Marine Terminal project at 15040 Williams Road. If CN Railway's approval includes conditions or requirements, the proponent must provide means to meet those conditions/requirements to the satisfaction of the City's Director of Transportation.

Note that should any future mitigation measures be triggered when / if CN Rail constructs and activates the railway the requirement for the proponent to implement such measures, at its sole cost, has been included in the proposed Municipal Access Agreement (MAA).

Frontage Improvements

As a result of the proposed development, the City will take ownership of developer-contributed assets, such as dike maintenance, roadworks, waterworks, storm sewers, sanitary sewers, street lights, street trees. The anticipated operating budget impact for the ongoing maintenance of these assets is $125,000.00 per annum. The majority of this figure is associated with the maintenance of the proposed addition of approximately 350 m of new dike infrastructure across the subject site. Dike maintenance costs for the City typically average approximately $350.00 per linear metre.

The operating budget impacts will be considered as part of the 2019 Operating Budget.

Conclusions

Staff worked with the applicant to ensure that all the Environmentally Sensitive Area (ESA) and Riparian Management Area (RMA) impacts arising from the proposed development have been identified and appropriate mitigation, compensation and enhancement measures are incorporated into the development plans. Compensation/enhancement for the impacts to the ESA and RMA features will result in a better than 2 for 1 net habitat gain and will incorporate native vegetation species enhancements and secure appropriate monitoring measures for three years.

Changes to the intertidal area will result in an improved, more stable and properly armoured bank for the 283 m length of the property's foreshore. The project will also result in the installation of a full 4.7 m high dike and a separate public trail connection through the subject site - both of which will be designed and constructed to City standards and secured with registered right-of-way agreements. A voluntary cash contribution for the future construction of a pedestrian observation platform overlooking the Fraser River near the subject site is also provided.

As the proposed development will meet applicable policies and the Development Permit Guidelines for Environmentally Sensitive Areas, staff recommend that the Development Permit be endorsed, and issuance by Council be recommended.

David Brownlee
Planner 2
(604-276-4200)
DCB:blg

List of Attachments

Attachment 1: Development Application Data Sheet
Attachment 2: Response to ESA DP Guidelines
Attachment 3: Proponent's Trail Location Rationale Statement
Attachment 4: Biologist Professional Opinion on Potential for Post Development Foreshore Habitat Improvement
Attachment 5: Development Permit Considerations

City of Richmond

Development Application Data Sheet

Development Applications Department

DP 16-741741 **Attachment 1**

Address: 15040 Williams Road

Applicant: Vancouver Airport Fuel Facilities Corporation (VAFFC) Owner: Same

Planning Area(s): Fraser Lands

Floor Area Gross: 205.94 m^2 (2,216.7 ft^2)

	Existing	Proposed
Site Area:	40,468.56 m^2 (10 ac.) including 31,241.73 m^2 (7.72 ac.) of land and 9,226.83 m^2 (2.28 ac.) of land covered by water	Same total area however the area of land and land covered by water will change.
Land Uses:	Vacant	'Industrial' - Marine Terminal Facility
OCP Designation:	Industrial	Same
Zoning:	Industrial (I)	Same

	Bylaw Requirement	Proposed	Variance
Floor Area Ratio:	1.0	0.006	none permitted
Lot Coverage:	Max. 60%	0.52%	None
Setback – Front Yard:	Min. 3.0 m	More than 3.0 m	None
Setback – Exterior Side Yard:	Min. 3.0 m	More than 3.0 m	None
Setback – Interior Side Yard:	No Minimum	More than 3.0 m	None
Setback – Rear Yard:	No Minimum	More than 3.0 m for buildings. Structures extend out into the Provincial water lot lease area.	None
Height (m): Buildings	Max. 12 m	Less than 6.0 m	None
Height (m): Structures	Max. 20 m	19.7 m (gangway tower)	None
Lot Size:	No Minimum	40,468.56 m^2	None
Off-street Parking Spaces –	1 space per 100.0 m^2 of gross leasable floor area of building (3 spaces required)	5 including 1 handicapped space	None

Bicycle Spaces:	Class 1: 0.27 spaces per each 100.0 m^2 of gross leasable floor area greater than 100.0 m^2 (1 space required). Class 2: 0.27 spaces per each 100.0 m^2 of gross leasable floor area greater than 100.0 m^2 (1 space required)..	Class 1: 1 space Class 2: 1 space	None

2012 OCP DEVELOPMENT PERMIT GUIDELINES FOR ESA
AS APPLICABLE TO 15040 WILLIAMS ROAD

Intertidal Guidelines

DP GUIDELINE	PERFORMANCE CRITERIA	RESPONSE
a) Preserve all intertidal zones, except in accordance with the conditions of the Development Permit and other necessary permits or approvals (e.g., FREMP, Port Metro Vancouver, and Navigable Waters).	• Linear metres of intertidal retained, removed, enhanced/created. • Overall net gain/loss of intertidal habitat.	**Summary** Approximately 75% (283 m) of the property river frontage will be modified/ enhanced to achieve a more stable (2:1) intertidal slope. Clean, competent materials will be added to a depth of approximately 16 m below the river bed. Bank stabilization works will involve: (1) removing the existing 127 m long wharf resulting in restoration of approximately 36,000 m^3 of the water column and 400 m^2 of new shoreline; and (2) replacing 156 m of overly steep (1.5:1 slope) and poor quality concrete rubble currently armouring the bank on either side of the wharf. Overall, approximately 8,000 m^3 of bank armour will be upgraded below the high water mark. The intertidal zone associated with the property will be significantly more stable, and will have clean, rounded materials which are more conducive to providing interstitial refugia for small aquatic organisms than densely-packed angular rubble or vertical steep pipes. **Linear metres of intertidal:** • **retained -** 94 m • **removed -** 0 m • **enhanced/created -** 283 m

		Overall net gain/loss - 283 m

b) Maintain ecological processes important to the long-term health of the intertidal zone including drainage and hydrology and natural sediment or detritus movement (accretion and erosion).	• Assess proposed net change to intertidal ecological processes.	Replacing the closely spaced vertical steel pipes that form a sealed 'box' in the river with stable, coarse bank armour, will lead to the creation of a continuous, linear, sloped, interstitial habitat below the high water mark. Although the post-development intertidal zone of the property will be enhanced when compared with existing conditions, this positive ecological net change is not expected to contribute significantly to the ecological processes of the already green-coded (low productivity) intertidal habitat along the property (i.e., the newly created interstitial habitat associated with the property's intertidal zone will likely remain green-coded low productivity habitat).
c) Development must not increase shade or disrupt the movement of detritus or other materials. Where water access is necessary for transportation or recreation facilities, filling of the intertidal zone shall be avoided. The preferred method of development over the intertidal zone is on pilings or floating structures.	• Area of shading coverage • Measures employed to avoid, mitigate, compensate impacts.	In-river infrastructure will be minimal and installed on low density piles to minimize shading and flow interference. With this design, the effects are expected to be negligible through the low productivity intertidal zone fronting the marine terminal, and considering the typically high turbidity of the river and consequent absence of a perceptible photic zone. Construction mitigation measures will be described in detail in the construction environmental management plan (CEMP).
d) Consider contiguous or nearby ESA areas such as shoreline zone which have the potential to influence the intertidal zone.	• Assess impact of removal/relocation of adjacent shoreline habitat. • Measures employed to avoid, mitigate, compensate impacts.	There is no natural vegetation in the shoreline ESA area of the property beyond a small 208 m^2 patch of native saplings, set 7 m from the high water mark. The saplings have no notable influence on the intertidal zone. However, compensation is proposed for the loss of this small patch, in the form of habitat enhancement in the northeast corner of the marine terminal property and along the more productive

		shoreline areas adjacent to the property (refer to Shoreline Guidelines section). Construction mitigation measures will be described in detail in the construction environmental management plan (CEMP).
e) No alterations should be made to the intertidal area without an appropriate environmental assessment and implementation of mitigation measures. The City may require preparation of an Environmental Protection Plan (EPP) prepared by a qualified professional to guide environmental management on sensitive, complex, or large sites.	• Submission of an acceptable Environmental Report inclusive of protection, mitigation and compensation measures. • Habitat Balance • Vegetation assessment, habitat utilization, sediment transfer modeling. • Construction and post construction monitoring plans.	A harmonized federal and provincial environmental assessment of the potential effects of the marine terminal development, including mitigation measures, potential residual effects and cumulative effects was conducted over a 5-year period. That review process was comprehensive and robust, with both levels of government concluding that significant effects were unlikely. Conditional environmental assessment approvals were granted in December 2013. Notwithstanding the aforementioned environmental assessment, the potential effects of the marine terminal development to the intertidal and shoreline ESAs associated with the property were further assessed as described in the Environmental Report that was prepared for the City of Richmond, and submitted to the City as part of the Development Permit (DP) application. The Environmental Report describes the site features and characteristics in detail, and presents recommended protection, mitigation and compensation measures. A habitat compensation plan was prepared as part of the DP application to the City, which includes a habitat balance sheet. However, the development of the marine terminal will result in

		zero loss of intertidal habitat (there will be an increase in interstitial refugia availability through wharf removal and bank stabilization works, but this is considered a negligible-to-marginal gain in intertidal habitat). Foreshore works will involve a mix of floating and land-based equipment. Details on construction mitigation measures are provided in the project's environmental assessment certificate application document, and will be described in detail in the construction environmental management plan (CEMP). The City will be provided a copy of the draft CEMP at least 60 days before the start of construction.
f) No recreational trails or other facilities shall be constructed in the intertidal zone.	• Linear metres of trail encroachment into intertidal zone.	No trail will be constructed in the intertidal zone.
g) Permitted works shall use careful site design to avoid the most sensitive portions of the intertidal zone (see FREMP habitat coding).	• FREMP habitat coding. • Measures employed to avoid, mitigate, compensate impacts.	Foreshore works along the green-coded (low productivity habitat) shoreline will be conducted in accordance with federal (DFO) and provincial (OGC) regulatory permits for works in or next to water. Construction mitigation measures will be described in detail in the construction environmental management plan (CEMP).
h) All works within or adjacent to the intertidal zone shall be constructed, where required, to preserve and enhance the shoreline by: o providing safe, durable access such that people are afforded an unobstructed view of the waterfront wherever possible;	• Accommodation of safe, access and unobstructed views of the waterfront. • Area of mature intertidal vegetation retained. • Area of replanted native intertidal vegetation. • Invasive species control plan.	There will be no safe access to the waterfront on the marine terminal property itself. A trail will be safely set back from the shoreline, which will connect the existing City trail (115 m to the southwest of the property) to an unobstructed view point immediately northeast of the marine terminal. There is currently no intertidal vegetation in the marine terminal ESA area

○ retaining mature vegetation, including existing large trees, shrubs, and aquatic vegetation; ○ replanting disturbed areas with native vegetation.	• Monitoring Plan.	(except algae on rip-rap rubble); nor will there be once the marine terminal is constructed.
i) Where possible, restore degraded intertidal zones by removing historical fill, structures, or contaminated sediment, and recreating natural habitats such as mudflats and marsh.	• Linear metres of intertidal fill removed. • Area and type of mudflat / marsh created.	Mudflat and marsh creation is not possible along this green-coded section of the intertidal zone, nor is it warranted. Bank stabilization is a priority at this location (approximately 283 m; refer to Intertidal Guidelines section row a).
j) Conformance with these guidelines does not exempt applicants from meeting requirements of other agencies, such as participating in the Fraser River Estuary Management Program (FREMP), and Port Metro Vancouver. It is the responsibility of proponents to ensure they meet all external requirements.	• External agency approvals achieved.	Noted.

Shoreline Guidelines

DP GUIDELINE	PERFORMANCE CRITERIA	RESPONSE
a) Preserve all natural vegetation and all trees in the shoreline zone, except in accordance with the conditions of the Development Permit and other necessary permits or approvals (e.g., FREMP, Port Metro Vancouver, and Navigable Waters).	• Linear metres of shoreline zone retained, removed, enhanced/created. • Overall net gain/loss.	**Summary** A 52-m long by 4-m wide patch of native pole sapling trees represents the only natural vegetation to be removed during the development of the marine terminal (the remainder of the site is comprised of compacted fill with scattered weeds and herbs; there are invasive shrubs at the top of bank on either side of the current wharf). A compensation plan was prepared as part of the DP application, which proposes to compensate for its loss by mechanically removing Himalayan blackberry and other non-native plants in portions of the shoreline ESA that are on site, and on either side of the marine terminal (along a red-coded intertidal zone to the southwest, and a yellow-coded intertidal zone to the northeast) and planting native trees, shrubs and herbs. This compensation work will be done at a 2:1 ratio, resulting in a habitat net gain of 416 m^2. **Linear metres of shoreline zone:** • **retained** – N/A • **removed -** 52 m (alder patch) • **enhanced/created:** 104 m **Overall net gain/loss:** 52 m

b) Maintain ecological processes important to the long-term health of the shoreline zone including drainage and hydrology.	• Assess proposed net change to shoreline ecological processes.	The shoreline ESA at the marine terminal property has no sensitive habitats, no wildlife habitat features, and borders a green-coded (low productivity habitat) intertidal zone. Wildlife is limited to transient, foraging birds. The ESA provides minimal contributions to the ecological processes typical of a river riparian zone (i.e., shade and nutrient inputs to river, water filtration, flood management, or the provision of wildlife habitat).
c) Consider contiguous or nearby ESA areas such as the intertidal zone which have the potential to influence the shoreline zone.	• Assess impact of changes to the intertidal zone to the adjacent shoreline habitat. • Measures employed to avoid, mitigate, compensate impacts.	Loss of some native saplings on the marine terminal property can be readily compensated for by planting native species along the property's northeast edge and enhancing adjacent, more functional ESA areas (refer to Shoreline Guidelines section row a). Construction mitigation measures will be described in detail in the construction environmental management plan (CEMP).
d) No alterations should be made to the shoreline zone without an appropriate environmental assessment and implementation of mitigation measures. The City may require preparation of an Environmental Protection Plan (EPP) prepared by a qualified professional to guide environmental management on sensitive, complex, or large sites.	• Submission of an acceptable Environmental Report inclusive of protection, mitigation and compensation measures. • Habitat Balance	A harmonized federal and provincial environmental assessment of the potential effects of the marine terminal development, including mitigation measures, potential residual effects and cumulative effects was conducted over a 5-year period. That review process was comprehensive and robust, with both levels of government concluding that significant effects were unlikely. Conditional environmental assessment approvals were granted in December 2013. Notwithstanding the aforementioned environmental assessment, the potential

		effects of the marine terminal development to the intertidal and shoreline ESAs associated with the property were further assessed as described in the Environmental Report that was prepared for the City of Richmond, and submitted to the City as part of the Development Permit (DP) application. The Environmental Report describes the site features and characteristics in detail, and presents recommended protection, mitigation and compensation measures. Construction mitigation measures will be described in detail in the construction environmental management plan (CEMP). There will be a minor loss of marginal habitat in the shoreline ESA (refer to Shoreline Guidelines section rows a and b), which will be compensated for through habitat improvements on site and in adjacent ESA areas bordering more productive shoreline zones: refer to Shoreline Guidelines section, rows a and c). A habitat compensation plan (including a habitat balance sheet) and planting prescription guidelines were prepared. The latter is in addition to the landscape design for the marine terminal and the trail sections being established on either side of the property for the City of Richmond. This planting prescription plan provides guidance on: (1) invasive plant removal and handling; (2) revegetation (native species to plant, pot size, spacing); and (3) the monitoring of native plant survival/invasive plant

		colonization rates during the subsequent three years, so that additional plant management actions can be outlined. The cost of the planting and monitoring, including a 10% contingency for supplemental planting, will be provided by the landscape architect once the project and trail designs are approved.
e) No recreational trails or other facilities shall be constructed in the shorelines zone without written approvals from FREMP or other regulatory bodies.	• Approvals from external agencies for works within the shoreline zone (e.g. DFO, Provincial Diking Authority, FLNRO, EC)	Noted.
f) Permitted works shall use careful site design to avoid the most sensitive portions of the shoreline zone.	• FREMP habitat coding. • Measures employed to avoid, mitigate, compensate impacts.	There are no sensitive areas in the shoreline zone of the marine terminal, which borders low productivity habitat (green-coded intertidal zone).
g) Water quality and natural systems shall be protected by leaving stream banks intact and by not altering natural slopes and existing vegetation.	• Water quality measures employed. • Area of natural slopes/existing vegetation impacted / enhanced.	Works below the high water mark will be conducted in compliance with regulatory permit conditions. Refer to Intertidal Guidelines section rows e and g. Water quality measures will be described in the Project CEMP. Habitat enhancement works in the ESA areas will occur above the dike crest (avoid the high water mark and dike slope). Sediment and erosion control measures will be used to isolate the high water mark from revegetation areas upslope
h) All works within or adjacent to the shoreline zone shall be constructed, where required, to preserve and enhance shoreline values by: o providing safe, durable access such	• Accommodation of safe, access and unobstructed views of the waterfront. • Area of mature shoreline vegetation retained.	Refer to Intertidal Guidelines section row h re. water front access. There is no mature shoreline vegetation to retain. Areas of replanted native shoreline

that people are afforded an unobstructed view of the waterfront wherever possible; o retaining mature vegetation, including existing large trees, shrubs, and aquatic vegetation; o replanting disturbed areas with native vegetation.	• Area of replanted native shoreline vegetation. • Submission of an acceptable, detailed planting and monitoring plans.	vegetation are addressed in the Shoreline Guidelines section (rows a to c). A planting prescription, including monitoring, was prepared (refer to Shore Guidelines section row d).
i) Development proposals that include measures to restore degraded shoreline zones by removing historical fill, structures, or contaminated sediment, and recreating natural habitats such as riparian forest may increase the level of support by the agencies provided that the works comply with DFO and FREMP guidelines. In many areas, the shoreline zone has been developed or landscaped and improvements including tree planting will enhance its ecological value over the long-term.	• Linear metres of shoreline fill removed. • Area of natural habitat created. • Number of trees removed and replanted.	Old fill material from the marine terminal property will be removed and replaced with cleaner and more suitable materials. Works will occur along approximately 75% (283 m) of the property's shoreline zone, which is approximately 377 m long. No natural habitat will be created in the Shoreline ESA on the marine terminal property. The removal of 208 m^2 of native saplings in the shoreline ESA will be compensated for as outlined in Shoreline Guidelines section row a to c). There is currently no other 'natural habitat' on site.
j) Conformance with these guidelines does not exempt applicants from meeting requirements of other agencies, such as those participating in FREMP and Port Metro Vancouver. It is the responsibility of proponents to ensure they meet all external requirements.	• External agency approvals achieved.	Noted.

FSM MANAGEMENT GROUP

SOLVE • BUILD • MANAGE

VAFFC / Vancouver Airport
Fuel Facilities Corporation
AN FSM GROUP MANAGED CORPORATION

March 13, 2017

David Brownlee, Planner 2 – Urban Design
Planning & Development Division
City of Richmond
6911 No. 3 Road
Richmond, BC, V6Y 2C1

RE: Rationale for Dyke Trail location at 15040 Williams Road
Vancouver Airport Fuel Delivery Project

Dear Mr. Brownlee:

This letter is provided to the City of Richmond in support of the Vancouver Airport Fuel Facilities Corporation (VAFFC) application for Development Permit (ESA) in connection with the development of its property at 15040 Williams Road, Richmond, BC.

VAFFC is constructing a Marine Terminal and fuel offloading system at this property as part of the Vancouver Airport Fuel Delivery Project. The industrial waterfront property is located at the east end of Williams Road and is bisected by a CN Rail corridor and a dyke structure that forms part of the perimeter dyke system protecting Lulu Island from flood and sea level rise conditions associated with the Fraser River estuary. The property is currently fenced and does not provide for any trail connectivity through or around the property to connect to existing trail systems northeast or southwest of the property boundaries.

In establishing the conditions for approval of the project under the harmonized Environmental Assessment process between 2009 and 2013, VAFFC agreed to construct a connecting trail on the property to contribute to the City's overall Trail Strategy as described in the Official Community Plan. In its Environmental Assessment application, VAFFC proposed that the trail follow the suggested trail network identified in the 2010 Richmond Trail Strategy (Option 1 in Figure 1 below). However, in its comments to the subsequent Development Permit application made by VAFFC, the City identified a preference for the trail to connect across the property as close to the shoreline as possible, estimated as Option 2 in Figure 1.

VAFFC has reconsidered its design to accommodate the City's request, and has determined that the position of the trail immediately next to the shoreline is not viable from an operational standpoint. VAFFC is offering to construct the trail in the location identified as Option 3 in Figure 1. The rationale for the route is discussed in the next section.

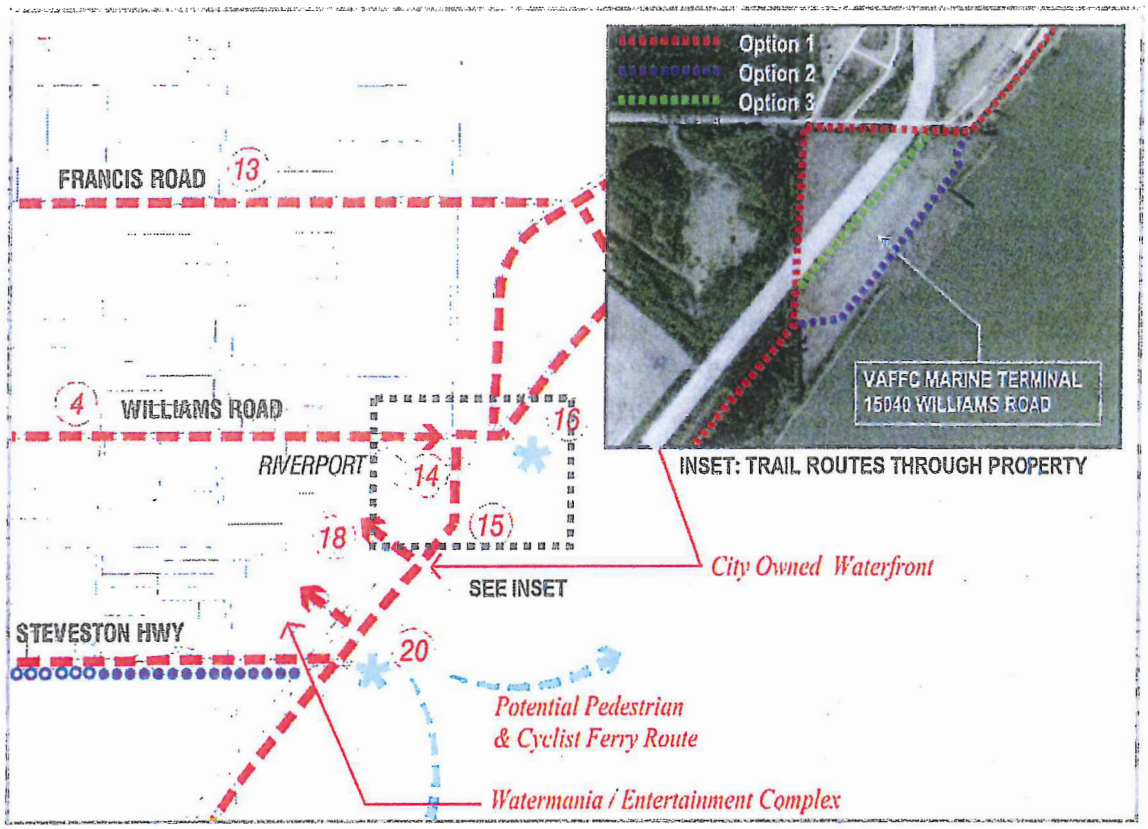


Figure 1. Excerpt from Richmond Trail Strategy with VAFFC property inset.

Rationale

VAFFC proposed route Option 1 in its initial Development Permit application to achieve consistency with the OCP. VAFFC identified further merits of this option as follows:

- Maximizes separation from operational areas of the Marine Terminal
- Aligns with properties boundaries with limited development value
- Overlaps with roads or road right-of-ways minimizing property dedication to this use.

As indicated earlier, the City has identified the desire to place the trail adjacent to the shoreline if possible (Option 2), consistent with public trail development in other areas of the city, and to avoid crossing of the CN Rail corridor in two locations as would be required under Option 1. VAFFC accommodated this request and has prepared a revised design aligning the trail across the front portion of the site, identified as Option 3, away from the shoreline but on the river side of the CN corridor. VAFFC recognizes the value of having the trail avoid rail crossings and align with the waterfront, however, due primarily to strict operational requirements, asserts that the trail must be set back from the waterfront area to provide security to the terminal and safety to the travelling public.

The following details are provided for additional clarity:

- Option 3 maximizes separation from operational areas of the Marine Terminal without pushing the trail across the CN rail corridor;
- Option 3 would have greater success in meeting the International Ship and Port Facility Security Code "ISPS Code" requirements which identifies restricted areas that must be considered in the Port Facility Security Plan "PFSP", including:
    - shore and waterside areas immediately adjacent to the ship;
    - embarkation and disembarkation areas, passenger and ship's personnel holding and processing areas including search points;
    - areas where loading, unloading or storage of cargo and stores is undertaken;
    - locations where security sensitive information, including cargo documentation, is held;
    - areas where dangerous goods and hazardous substances are held;
    - vessel traffic management system control rooms, aids to navigation and port control buildings, including security and surveillance control rooms;
    - areas where security and surveillance equipment are stored or located;
    - essential electrical, radio and telecommunication, water and other utility installations; and
    - other locations in the port facility where access by vessels, vehicles and individuals should be restricted.

  The placement of any public space or public right-of-way in areas identified as restricted would require operational constraints such as closure during operations, confinement by fencing on both sides, significant physical barriers to protect against ship mooring ropes and cables, and highly restrictive signage warning the public of the danger and prohibited activities.
- Due to the safety and security constraints in the operational area, Option 3 will provide a more enjoyable public experience than Option 2 for the following reasons:
    - Fencing will be required on only one side of the trail;
    - Mild grade changes will provide for some landscaping and visual variability;
    - Users will experience less operational noise and visual distraction of the facility operations;
    - Trail closures will be minimized or eliminated during the securing of vessels upon arrival;
    - There will be less restrictive signage identifying safety requirements for public passage (ie smoking, loitering, etc).

VAFFC is currently undertaking a Security Vulnerability Assessment (SVA) which must be reviewed and approved by Transport Canada. The assessment considers the facility operations and layout and recommends security features (ie fencing, surveillance, access control, barrier protection, etc) to be incorporated into the facility to maximize safety and security of the facility. The assessment and findings are confidential, however the draft assessment contains the following excerpt specific to this facility and would not be compromised by the trail if positioned in accordance with Option 3:

Restricted Areas

The Marine Transportation Security Regulations (MTSR) of Canada and the IMO's International Ship and Port Facility Security (ISPS) Code require that certain areas be restricted to avoid any possibility of sabotage and limit accidents. Such areas include those that require deterrence of unauthorized access; places where security and surveillance systems are located; land areas adjacent to where vessels interface with the facility; places where security sensitive information is kept, inclusive of cargo documentation; location of central controls for security and surveillance systems; location of central lighting controls; location of critical infrastructure including water, electric, telecommunications and process control rooms; areas designated for the unloading of cargo, and areas containing dangerous cargoes. (MTSR – 329.) Such restricted areas must be alarmed, have access control, lighting and be monitored in some way to ensure any tampering or breach is detected and responded to. Further, the level of surveillance of the restricted areas must increase in response to any raised marine security level (MARSEC) above level 1. The restricted areas for this facility should include:

1. *The marine terminal area which contains:*
   - *a. The dock and off-loading equipment*
   - *b. The spill containment areas*
   - *c. The building housing utilities controls (electric, water, telecommunications) and security equipment (alarm panels, security lighting, video recording.)*
   - *d. The building housing operations controls.*
2. *The tank farm which contains*
   - *a. An operations building*
   - *b. A power transformer*
   - *c. An emergency generator*
   - *d. An electrical building (E-house) for all electrical cabling and controls*
   - *e. A foam monitor enclosure and a foam distribution enclosure*
   - *f. Six storage tanks for Jet A-1*
3. *Piping and pumps for the product which are exposed and/or accessible and which are thereby vulnerable to tampering or attack.*

For organizational purposes each of these designated areas will be addressed separately.

1. Marine Terminal -General

The terminal includes many of the key assets including operational controls for the terminal, utility controls, backup power, fire suppression buildings and equipment and the spill containment areas. This area is to be surrounded by a fence line which will extent from the water on the southwest boundary to the location of the easement that runs through the property, and back to the waterline in the northeast of the property. It is noted that local pedestrians have in the past walked along the river bank onto what is now part of the facility. It is therefore imperative that the fence line extend to and into the river to preclude passage along the bank. This needs to be done on both the northeast and southwest ends of the fence line.

Closure

VAFFC requests that the City consider the alternative presented by VAFFC in its updated submissions related to the Development Permit application supporting the Option 3 location. Updated design drawings, landscape drawings, and Environmental Reports have all been recently submitted with this option in mind.

VAFFC recognizes the need for public access and wishes to do its part in connecting neighbourhoods with this initiative. VAFFC's recommendation for the trail location maximizes safety and security for both the public users and the operational staff at the marine terminal facility. The VAFFC development team would be happy to meet to discuss these items in more detail if required.

Sincerely,
Vancouver Airport Fuel Facilities Corporation

Adrian Pollard, P.Eng.
Project Director

Hatfield
CONSULTANTS

MEMO

Date:	May 23, 2017 HCP Ref No.: VAFFC6773-NV
From:	Cory Bettles, MSc, RPBio, FP-C, Senior Fisheries Manager
To:	Adrian Pollard, PEng, Director of Engineering, FSM Management Group Inc.
Subject:	Vancouver Airport Fuel Delivery Project, Marine Terminal Development: Professional opinion on potential for post-development foreshore habitat improvement

1.0 Context

Vancouver Airport Fuel Facilities Corporation (VAFFC) has received Environmental Assessment (EA) approvals from the provincial and federal governments to construct and operate a new aviation fuel delivery system (the Project) to serve Vancouver International Airport (YVR). The Project was subject to a robust 5-year coordinated provincial and federal environmental assessment review that involved agencies and departments from all levels of government, which was concluded in December 2013 with the issuance of conditional approvals from British Columbia (BC) Ministers and Vancouver Fraser Port Authority (VFPA). Fisheries and Oceans Canada (DFO) was an active participant throughout the Project review process and all issues of concern with respect to potential residual effects to fish and fish habitat were addressed in the EA to the satisfaction of the federal regulator.

The Project includes construction and operation of a marine terminal located at 15040 Williams Road on the north shore of the South Arm of the Fraser River located in Richmond, BC; a fuel receiving facility located on nearby industrial zoned property that VAFFC has leased from VFPA; and underground pipelines to transfer fuel from the marine terminal to the fuel receiving facility (fuel transfer pipeline) and then to YVR (fuel delivery pipeline).

As part of VAFFC's permitting requirements post-EA certification, submission of a Development Permit (DP) application to the City of Richmond (CoR) was executed for the marine terminal component. Since DP application filing, follow-up information requests (IRs) and position statements have been issued by the CoR. Most recently, the CoR issued their position with respect to the anticipated habitat improvement to be gained with the removal and replacement of the current infrastructure at the site. Their position stated that,

"[t]he foreshore restructuring will not be considered as habitat improvement along the water edge of the property. As the CoR feels that the water flows are too high to provide any benefit increases. The CoR requests that VAFFC submit a proposal for improving habitat upland of the MT. (Bench marsh)."

VAFFC has requested an unbiased professional opinion as to whether the planned marine terminal development will result in "improved habitat" compared to existing conditions and whether additional habitat enhancement is justified. Professional opinion has been formulated based on a review of pertinent information including the EA information record, the DP application submitted to the CoR, DP Guidelines

for Environmentally Sensitive Areas (ESAs) applicable to 15040 Williams Road, site-specific engineering designs, and scientific literature.

2.0 Summary of Intertidal (Foreshore) Baseline Conditions

Characterization of the current intertidal (foreshore) habitat conditions at the marine terminal site is described in detail in the DP application submitted to the CoR. Below, I highlight key features.

Intertidal areas are influenced by waves, tides, and other processes along the Fraser River or Strait of Georgia. Typical conditions of an intertidal zone include mudflats, tidal channels and pools, salt marsh communities, as well as developed shorelines (wharves, pilings, bank armouring). Natural intertidal zone features represent important fish and wildlife habitat. The majority of habitat and aquatic resource information available for the Lower Fraser River has been synthesized by the Fraser River Estuary Management Program (FREMP). The intertidal (foreshore) of the property has been classified as low productivity habitat ("green coded"; FREMP, 2006).

There is a CoR designated ESA along the property shoreline, which encompasses an intertidal (foreshore) zone 30 m seaward of the high water mark (HWM), and a shoreline zone 30 m landward of the HWM. The entire portion of the ESA on the property represents the south-eastern portion of the Project's DP Area.

The shoreline of the industrial-zoned property includes a backfilled protruding steel pipe pile bulkhead wharf and steep intertidal areas on either side comprising poor quality concrete rubble with embedded rebar.

3.0 Net Result of Bulkhead Wharf Removal and Regrading of the Existing Foreshore

Based on a review of the current footprint conditions and proposed engineering design for the site, there will be additional intertidal and subtidal area gained below the HWM with the removal of existing and development/construction of new structures and shoreline. Removal of the bulkhead wharf and re-grading of the shoreline is aimed to create a new intertidal area of approximately 730 square meters (m^2), and additional subtidal area of approximately 3,000m^2. The proposed re-grading of the existing shoreline on either side of the removed dock to a shallower slope will result in approximately 625 m^2 of new intertidal area. The resulting net gain of intertidal area post-development will be approximately 1,355 m^2 while the net gain of subtidal area is to be approximately 3,000 m^2. The shoreline to be exposed by the dock removal and large volume of existing rubble on either side of the dock, will be replaced by appropriate and fit-for-purpose angular rip-rap material.

4.0 Positive Effects of Replaced Rip-Rap on Fish and Fish Habitat

Positive effects of rip-rap on fish and aquatic resources in lotic environments has been described in scientific literature. Positive effects have been reported in large and small riverine systems and were usually attributed to degraded conditions prior to rip-rap installation in combination with the use of other mitigative measures (Craig and Zale 2001). Below I provide a couple of those examples where rip-rap resulted in positive outcomes and supports the position that the proposed use of rip-rap at the marine terminal will provide an improvement of habitat conditions.

Schmetterling et al. (2001) found that rip-rap provided habitat for juvenile salmonids in watercourses that have been severely degraded. Whether juvenile salmonids would utilize the proposed rip-rap at this site

along the Fraser River is unknown. However, the presence of the rip-rap would provide additional refuge habitat (albeit a small amount) for juvenile salmonids in the lower Fraser River.

Hinch and Rand (1998) observed that rip-rap placed to control erosion along the Nechako River, BC, generated small reverse flow fields (i.e., eddy vortices) along the foreshore that were used by adult sockeye salmon to facilitate their migration upstream. Migration through reaches with constrictions (e.g., large islands, gravel bars or large rock outcroppings) was found to require higher energy expenditure than that through reaches with parallel, straight banks. The additional placement of rip-rap at the site, including replacement of existing rubble, may provide improved conditions (reduced velocities) during upstream migration of all adult salmon species.

Craig and Zale (2001) observed that aquatic invertebrates flourish in rip-rap because it provides many interstices and high surface area suggesting that it may provide a superior food source for fish. Regardless of whether fish utilize the increased abundance of invertebrates as a food source, the expected increase in productivity is of overall benefit to the aquatic environment.

5.0 Opinion

Based on my review of the existing information that characterizes current baseline intertidal and shoreline conditions of the site, available scientific literature that highlights where the use of rip-rap can offer improvements to habitat conditions in degraded areas, and the 2012 CoR OCP DP Guidelines for ESAs (specific to Intertidal Guidelines), I am of the opinion that the dock removal, shoreline regrading and proposed use of angular rip-rap in the intertidal (foreshore) area will provide intertidal and subtidal habitat gains and some level of improvement to habitat conditions at the site in comparison to what baseline conditions currently offer. The scientific literature provides evidence that rip-rap can provide some enhancement opportunities in areas that have been tarnished, as is the case here including the potential to reduce flow velocities in the area. Additionally, the area will likely benefit from the protruding steel sheet pipe pile spill containment walls that are proposed at the upriver and downriver extents of the property providing further (secondary opportunity to reduce flow velocity in the terminal area.

The level of 'improvement' is not expected to be substantial – I agree with the response provided in (b) of the 2012 OCP DP Guidelines for ESA that states, "...[any] positive ecological net change is not expected to contribute significantly to the ecological processes of the already green-coded (low productivity) intertidal [foreshore] habitat along the property". However, no additional degradation of habitat conditions at the site through the use of rip-rap are to be expected (given the site is already low productivity habitat), hence no additional enhancement (e.g., upland habitat as requested by the CoR) is warranted.

6.0 Closing

My professional opinion is based solely on the information reviewed as described herein. I reserve the right to expand, modify or otherwise amend my opinion as additional information becomes available.

Regards,

Cory Bettles, MSc, RPBio, FP-C
Senior Fisheries Manager
Certified Fisheries Professional
Hatfield Consultants

Literature Cited

Craig, A.J., and A.V. Zale. 2001. Effects of bank stabilization structures on fish and their habitat. US Geological Survey, Washington Department of Ecology, and Montana State University. Bozeman, MT, 29 pp.

Schmetterling, D.A., C.G. Clancy, and T.M. Brandt. 2001. Effects of rip-rap bank reinforcement on stream salmonids in the western United States. Fisheries 26(7):6-13.

Hinch, S.G., and P.S. Rand. 1998. Swim speeds and energy use of upriver-migrating Oncorhynchus nerka: Role of local environment and fish characteristics. Can. J. Fish. Aquat. Sci. 55:1821-1831.

City of Richmond

Development Permit Considerations

Development Applications Department
6911 No. 3 Road, Richmond, BC V6Y 2C1

Address: 15040 Williams Road **File No.:** DP 16-741741

Prior to approval of the Development Permit, the developer is required to complete the following:

1. Receipt of a Letter of Credit/security for $250,078.40 inclusive of the following:
   - On-site ESA and RMA landscaping in the amount of $67,589.50,
   - On-site non ESA/RMA landscaping (slope adjacent to trail) in the amount of $14,459.50,
   - On-site Trail landscaping in the amount of $105,065.40
   - Three years of maintenance (ESA/RMA/Trail/non ESA/RMA) in the amount of, $54,252.00.
   - Three years of monitoring (ESA/RMA/Trail) in the amount of $8,712.00.

   (The above amounts being based on the costs estimate provided by a BCSLA Registered Landscape Architect including 10% contingency).

   Off-site ESA/RMA securities will be addressed through a Servicing Agreement.
2. Submission of a contract entered into between the applicant and a Qualified Environmental Professional (QEP) to monitor all planting ESA, RMA and trail vegetation installations and to provide three years of post-installation monitoring with annual reporting for the on-site and the off-site ESA and RMA enhancement areas and the pedestrian trail vegetation installation. The Contract should include the scope of work to be undertaken, including: the proposed number of site monitoring inspections, and a provision any remedial works during the monitoring period. Planting within RMA areas is to comply with Provincial RAR re-vegetation guidelines.
3. Submission of a contract to ensure that pruning and limb removal of retained trees is under supervision of a certified arborist, invasive vegetation removal within the tree protection area by hand only and activity within the drip line of retained trees to be done under the supervision of a Qualified Environmental Professional (QEP) or a certified arborist as outlined in the arborist's report.
4. Installation of appropriate tree protection fencing around all trees identified for retention by the Arborist (uTree Environmental Consultants report). Fencing is to be installed to the City's standards as part of the development prior to any construction activities occurring on-site.
5. Submission of payment in the amount of $62,000 to the City of Richmond, as a voluntary contribution for the design and future construction of a pedestrian observation platform overlooking the Fraser River and located to the east of Williams Road at the City's discretion. Timing of the platform construction may be affected by future dike improvements.
6. Registration of a 6 metre wide statutory right-of-way with public right of passage through 15040 Williams Road to accommodate a public trail in an alignment generally along the southern side of the CN Rail right-of-way as indicated in the Development Permit application and to the satisfaction of the Senior Manager of Parks. After completion of the Servicing Agreement maintenance period, the City will be responsible for maintenance and liability associated with the SRW.
7. Registration of a 7.5 metre wide statutory right-of-way for dike through 15040 Williams Road in an alignment generally near the property's foreshore with the Fraser River as indicated in the Development Permit application and to the satisfaction of the General Manager of Engineering. After completion of the Servicing Agreement maintenance period, the City will be responsible for maintenance and liability associated with the SRW. The SRW will provide the City with rights for access and the ability to maintain the works. The agreement should include a minimum building setback from the SRW of 7.0 metres.
8. Registration of a flood plain covenant on title identifying a minimum habitable elevation of 3.0 / 4.35 m GSC split approximately at the alignment of the southern edge of the CN Rail right-of-way.

Initial: _____

9. Registration of a legal agreement on title to ensure that landscaping planted as part of the on-site ESA and the on-site RMA is maintained and will not be abandoned or removed. Registration of a statutory right-of-way, and/or other legal agreements or measures, as determined to the satisfaction of the Director of Development.
10. Discharge of the existing foreshore covenant (BG 285960).
11. Registration of a legal agreement on title to require the owner to design and construct bank protection along the river to the satisfaction of the General Manager, Engineering and the Inspector of Dikes and to provide the City with access to the land to inspect and maintain the works should the owner fail to do so. The owner will be responsible for the ongoing maintenance and liability of the works. The intent of the covenant is to ensure that the area outside of the 7.5 m right-of-way will be constructed and maintained in a manner that protects the dike and cannot be modified without consent of the City of Richmond and the Provincial Inspector of Dikes.

Prior to Building Permit Issuance, the developer must complete the following requirements:

1. Enter into a Servicing Agreement* for the design and construction of a dike across 15040 Williams Road within the 7.5 m wide right-of-way and integration with existing dikes on adjacent properties acceptable to the General Manager, Engineering.
2. Enter into a Servicing Agreement* for the design and construction of a 6 m wide park trail across 15040 Williams Road and integration with existing trails on adjacent properties acceptable to the Senior Manager of Parks. Works include, but may not be limited to, a 3 m wide aggregate trail surface with vegetation strips on both sides to the satisfaction of the Senior Manager of Parks.
3. Enter into a Servicing Agreement* for the design and construction of utility and frontage works and the off-site ESA/RMA landscaping enhancement areas identified as per the landscaping plans submitted under DP 16-741741. Works include, but may not be limited to the following:

Water Works:

a. Using the OCP Model, there is 583 L/s of water available at a 20 psi residual at the Williams Road frontage. Based on your proposed development, your site requires a minimum fire flow of 250 L/s.
b. The Developer is required to:
   - Submit Fire Underwriter Survey (FUS) or International Organization for Standardization (ISO) fire flow calculations to confirm development has adequate fire flow for onsite fire protection. Calculations must be signed and sealed by a Professional Engineer and be based on Building Permit Stage Building designs.
   - Install a single water service connection to serve the development site. The service connection can be split at the property line, and two meters installed (one for fire, one for domestic use) inside meter chamber(s).
   - Install backflow prevention device at property line.
   - Provide statutory right-of-way for meter and meter chamber.
c. At Developer's cost, the City is to:
   - Complete all tie-ins for the proposed works to existing City infrastructure.

Storm Sewer Works:

a. The Developer is required to:
   - Design and construct a storm sewer outfall into the RMA ditch utilizing appropriate sediment and erosion control methods, such as deltalok bags, and provide a functional plan within the first servicing agreement submission for review and approval by the City.
   - Install an oil & grit separator upstream of the proposed outfall, and provide the City with a separator maintenance plan within the first servicing agreement submission for review and approval.

Sanitary Sewer Works:

a. The Developer is required to:
   - N/A

Frontage Improvements:

a. The Developer is required to:

- Coordinate with BC Hydro, Telus and other private communication service providers:
- When relocating/modifying any of the existing power poles and/or guy wires within the property frontages.
- To locate all above ground utility cabinets and kiosks required to service the proposed development within the developments site (see list below for examples). A functional plan showing conceptual locations for such infrastructure shall be included in the development process design review. Please coordinate with the respective private utility companies and the project's lighting and traffic signal consultants to confirm the requirements (e.g., statutory right-of-way dimensions) and the locations for the aboveground structures. If a private utility company does not require an aboveground structure, that company shall confirm this via a letter to be submitted to the City. The following are examples of statutory right-of-ways that shall be shown in the functional plan and registered prior to SA design approval:
  - BC Hydro PMT – 4mW X 5m (deep)
  - BC Hydro LPT – 3.5mW X 3.5m (deep)
  - Street light kiosk – 1.5mW X 1.5m (deep)
  - Traffic signal kiosk – 2mW X 1.5m (deep)
  - Traffic signal UPS – 1mW X 1m (deep)
  - Shaw cable kiosk – 1mW X 1m (deep) – show possible location in functional plan
  - Telus FDH cabinet-1.1 m W X 1 m (deep – show possible location in functional plan
- Implement a riparian enhancement planting plan in the 5.0 m RMA watercourse along the Williams Road frontage.

Dike Improvements:

a. The Developer is required to satisfy the following for the dike:
   - The dike shall be designed by a Professional Geotechnical Engineer.
   - The elevation of the dike crest shall be raised to minimum 4.7 m geodetic, and designed to accommodate a future elevation of 5.5 m. On the waterside of the dike, the slope shall be maximum 2:1. On the landside of the dike, the slope shall be maximum 3:1.
   - The crest of the dike shall be minimum 4.0 m wide.
   - Provide a 7.5 m statutory right-of-way for the dike.
   - There shall be a minimum building setback of 7.0 m from the dike right-of-way.
   - The drip line of any trees shall be set back at least 8.0 m from the future toe of the dike.
   - Above ground pipes crossing the dike right-of-way shall be removable to allow for dike inspection and maintenance.
   - Design the dike and operations in a manner that allows for vehicular and man access along the dike upon the City's request.
   - The dike along the frontage of the development site shall be tied in to the adjacent dikes to the north and south at a maximum slope of 3:1. Developer to be responsible to locate the dike to the north and south for a smooth transition. No retaining walls within the dike crest or slope area are allowed.
   - All dike construction, including materials, shall be in conformance with City standard drawing MB-98 or MB-99, Dike Design and Construction Guide – Best Management Practices for British Columbia (2003), and Environmental Guidelines for Vegetation Management on Flood Protection Works to Protect Public Safety and the Environment (1999).
   - The design and construction of the dike shall be done to the satisfaction of the General Manager, Engineering and Public Works, and any other relevant dike approving authorities.
   - Discharge existing foreshore covenant and register a new foreshore covenant to ensure that the area outside of the 7.5 m right-of-way will be constructed and maintained in a manner that protects the dike and cannot be modified without consent of the City of Richmond and Inspector of Dikes.

General Items:

a. The Developer is required to:

- Develop a sediment and erosion control and protection fencing plan for the proposed works to minimize impact to the 5.0m RMA along Williams Road during construction, to the satisfaction of the City. A functional plan must be reviewed and approved by the City prior to development permit issuance.
- Provide, within the first servicing agreement submission, a geotechnical assessment of preload and soil preparation impacts on the existing utilities fronting the development site and provide mitigation recommendations.
- Enter into, if required, additional legal agreements, as determined via the subject development's Servicing Agreement(s) and/or Development Permit(s), and/or Building Permit(s) to the satisfaction of the Director of Engineering, including, but not limited to, site investigation, testing, monitoring, site preparation, de-watering, drilling, underpinning, anchoring, shoring, piling, pre-loading, ground densification or other activities that may result in settlement, displacement, subsidence, damage or nuisance to City and private utility infrastructure.
- Prepare and submit a design and sealed cost estimate (inclusive of a 10% contingency) as prepared by a qualified professional for the construction of a foreshore observation deck to the satisfaction of the Senior Manager, Parks and the Director, Engineering.
- Submit a voluntary cash contribution for the construction of the foreshore observation deck to the satisfaction of the Senior Manager, Parks and the Director, Engineering.

b. Plan and undertake the off-site ESA and RMA landscaping as per the landscaping plans submitted under DP 16-741741. A Qualified Environmental Professional (QEP) to monitor all planting ESA, RMA and trail vegetation installations and to provide three years of post-installation monitoring with annual reporting for the on-site and the off-site ESA, the RMA enhancement areas and the pedestrian trail vegetation installation. Planting within RMA areas is to comply with Provincial RAR re-vegetation guidelines.

c. Ensure that all pruning and limb removal of retained trees is to be under supervision of a certified arborist, invasive vegetation removal within the tree protection area is by hand only and activity within the drip line of retained trees to be done under the supervision of a Qualified Environmental Professional (QEP) or a certified arborist as outlined in the arborist's report.

4. City arborist (Conor Sheridan: 604-244-1208, CSheridan@richmond.ca) to be notified prior to commencement of works within the drip line of existing retained offsite trees. Provide 3 business days minimum notice.
5. City Parks to review all offsite planting after it is in place (contact Steve Priest, Supervisor of Horticulture: 604-244-1208, and Miriam Plishka, Park Planner: 604-233-3310). Once plant material and placement have been accepted by the City, the maintenance period will commence.
6. Submission of a final sign-off letter of from CN Railway, to the satisfaction of the City's Director of Transportation and the Director of Engineering, for the VAFFC Marine Terminal project at 15040 Williams Road. If CN Railway's approval includes conditions or requirements, the proponent must provide means to meet those conditions / requirements to the satisfaction of the City's Director of Transportation.
7. Submission of a Construction Parking and Traffic Management Plan to the Transportation Department. Management Plan shall include location for parking for services, deliveries, workers, loading, application for any lane closures, and proper construction traffic controls as per Traffic Control Manual for works on Roadways (by Ministry of Transportation) and MMCD Traffic Regulation Section 01570.
8. Obtain a Building Permit (BP) for any construction hoarding. If construction hoarding is required to temporarily occupy a public street, the air space above a public street, or any part thereof, additional City approvals and associated fees may be required as part of the Building Permit. For additional information, contact the Building Approvals Department at 604-276-4285.

Note:

* This requires a separate application.

- Where the Director of Development deems appropriate, the preceding agreements are to be drawn not only as personal covenants of the property owner but also as covenants pursuant to Section 219 of the Land Title Act.

  All agreements to be registered in the Land Title Office shall have priority over all such liens, charges and encumbrances as is considered advisable by the Director of Development. All agreements to be registered in the Land Title Office shall, unless the

Director of Development determines otherwise, be fully registered in the Land Title Office prior to enactment of the appropriate bylaw.

The preceding agreements shall provide security to the City including indemnities, warranties, equitable/rent charges, letters of credit and withholding permits, as deemed necessary or advisable by the Director of Development. All agreements shall be in a form and content satisfactory to the Director of Development.

- Additional legal agreements, as determined via the subject development's Servicing Agreement(s) and/or Development Permit(s), and/or Building Permit(s) to the satisfaction of the Director of Engineering may be required including, but not limited to, site investigation, testing, monitoring, site preparation, de-watering, drilling, underpinning, anchoring, shoring, piling, pre-loading, ground densification or other activities that may result in settlement, displacement, subsidence, damage or nuisance to City and private utility infrastructure.
- Applicants for all City Permits are required to comply at all times with the conditions of the Provincial *Wildlife Act* and Federal *Migratory Birds Convention Act*, which contains prohibitions on the removal or disturbance of both birds and their nests. Issuance of Municipal permits does not give an individual authority to contravene these legislations. The City of Richmond recommends that where significant trees or vegetation exists on site, the services of a Qualified Environmental Professional (QEP) be secured to perform a survey and ensure that development activities are in compliance with all relevant legislation.

Signed _____ Date _____

City of Richmond

Development Permit

No. DP 16-741741

To the Holder:	VANCOUVER AIRPORT FUEL FACILITIES CORPORATION
Property Address:	15040 WILLIAMS ROAD
Address:	C/O FSM MANAGEMENT GROUP INC. 108 – 12300 HORSESHOE WAY RICHMOND, BC V7A 4Z1

1. This Development Permit is issued subject to compliance with all of the Bylaws of the City applicable thereto, except as specifically varied or supplemented by this Permit.
2. This Development Permit applies to and only to those lands shown cross-hatched on the attached Schedule "A" and any and all buildings, structures and other development thereon.
3. Subject to Section 692 of the Local Government Act, R.S.B.C.: buildings and structures; off-street parking and loading facilities; roads and parking areas; and landscaping and screening shall be constructed generally in accordance with Plans #1 to #25 attached hereto.
4. Sanitary sewers, water, drainage, highways, street lighting, underground wiring, and sidewalks, shall be provided as required.
5. As a condition of the issuance of this Permit, the City is holding the security in the amount of $250,078.40 (including, on-site ESA/RMA $67,589.50, on-site non-ESA $14,459.50, on-site trail planting $105,065.40, 3 years of maintenance $54,252.00 and 3 years of monitoring $8,712.00) to ensure that development is carried out in accordance with the terms and conditions of this Permit. Should any interest be earned upon the security, it shall accrue to the Holder if the security is returned. The condition of the posting of the security is that should the Holder fail to carry out the development hereby authorized, according to the terms and conditions of this Permit within the time provided, the City may use the security to carry out the work by its servants, agents or contractors, and any surplus shall be paid over to the Holder. Should the Holder carry out the development permitted by this permit within the time set out herein, the security shall be returned to the Holder. The City may retain the security for up to three years after inspection of the completed landscaping in order to ensure that plant material has survived.
6. If the Holder does not commence the construction permitted by this Permit within 24 months of the date of this Permit, this Permit shall lapse and the security shall be returned in full.

Development Permit
No. DP 16-741741

To the Holder:	VANCOUVER AIRPORT FUEL FACILITIES CORPORATION
Property Address:	15040 WILLIAMS ROAD
Address:	C/O FSM MANAGEMENT GROUP INC. 108 - 12300 HORSESHOE WAY RICHMOND, BC V7A 4Z1

7. The land described herein shall be developed generally in accordance with the terms and conditions and provisions of this Permit and any plans and specifications attached to this Permit which shall form a part hereof.

   This Permit is not a Building Permit.

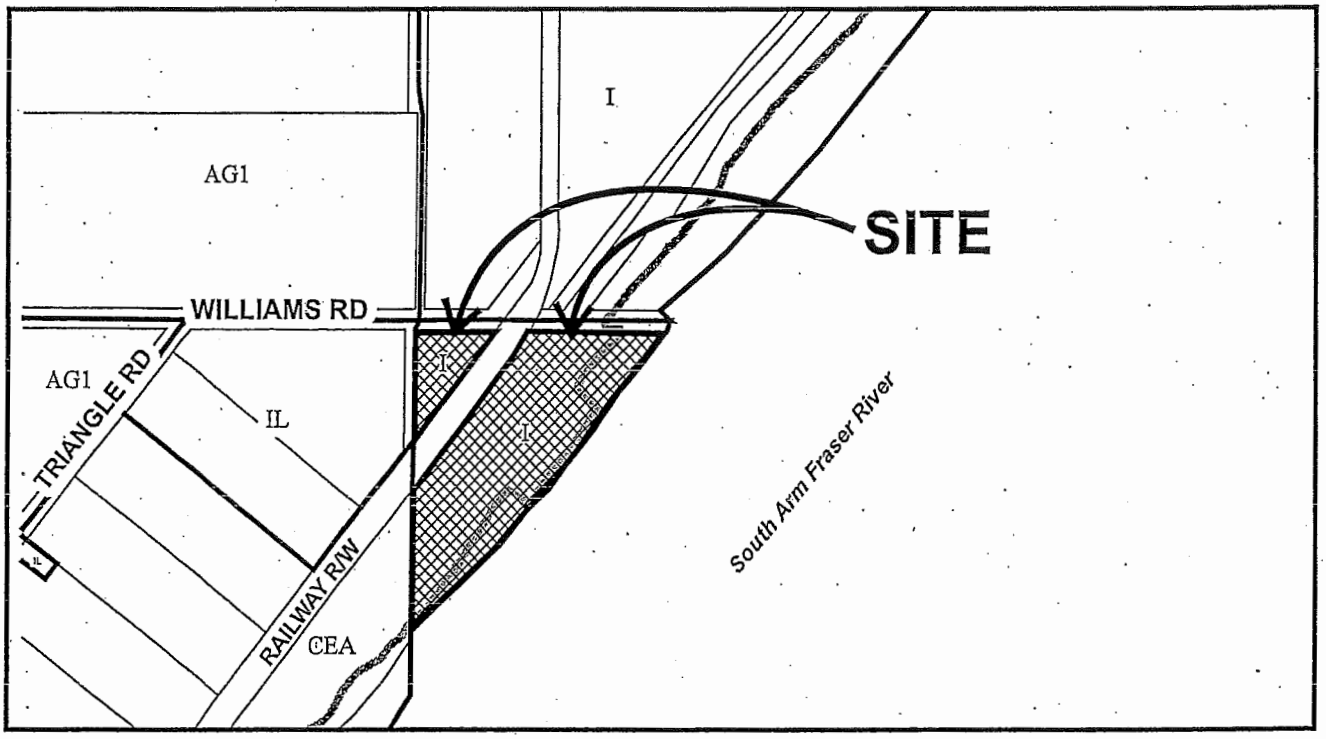
AUTHORIZING RESOLUTION NO. ISSUED BY THE COUNCIL THE DAY OF , .

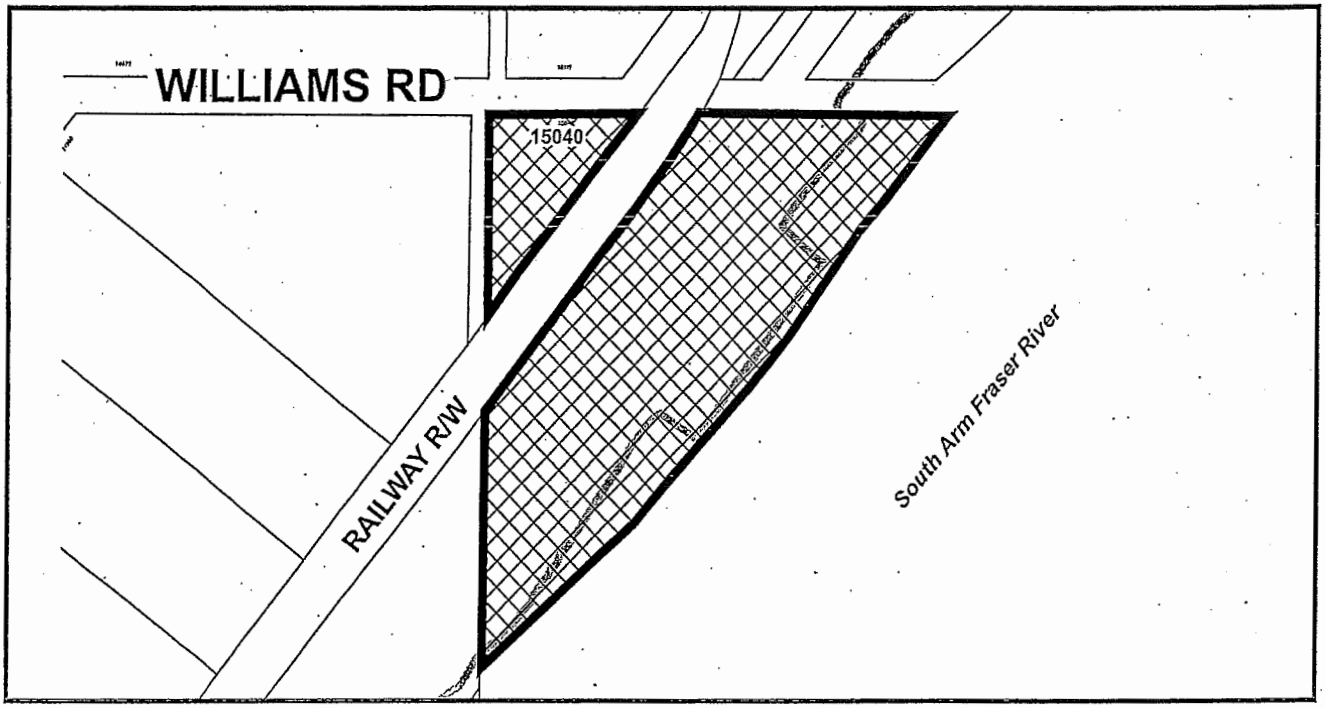
DELIVERED THIS DAY OF , .

_____

MAYOR

City of
Richmond





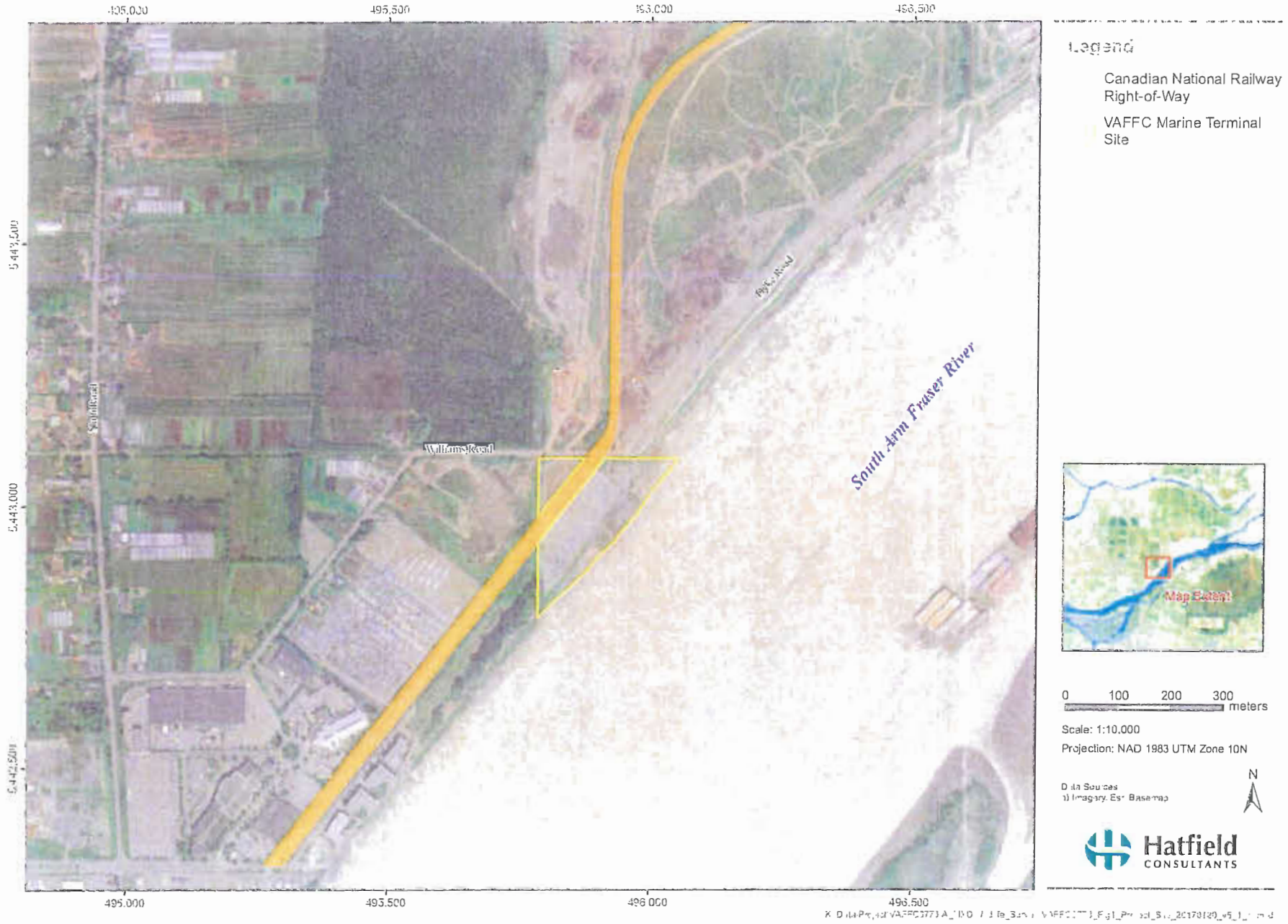
DP 16-741741
SCHEDULE "A"

Original Date: 08/22/16

Revision Date:

Note: Dimensions are in METRES

Figure 1 Vancouver Airport Fuel Delivery Project – Marine Terminal site location.



This plan is reprinted from the
ESA and FMA Environmental Report
by
Hatfield Environmental Consultants

DAMON ORIENTE LTD.
9908 - 4184 Vest 10th Avenue
Vancouver BC Canada
V6R 2H9
t. 60 -222-6230
e. [illegible]
w. [illegible]

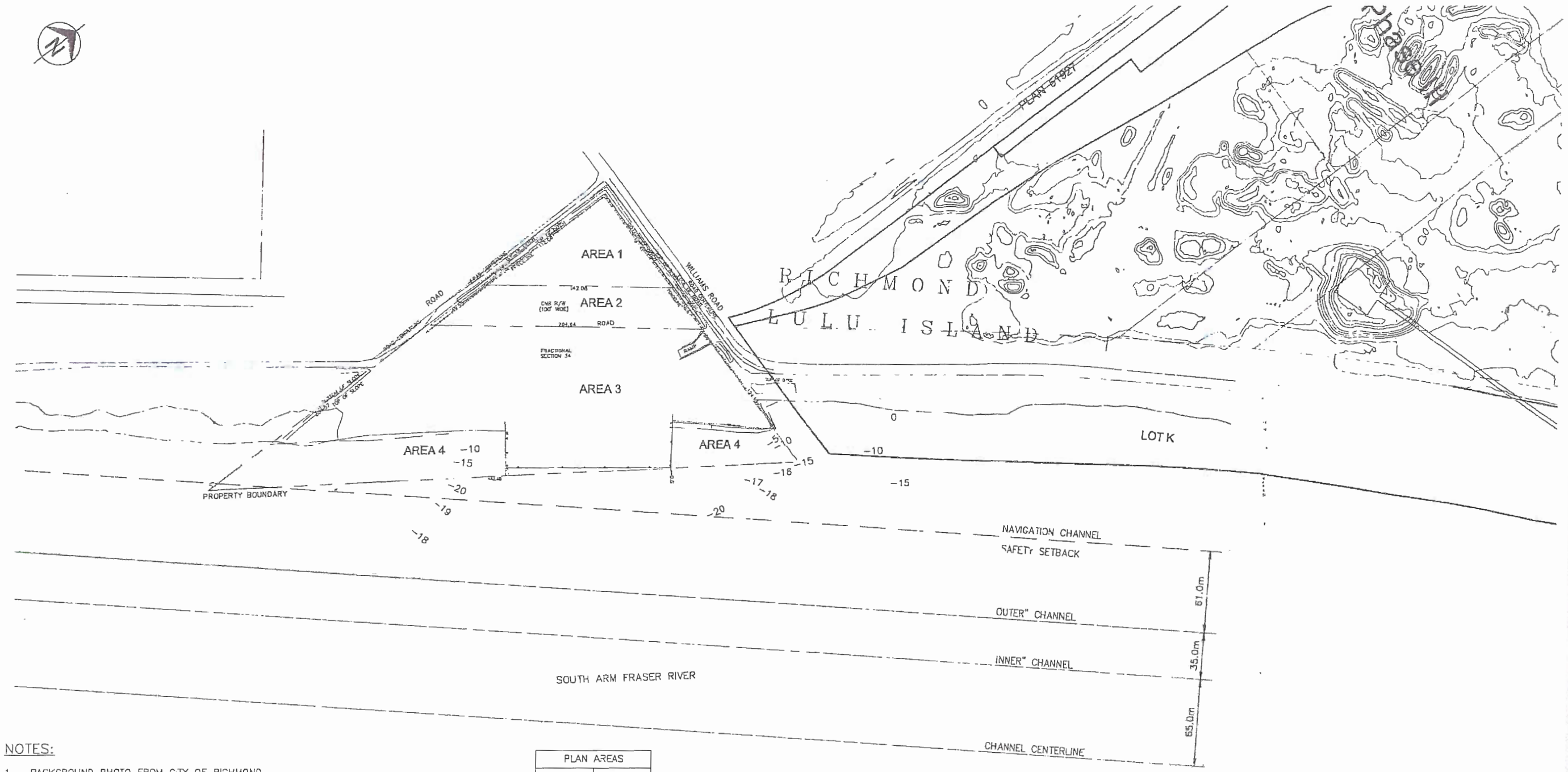
Project:
VAFFC MARINE TERMINAL FACILITY
15040 Williams Road, Richmond BC

Drawing
MARINE TERMINAL SITE LOCATION

Issue:
30 June 2017 Development Permit Application Resubmission

Scale: nts
Date:
Project Number: 2014-280

Dwg
L0.02
Reference



NOTES:

1. BACKGROUND PHOTO FROM CITY OF RICHMOND.
2. TOPOGRAPHIC SURVEY PREPARED BY MATSON, PEAK AND TOPLISS. DRAWING REFERENCE V-06-15234-TPG. SURVEY DONE BY SEPTEMBER 12-14, 2006
3. ALL ELEVATIONS ARE REFERENCED TO GEODETIC DATUM.

PLAN AREAS	
LOCATION	AREA (m^2)
AREA 1	4985
AREA 2	5298
AREA 3	26388
AREA 4	9229
TOTAL	45810

1 EXISTING SITE PLAN
1:1500

0 30 60 90 150m
1:1500

ISSUE NO.	DRAWING REVISIONS	ISSUE DATE
0	ISSUED FOR CONSTRUCTION	09/14/2017

Fuel Facilities Corporation

VANCOUVER AIRPORT FUEL DELIVERY PROJECT
MARINE RECEIVING AREA
MARINE DESIGN PACKAGE
VANCOUVER AIRPORT FUEL FACILITIES CORPORATION
RICHMOND, BRITISH COLUMBIA

SEAL

moffatt & nichol

Argus
ENGINEERING PLANNING | MANAGEMENT
ARGUS CONSULTING, INC
6183 College Boulevard, Suite 160
Overland Park, Kansas 66211
816 228 7500 FAX 816 228.7535
www.argusconsulting.com

PROJECT NO	15004 22C
DATE	12/21/15
DESIGNED BY	PS
DRAWN BY	WM
CHECKED BY	RB
CAD FILE NAME	15004 22C-2009

EXISTING SITE PLAN

DRAWING NO. G-009

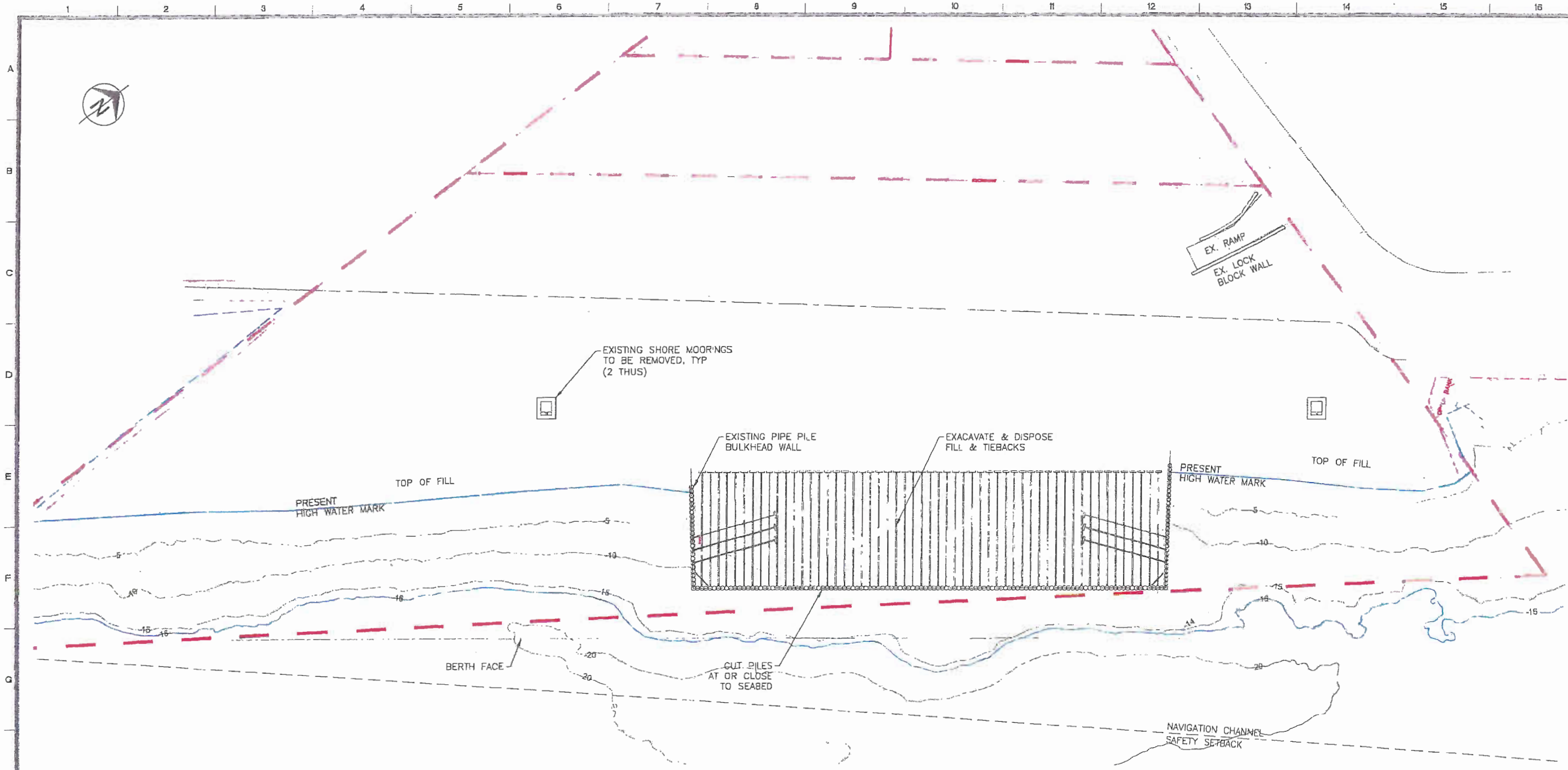
ISSUED FOR CONSTRUCTION

SEP 27 2017

Plotted: P:\8338 VC Vancouver Airport Fue Delivery Project\CADD_Active\15004 22C-G009.dwg on 09/7/17 at 1:17 PM by AMANUZON using Argus 2013.stb

Plan #1

PLEASE RECYCLE



1 DEMOLITION PLAN
1:500

LEGEND:

PROPERTY BOUNDARY

NOTES:

1. CONTOURS ARE BASED ON GEODETIC DATUM.

0 10 20 30 50m
1:500

ISSUE NO	DRAWING REVISIONS	ISSUE DATE
0	ISSUED FOR CONSTRUCTION	02/14/2017

Fuel Facilities Corporation

VANCOUVER AIRPORT FUEL DELIVERY PROJECT
MARINE RECEIVING AREA
MARINE DESIGN PACKAGE
VANCOUVER AIRPORT FUEL FACILITIES CORPORATION
RICHMOND, BRITISH COLUMBIA

SEAL

LOGO moffatt & nichol
727 WEST BROADWAY, STE 301
VANCOUVER, BC CANADA V5Z 4L7
604-707-3034

Argus ENGINEERING PLANNING | MANAGEMENT
ARGUS CONSULTING INC
6361 College Boulevard, Suite 600
Overland Park, Kansas 66211
816.228.7500 FAX 816.228.7535
www.argusconsulting.com

PROJECT NO	15004 22C
DATE	12/16/15
DESIGNED BY	RB
DRAWN BY	AYM
CHECKED BY	RB
CAD FILE NAME	15004 22C -G020

MARINE TERMINAL DEMOLITION PLAN

DRAWING NO G-020

ISSUED FOR CONSTRUCTION

SEP 27 2017

PLEASE RECYCLE

Plotted: P:\8338 VC Vancouver Airport Fuel Delivery Project\CADD_Active\15004 22C-G020.dwg on 03/7/17 at 1:18 PM by AMANZON using Argus 2013.stb

Plan #2

BUILDING AREA AND STRUCTURE ELEVATIONS			
BUILDING NAME	FLOOR AREA (M 2)	STRUCTURE HEIGHT (M)	STRUCTURE ELEVATION (M)
CONTROL ROOM AND WASHROOM ENCLOSURE	43.29	3.5	9.0
FUEL LAB ENCLOSURE	21.65	3.5	9.0
FIRE PUMP ENCLOSURE 1	33.51	2.6	8.1
FIRE PUMP ENCLOSURE 2	33.51	2.6	8.1
FOAM STORAGE ENCLOSURE	28.01	2.6	8.1
ELECTRICAL ENCLOSURE	45.97	5.5	11.0
DOCK UNLOADING ARMS	N/A	33.0	37.8
DOCK GANGWAY TOWER	N/A	19.7	24.5
NOTE: THE MARINE UNLOADING ARMS ELEVATION ARE TO BE DETERMINED BY THE MANUFACTURER. APPROXIMATE ELEVATIONS OF THE STRUCTURE ARE LISTED ABOVE.			
SITE AREA: 40,468 M^2			
LOT COVERAGE AREA: 0.52%			

BACKFLOW PREVENTOR AND WATER SHUTOFF BUILDING

VEHICLE PARKING
4 - SPACES @ 3.2m
1 - HANDICAP SPACE @ 3.7m x 5.5m
5 SPACES TOTAL

ACCESS ROAD TO BACKFLOW PREVENTOR BUILDING

DYKE NATURE TRAIL

OIL WATER SEPARATOR

ABOVEGROUND WASTE TANK

CN RAIL ROW

FOAM STORAGE ENCLOSURE

DIESEL POWERED FIRE PUMP ENCLOSURE

TRANSFORMER

GENERATOR

ELECTRICAL ENCLOSURE (SEE A-1401)

7.0 M DYKE SETBACK

PROPOSED DYKE ROW

NEW MOORING STRUCTURE WITH QUICK RELEASE MOORING HOOK (TYP.)

MOORING DOLPHIN 1

MOORING DOLPHIN 2

UNLOADING ARMS WITH SPILL CONTAINMENT (DRAINS TO OIL WATER SEPARATOR)

UTILITY VESSEL LAUNCH

CONTAINMENT WALL

BERTHING DOLPHIN 1

BERTHING DOLPHIN 2

BERTHING DOLPHIN 3

BERTHING DOLPHIN 4

EQUIPMENT PAD WITH CONTAINMENT

EXISTING BULKHEAD WALL TO BE REMOVED

6.0m ENTRANCE/EXIT FIRE CRASH GATE

TRASH AND RECYCLE RECEPTICLE

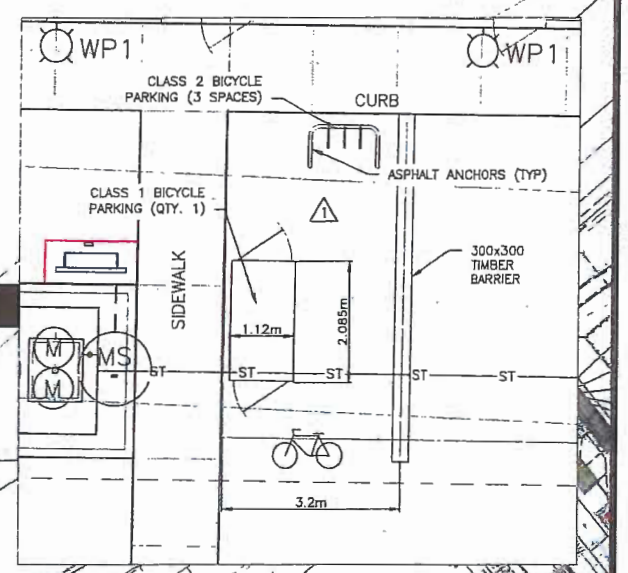
CONTROL ROOM AND WASHROOM ENCLOSURE (SEE A-1402)

WILLIAMS ROAD

OVERHEAD POWER POLE TRANSITION TO BELOWGROUND ELECTRICAL DUCT BANK

CLASS 1 enclosure:
"Urban Bike Locker" or equivalent
http://www.urbanracks.com/bikelockers.html#image-3
Based in Surrey, BC

CLASS 2 Rack:
"Urban Hanger Rack" Model UB2000 or equivalent
http://www.urbanracks.com/hangerrack.html
Based in Surrey, BC



UTILITIES TO/FROM MARINE FACILITY (WORK OUTSIDE PROPERTY BOUNDARY NOT INCLUDED IN CITY OF RICHMOND PROJECT PERMIT)

NEW ELECTRICAL SERVICE CONNECTION TO EXISTING POWER POLE

7.0 M DYKE SETBACK

DYKE ROAD

SECURITY FENCE AND PROPERTY BOUNDARY

EXISTING PARCEL A WATER LOT AREA = 3,550 SQ.M.

PROPOSED PARCEL A WATER LOT AREA = 7,977 SQ.M.

CONTAINMENT WALL

CONTAINMENT BOOM DEPLOYED WHEN SHIP AT BERTH

MOORING DOLPHIN 4

MOORING DOLPHIN 3

0 15 30 45 75m
1:750

PLEASE RECYCLE

ISSUED FOR DEVELOPMENT PERMIT REVIEW

SEP 27 2017

ISSUE NO.	DRAWING REVISIONS	ISSUE DATE
2	REVISED LOCATION OF UNLOADING ARMS INTO WATER LOT	08/18/2017
1	ADDED BICYCLE PARKING DETAIL	07/24/2017
0	ISSUED FOR DEVELOPMENT PERMIT REVIEW	12/02/2016

Fuel Facilities Corporation

PSM WATSON GROUP
128 - 12300 Horseshoe Way
Richmond, BC V7A 4Z1
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www.vancouverairportfuel.ca

VANCOUVER AIRPORT FUEL DELIVERY PROJECT
MARINE RECEIVING AREA
PERMIT PACKAGE
VANCOUVER AIRPORT FUEL FACILITIES CORPORATION
RICHMOND, BRITISH COLUMBIA

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Argus
ENGINEERING | PLANNING | MANAGEMENT
ARGUS CONSULTING, INC.
6363 College Boulevard, Suite 600
Overland Park, Kansas 66211
819.228.7500 FAX 816.228.7535
www.argusconsulting.com

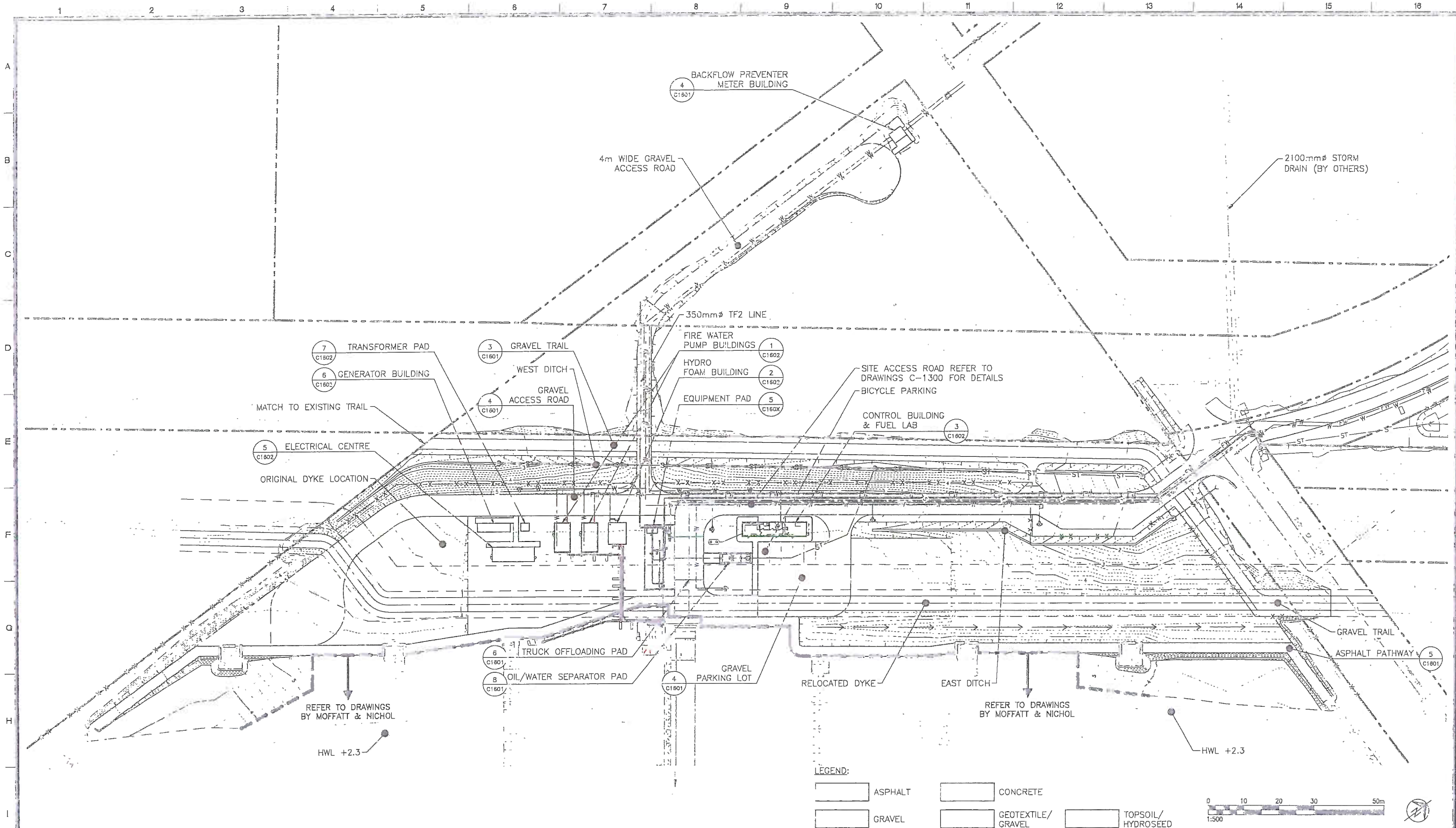
PROJECT NO:	15004.22
DATE:	05/22/2015
DESIGNED BY:	DWF
DRAWN BY:	DWF
CHECKED BY:	DWF
CAD FILE NAME	CS1.01

OVERALL SITE PLAN

DRAWING NO.: CS-101

Plotted: Y:\Comm\YVR - Vancouver\15004 VAFDP\Dwgs\22-Marine\22A - Permit\Civil\CS1.01.dwg on 08/18/17 at 5:51 PM by SNEWBOLD using acad.stb

Plan #3



ISSUE NO.	DRAWING REVISIONS	ISSUE DATE
	ISSUED FOR DEVELOPMENT PERMIT REVIEW	05/05/2017

Fuel Facilities Corporation

VANCOUVER AIRPORT FUEL DELIVERY PROJECT
MARINE RECEIVING AREA
MARINE DESIGN PACKAGE

VANCOUVER AIRPORT FUEL FACILITIES CORPORATION
RICHMOND, BRITISH COLUMBIA

SEAL

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1300-885 OLIVER ST. VANCOUVER BC CANADA V6C 1N5
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6363 College Boulevard, Suite 200
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PROJECT NO:	15004.22C
DATE:	10/10/16
DESIGNED BY:	-
DRAWN BY:	-
CHECKED BY:	RK
CAD FILE NAME:	15004.22C-C1112

SURFACING PLAN (COLOUR)

DRAWING NO.: C-1112

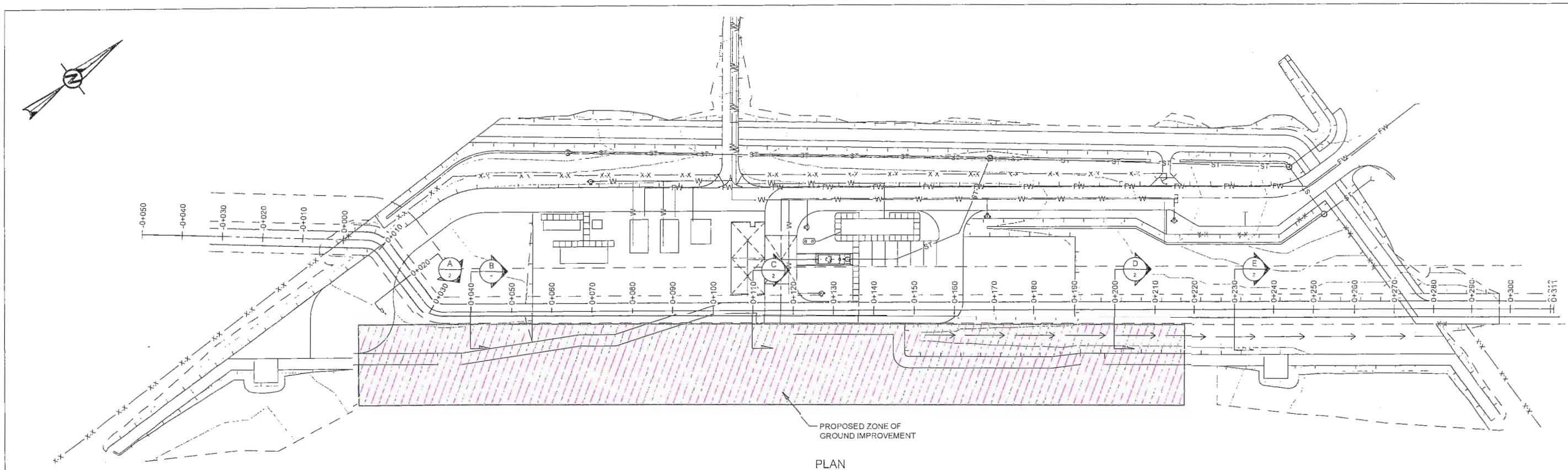
ISSUED FOR DEVELOPMENT PERMIT REVIEW

SEP 27 2017

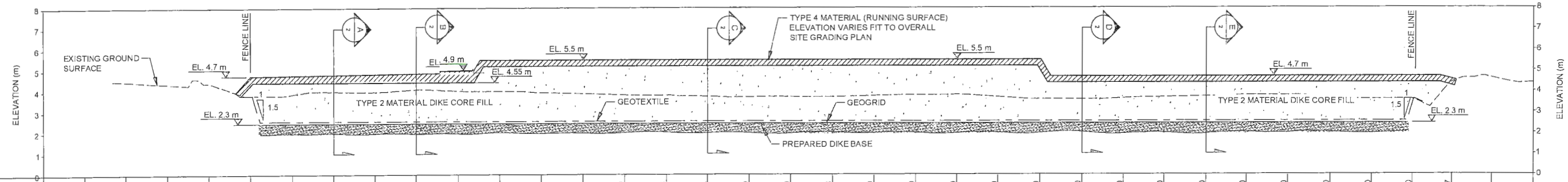
PLEASE RECYCLE

Plotted: G:\CAD\15100509-01\15004.22C\CADD\DWGS\SHTS\15004.22C-C1112.dwg on 05/4/17 at 9:03 AM by TANNER.JOHNSON using Argus.stb

Plan #4



PLAN



CHAINAGE	FINISHED GROUND	EXISTING GROUND
0+050		
0+040		
0+030		4.48
0+020		4.35
0+010		4.40
0+000	4.73	3.80
0+010	4.74	3.85
0+020	4.76	3.98
0+030	4.81	3.97
0+040	4.85	4.09
0+050	4.89	4.02
0+060	5.50	4.00
0+070	5.50	3.94
0+080	5.50	3.88
0+090	5.50	3.82
0+100	5.46	3.80
0+110	5.42	3.74
0+120	5.50	3.71
0+130	5.49	3.72
0+140	5.48	3.72
0+150	5.49	3.76
0+160	5.50	3.80
0+170	5.50	3.82
0+180	5.50	3.71
0+190	5.50	3.60
0+200	4.70	3.60
0+210	4.70	3.65
0+220	4.70	3.70
0+230	4.70	3.73
0+240	4.70	3.80
0+250	4.70	3.78
0+260	4.70	3.67
0+270	4.70	3.60
0+280	4.70	3.59
0+290	4.57	4.40
0+300		4.62
0+310		4.40

ELEVATION PROFILE

NOTE(S)

1. BASE DRAWING PROVIDED BY ARGUS CONSULTING CAD FILE: L2.01.DWG, DATED RECEIVED MAY 10, 2017.
2. ELEVATION SHOWN ARE IN GEODETIC DATUM
3. DATUM NAD 83, PROJECTION ZONE 10
4. ALL MATERIALS AND CONSTRUCTION SHALL CONFORM TO THE FOLLOWING:
5. A) CURRENT EDITION OF THE CITY OF RICHMOND SUPPLEMENTARY SPECIFICATIONS AND DETAIL DRAWINGS AND ASSOCIATED EDITION OF THE MASTER MUNICIPAL CONSTRUCTION DOCUMENTS.
   B) PROVINCE OF BRITISH COLUMBIA MINISTRY OF ENVIRONMENT, LANDS AND PARKS "ENVIRONMENTAL GUIDELINES FOR VEGETATION MANAGEMENT ON FLOOD PROTECTION WORKS TO PROTECT PUBLIC SAFETY AND THE ENVIRONMENT" AND "RIPRAP DESIGN AND CONSTRUCTION GUIDE" AND "DIKE DESIGN AND CONSTRUCTION GUIDE: BEST MANAGEMENT PRACTICES FOR BRITISH COLUMBIA".
6. COMPATIBILITY OF THE MATERIAL SHOULD BE CHECKED BEFORE AND DURING CONSTRUCTION TO CONFIRM WHETHER GEOTEXTILE FABRIC IS NEEDED.

DRAFT

0 20 40
1:500 METRES
HORIZONTAL SCALE

0 5 10
1:100 METRES
VERTICAL SCALE

CLIENT
FSM MANAGEMENT GROUP

CONSULTANT
Golder Associates

DESIGNED	M. MIAO / J. JI
PREPARED	GB
REVIEWED	M. MIAO
APPROVED	J. JI

PROJECT
VANCOUVER AIRPORT FUEL DELIVERY PROJECT
NEW FLOOD PROTECTION DIKE
15040 WILLIAMS ROAD, RICHMOND, B.C.

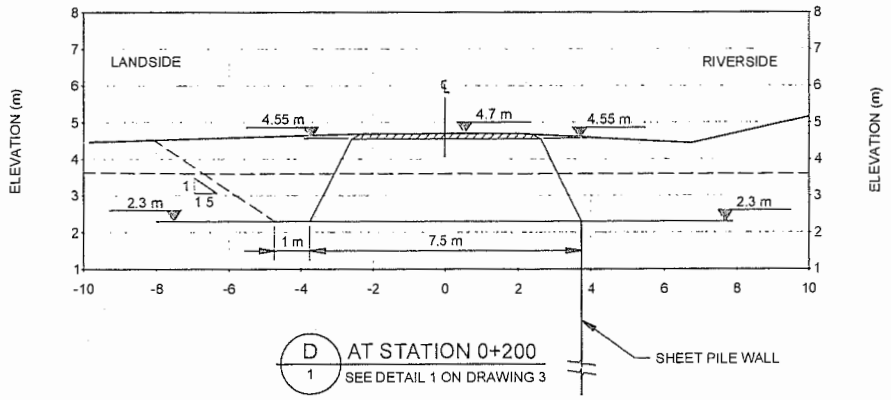
TITLE
PLAN AND ELEVATION PROFILE

PROJECT NO	PHASE	REV	FIGURE
1406834	9442	B	1

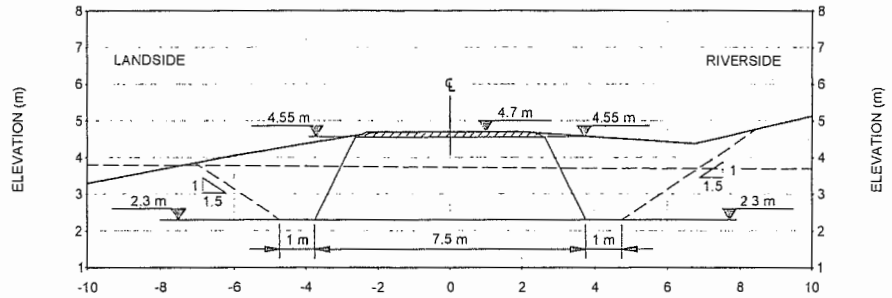
25 mm

SEP 27 2017

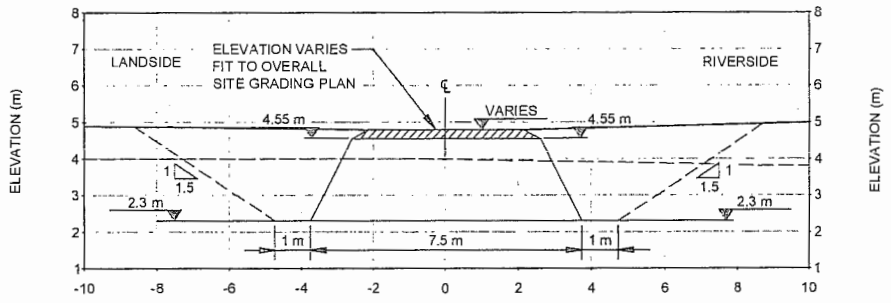
Plan #5



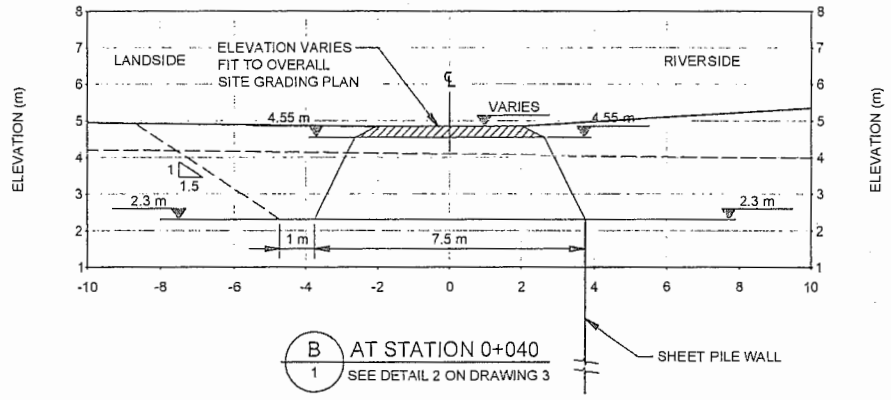
D / 1 AT STATION 0+200
SEE DETAIL 1 ON DRAWING 3



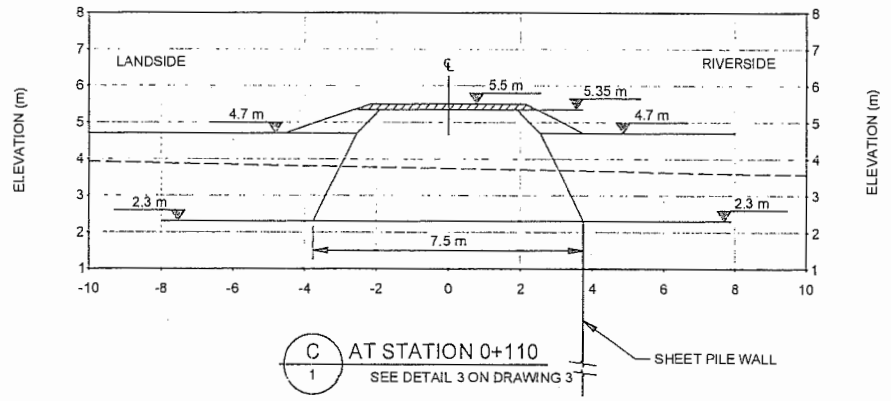
E / 1 AT STATION 0+230
SEE DETAIL 1 ON DRAWING 3



A / 1 AT STATION 0+020
SEE DETAIL 1 ON DRAWING 3



B / 1 AT STATION 0+040
SEE DETAIL 2 ON DRAWING 3



C / 1 AT STATION 0+110
SEE DETAIL 3 ON DRAWING 3

NOTE(S)
1. BASE DRAWING PROVIDED BY ARGUS CONSULTING
   CAD FILE: L2.01.DWG. DATED RECEIVED MAY 10, 2017.
2. ELEVATION SHOWN ARE IN GEODETIC DATUM
3. DATUM NAD 83, PROJECTION ZONE 10

DRAFT

0 5 10
1:100 METRES

CLIENT
FSM MANAGEMENT GROUP

CONSULTANT
Golder Associates

DESIGNED	M. MIAO / J. JI
PREPARED	GB
REVIEWED	M. MIAO
APPROVED	J. JI

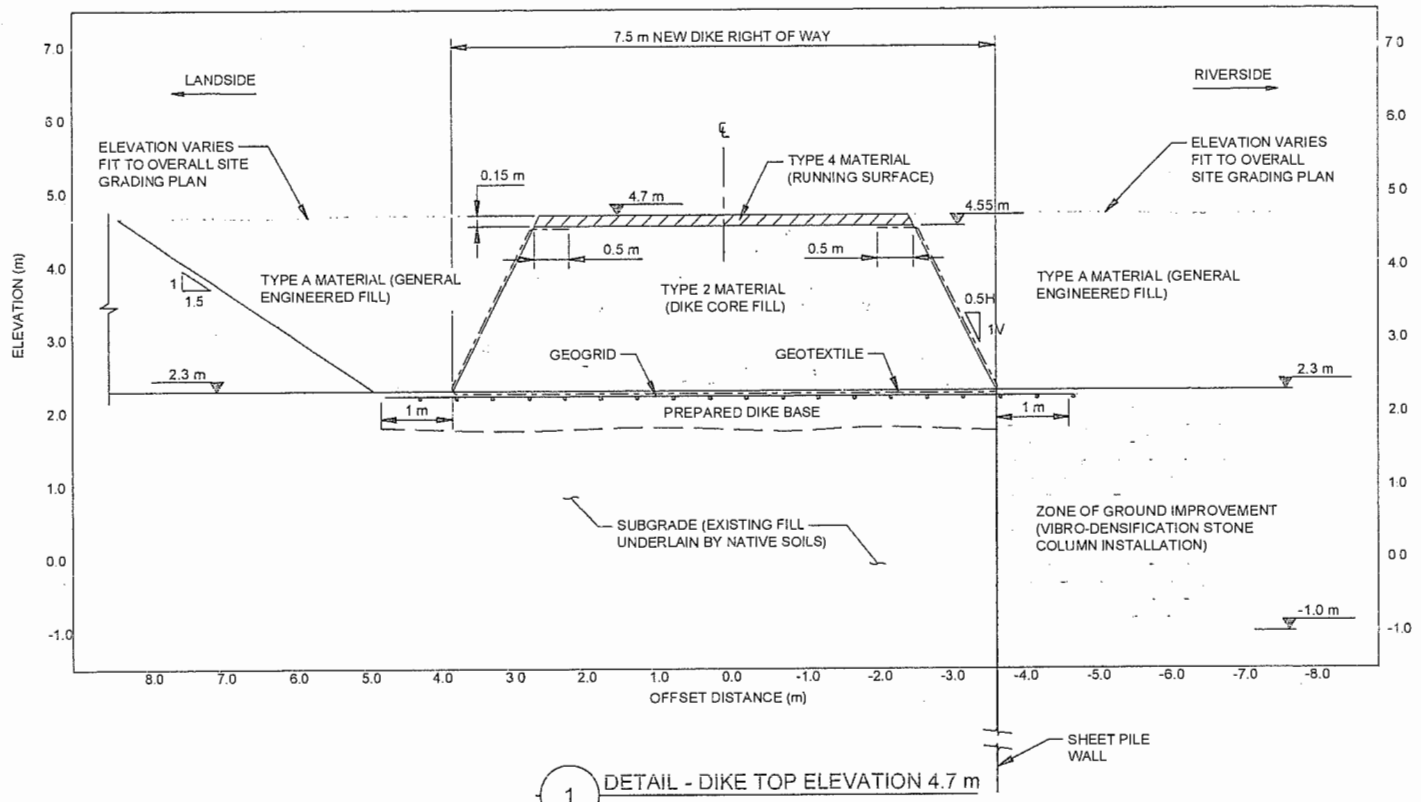
PROJECT
VANCOUVER AIRPORT FUEL DELIVERY PROJECT
NEW FLOOD PROTECTION DIKE
15040 WILLIAMS ROAD, RICHMOND, B.C.

TITLE
CROSS SECTIONS

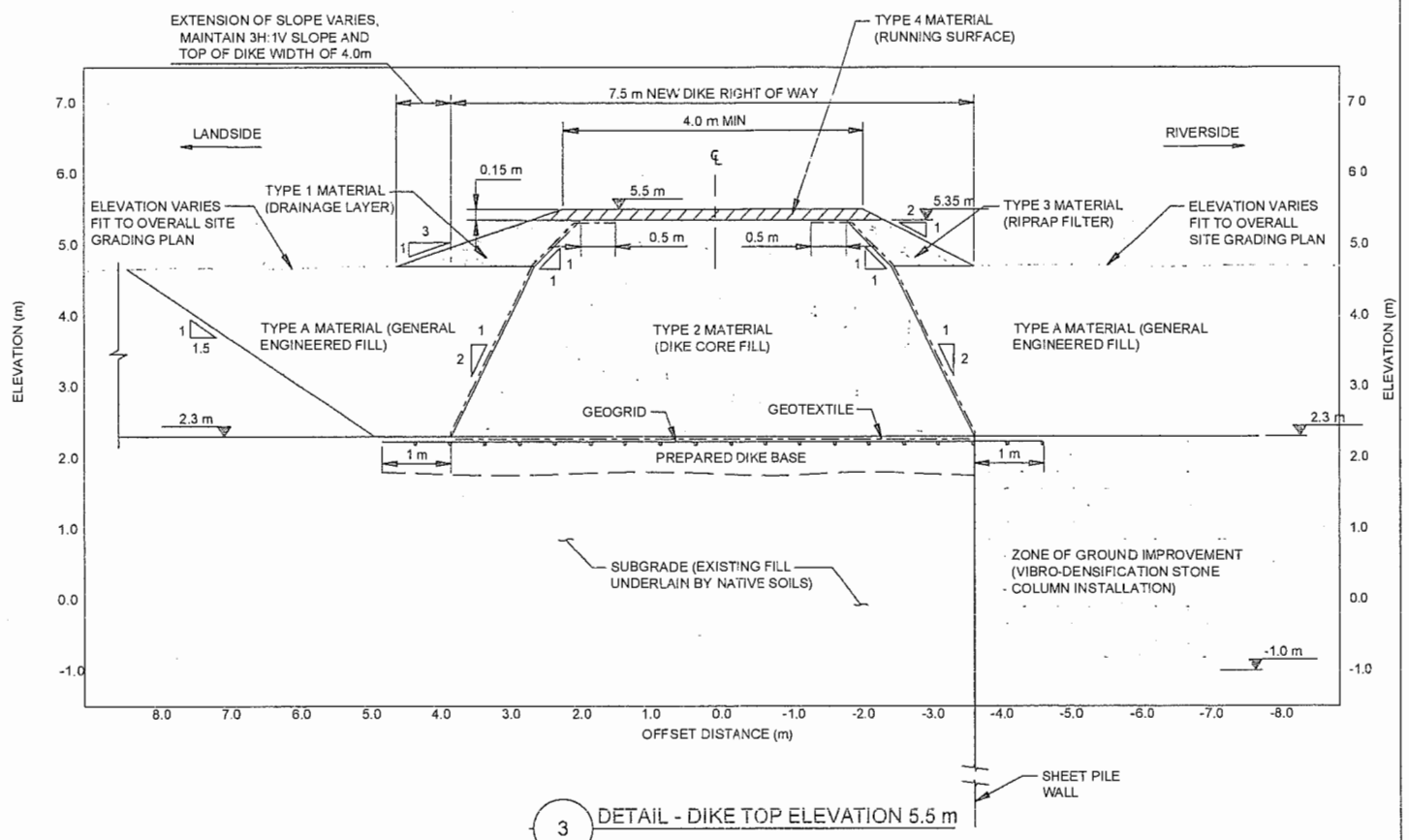
PROJECT NO	PHASE	REV.	FIGURE
1406834	9442	B	2

SEP 27 2017

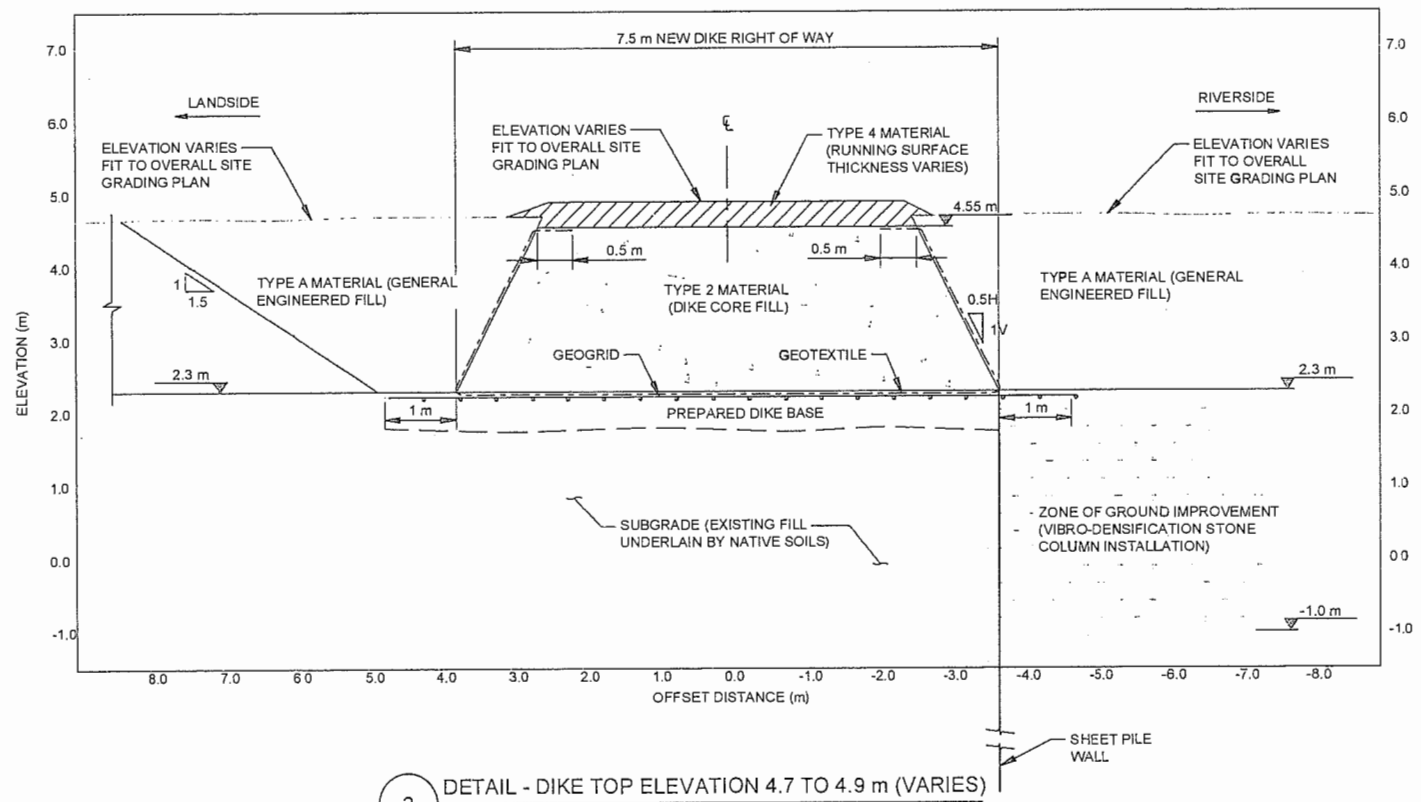
Plan #6



1 DETAIL - DIKE TOP ELEVATION 4.7 m



3 DETAIL - DIKE TOP ELEVATION 5.5 m



2 DETAIL - DIKE TOP ELEVATION 4.7 TO 4.9 m (VARIES)

TYPE 1 MATERIAL (DRAINAGE LAYER)
Type 1 material shall consist of clean well-graded 75 mm minus sand and gravel meeting the following gradation limits

PARTICLE SIZE (mm)	PERCENTAGE BY WEIGHT PASSING
75	100
37.5	60 - 100
19	35 - 80
9.5	26 - 60
4.75	20 - 40
2.36	15 - 30
1.18	10 - 20
0.6	5 - 15
0.3	3 - 10
0.075	0 - 5

TYPE 2 MATERIAL (BULK FILL OR DIKE CORE FILL)
Type 2 material shall consist of well-graded sand with 15 to 30 percent fines passing 0.075 mm sieve meeting the following gradation limits

PARTICLE SIZE (mm)	PERCENTAGE BY WEIGHT PASSING
19	100
4.75	80 - 100
0.425	25 - 90
0.15	18 - 50
0.075	15 - 30

TYPE 3 MATERIAL (RIPRAP FILTER)
Type 3 material shall consist of clean well-graded pit-run or processed sand, gravel and cobbles, or quarried stone meeting the following gradation limits

PARTICLE SIZE (mm)	PERCENTAGE BY WEIGHT PASSING
200	100
75	60 - 90
9.5	30 - 65
0.85	5 - 30
0.15	0 - 5

TYPE 4 MATERIAL (RUNNING SURFACE)
Type 4 material shall consist of clean well-graded 19mm minus sand and gravel or road mulch meeting the following gradation limits

PARTICLE SIZE (mm)	PERCENTAGE BY WEIGHT PASSING
19	100
12.5	75 - 100
9.5	60 - 90
4.75	40 - 70
2.36	27 - 55
1.18	16 - 42
0.6	8 - 30
0.3	5 - 20
0.075	2 - 8

TYPE A MATERIAL (GENERAL ENGINEERED FILL)
Type A material shall consist of clean well-graded 75 mm minus sand and gravel meeting the following gradation limits

PARTICLE SIZE (mm)	PERCENTAGE BY WEIGHT PASSING
75	100
37.5	30 - 100
19	20 - 100
4.75	10 - 60
1.18	6 - 32
0.3	4 - 15
0.075	0 - 5

NOTE(S)
1. BASE DRAWING PROVIDED BY ARGUS CONSULTING CAD FILE: L2.01.DWG. DATED RECEIVED MAY 10, 2017.
2. ELEVATION SHOWN ARE IN GEODETIC DATUM
3. DATUM NAD 83, PROJECTION ZONE 10

DRAFT

0 2 4
1:50 METRES

CLIENT
FSM MANAGEMENT GROUP

CONSULTANT
Golder Associates

DESIGNED	M. MIAO / J. JI
PREPARED	GB
REVIEWED	M. MIAO
APPROVED	J. JI

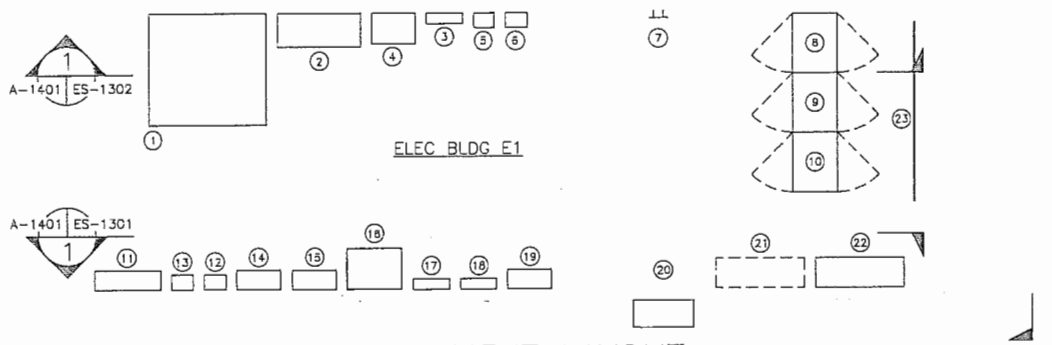
PROJECT
VANCOUVER AIRPORT FUEL DELIVERY PROJECT
NEW FLOOD PROTECTION DIKE
15040 WILLIAMS ROAD, RICHMOND, B.C.

TITLE
TYPICAL DETAILS

PROJECT NO	PHASE	REV	FIGURE
1406834	9442	B	3

SEP 27 2017

Plan #7



1 ELECTRICAL EQUIPMENT LAYOUT
ES-1201, ES-1202 | A-1401 1:50

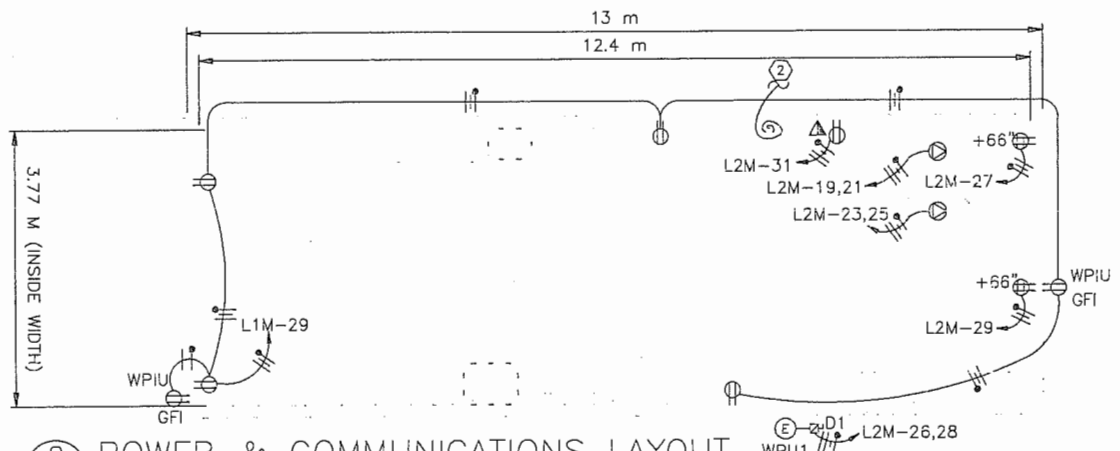
EQUIPMENT LIST			
ITEM(S)	QUANTITY	TAG(S)	DESCRIPTION
1	1	ATS1	AUTOMATIC TRANSFER SWITCH
2	1	MDP1	MAIN DISTRIBUTION PANELBOARD – NORMAL POWER
3	1	L1M	PANELBOARD L1M
4	1	T2M	TRANSFORMER
5	1	ST-SP-103	MOTOR STARTER
6	1	ST-SP-104	MOTOR STARTER
7	1	MGB1	MASTER GROUND BAR 1
8	1	CR1	COMMUNICATIONS RACK 1 (SHORE)
9	1	CR2	COMMUNICATIONS RACK 2 (PIER)
10	1	CR3	COMMUNICATIONS RACK 3 (FUTURE)
11	1	H1M	PANELBOARD H1M
12	1	ST-SP-101	MOTOR STARTER
13	1	ST-SP-102	MOTOR STARTER
14	1	H2M	PANELBOARD H2M
15	1	H2MB	PANELBOARD H2MB
16	1	T3M	TRANSFORMER
17	1	L2M	PANELBOARD L2M
18	1	L2MB	PANELBOARD L2MB
19	1	LCP1	PANELBOARD LCP1
20	1	WPU1	WALL PACKAGE UNIT 1
21	1	PLCC2	PROGRAMMABLE LOGIC CONTROLLER CAB 2 (FUTURE)
22	1	PLCC1	PROGRAMMABLE LOGIC CONTROLLER CAB 1
23	1	BKBD	PLYWOOD BACKBOARD

NOTES:

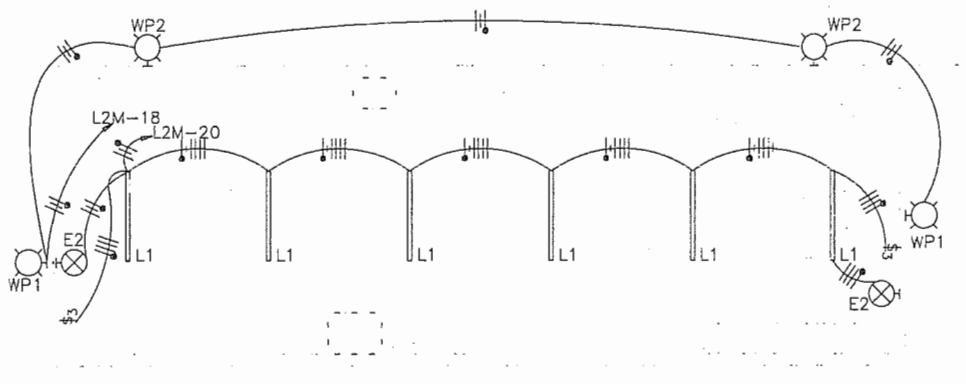
1. SEE DRAWINGS E-1001 AND E-1002 FOR LEGEND, ABBREVIATIONS AND GENERAL NOTES.
2. ELECTRICAL WORK SHOWN WITH DARK LINE WEIGHT SHALL BE PROVIDED.
3. SEE 1700 SERIES DRAWINGS FOR CABLE, DUCTBANK, LIGHTING, PANELBOARD, AND RACEWAY SCHEDULES.

⬡ KEYNOTES:

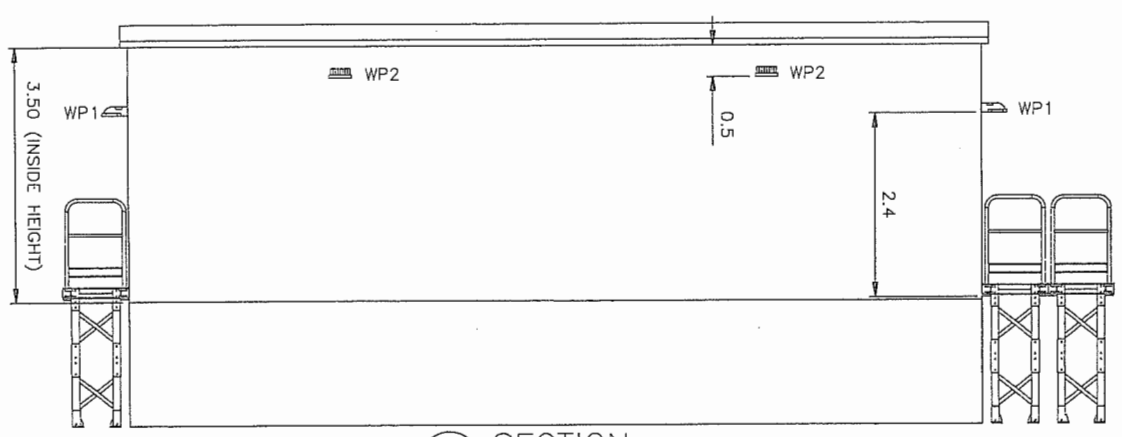
1. PROVIDE REMOVABLE RAIL WIDTH OF DOUBLE DOORS TO AID EQUIPMENT MOVEMENT. SEE STRUCTURAL DRAWINGS FOR DETAILS.
2. PROVIDE GROUND COILED. BOND TO BUILDING COUNTERPOISE FROM MASTER GROUND BAR. SEE DRAWING ES-1104 FOR CONTINUATION.



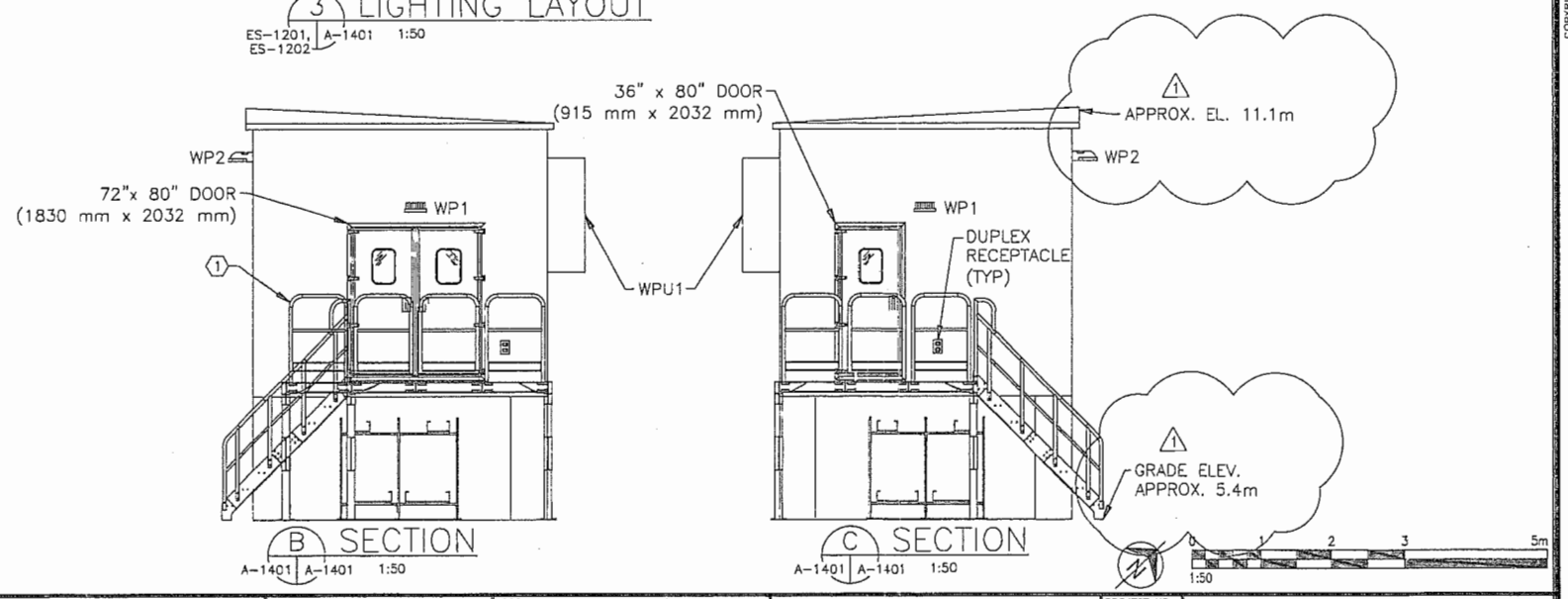
2 POWER & COMMUNICATIONS LAYOUT
ES-1201, ES-1202 | A-1401 1:50



3 LIGHTING LAYOUT
ES-1201, ES-1202 | A-1401 1:50



A SECTION
A1401 | A-1401 1:50



B SECTION
A-1401 | A-1401 1:50

C SECTION
A-1401 | A-1401 1:50

ISSUE NO.	DRAWING REVISIONS	ISSUE DATE
1	ADDED ELEVATION TEXT	08/18/2017
	ISSUED FOR CONSTRUCTION	02/14/17

Fuel Facilities Corporation

VANCOUVER AIRPORT FUEL DELIVERY PROJECT
MARINE RECEIVING AREA

VANCOUVER AIRPORT FUEL FACILITIES CORPORATION
RICHMOND, BRITISH COLUMBIA

SEAL

LOGO

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ENGINEERING | PLANNING | MANAGEMENT
ARGUS CONSULTING, INC.
6363 College Boulevard, Suite 500
Overland Park, Kansas 66211
816.228.7500 FAX 816.228.7535
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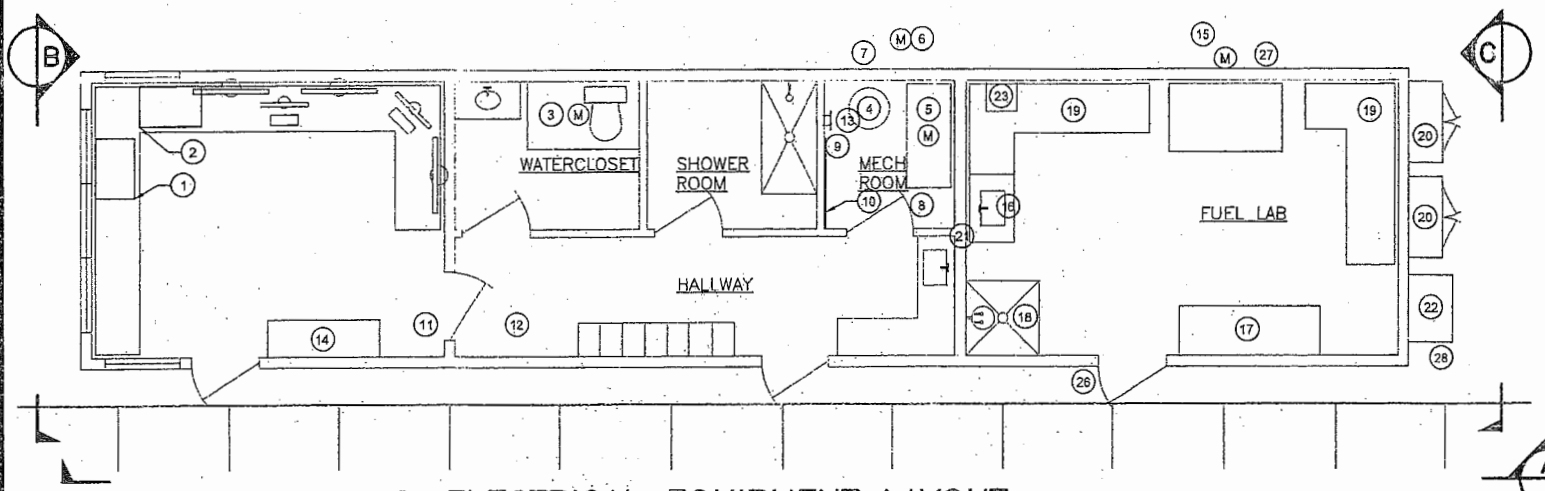
PROJECT NO: 15004.22	E1 ELEC BLDG FLOOR PLAN
DATE: 03/19/16	
DESIGNED BY: WBJ	
DRAWN BY: SMF	
CHECKED BY: DWF	DRAWING NO.: A-1401
CAD FILE NAME: 15004.22C-A1401	

PLEASE RECYCLE

ISSUED FOR CONSTRUCTION
SEP 27 2017

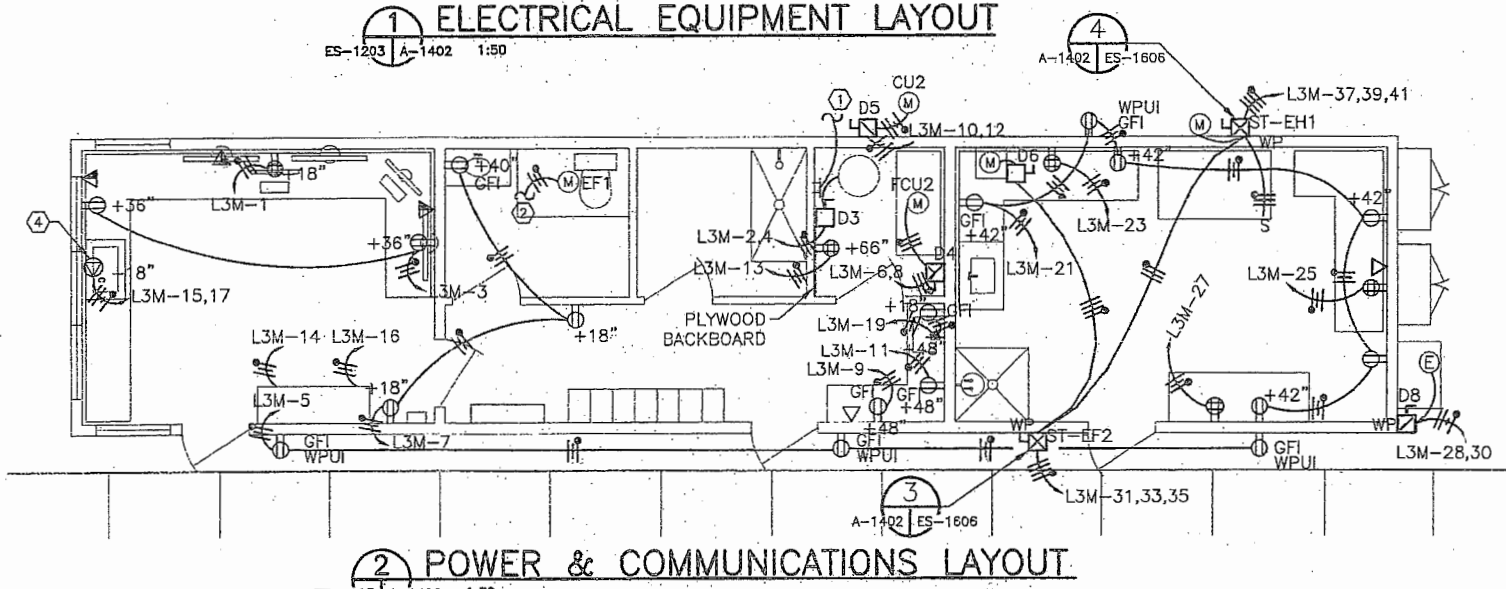
Plotted: Y:\Comm\YVR – Vancouver\15004 VAFDP\Dwgs\22-Marine\22C – Design\Arch\15004.22C-A1401.dwg on 08/18/17 at 5:53 PM by SNEWBOLD using acad.stb

Plan #8



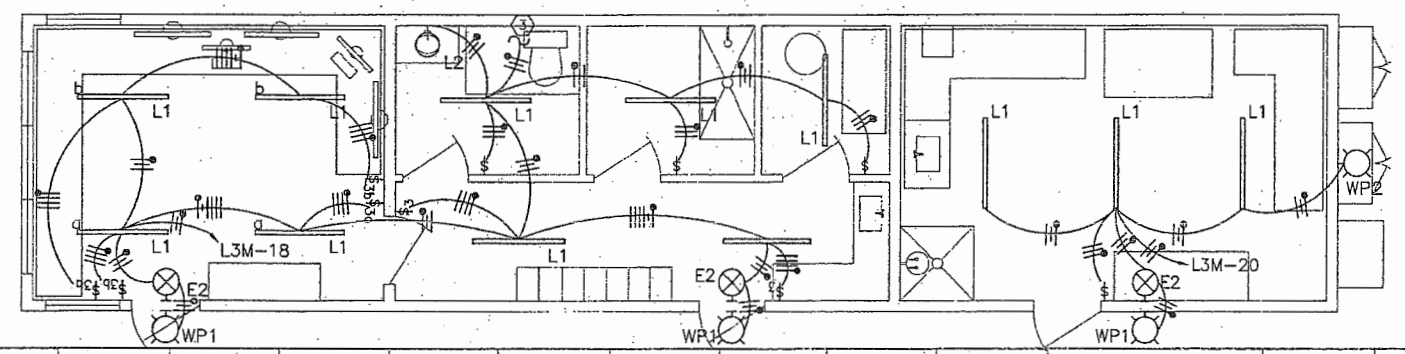
1 ELECTRICAL EQUIPMENT LAYOUT

ES-1203 | A-1402 1:50



4 A-1402 | ES-1606

3 A-1402 | ES-1606



EQUIPMENT LIST			
ITEM(S)	QUANTITY	TAG(S)	DESCRIPTION
1	1	MR-CR-4	COMMUNICATIONS RACK 4
2	1	MR-CR-5	COMMUNICATIONS RACK 5
3	1	EF1	EXHAUST FAN 1
4	1	WH1	WATER HEATER 1
5	1	FCU2	FAN COIL UNIT 2
6	1	CU2	CONDENSING UNIT 2
7	1	D5	SERVICE DISCONNECT (CU2)
8	1	D4	SERVICE DISCONNECT (FCU2)
9	1	D3	SERVICE DISCONNECT (WH1)
10	1	BKBD	PLYWOOD BACKBOARD
11	1	GAP1	GENERATOR ANUNCIATOR PANEL
12	1	L3M	PANELBOARD L3M
13	1	MGB2	MASTER GROUND BAR 2
14	1	NODE1	FIRE ALARM CONTROL PANEL
15	1	EH1	EXHAUST HOOD
16	1	CT1	WATER ONLY SINK
17	1	CB1	WORKBENCH BASE CABINETS
18	1	EWSH1	EYE WASH / SHOWER STATION
19	2	CB2	CABINET BASE AND OVERHEAD UNIT (LEFT CORNER)
20	2	CO	OUTDOOR FUEL SAMPLE CABINETS
21	1	FW1	FIRE WALL BETWEEN OPERATIONS AND FUEL LAB
22	1	WPU2	WALL PACKAGE UNIT 2
23	1	EF2	EXHAUST FAN
24	1	D6	SERVICE DISCONNECT (EF2)
25	1	D7	SERVICE DISCONNECT (WPU2)
26	1	ST-EF2	MOTOR STARTER (EF2)
27	1	ST-EH1	MOTOR STARTER (EH1)

NOTES:

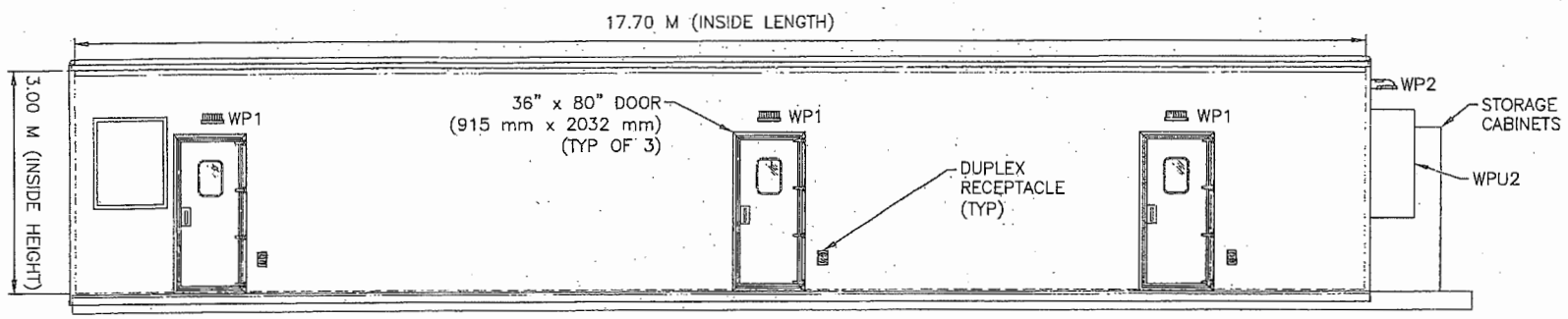
1. SEE DRAWINGS E-1001 AND E-1002 FOR LEGEND, ABBREVIATIONS AND GENERAL NOTES.
2. ELECTRICAL WORK SHOWN WITH DARK LINE WEIGHT SHALL BE PROVIDED.
3. SEE 1700 SERIES DRAWINGS FOR CABLE, DUCTBANK, LIGHTING, PANELBOARD, AND RACEWAY SCHEDULES.

KEYNOTES:

1. PROVIDE GROUND COILED IN MECHANICAL ROOM. BOND TO BUILDING COUNTERPOISE FROM MASTER GROUND BAR. SEE DRAWING ES-1104 FOR CONTINUATION.
2. SEE CONTINUATION FOR EXHAUST FAN ON DETAIL 3 LIGHTING LAYOUT ON THIS SHEET.
3. SEE CONTINUATION FOR EXHAUST FAN ON DETAIL 2 POWER LAYOUT ON THIS SHEET.
4. PROVIDE RECEPTACLE TO MATCH UPS EQUIPMENT PLUG.

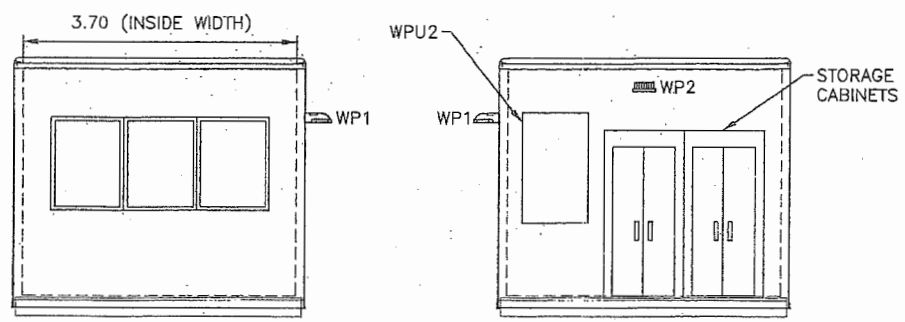
2 POWER & COMMUNICATIONS LAYOUT

ES-1203 | A-1402 1:50



3 LIGHTING LAYOUT

ES-1203 | A-1402 1:50



A SECTION

ES-1203 | A-1402 1:50

B SECTION

ES-1203 | A-1402 1:50

C SECTION

ES-1203 | A-1402 1:50

N

0 015 2 135 2.5m

1:20

ISSUE NO.	DRAWING REVISIONS	ISSUE DATE
	ISSUED FOR CONSTRUCTION	02/14/17

VAFFC, Vancouver Airport Fuel Facilities Corporation
A JV PEER GROUP MANAGED COMPANY
108 - 12300 Horseshoe Way
Richmond, BC V7A 4Z1
604-271-7113
www.fmgroup.ca
www.vancouverairportfuel.ca

VANCOUVER AIRPORT FUEL DELIVERY PROJECT
MARINE RECEIVING AREA

VANCOUVER AIRPORT FUEL FACILITIES CORPORATION
RICHMOND, BRITISH COLUMBIA

SEAL

LOGO

Argus
ENGINEERING | PLANNING | MANAGEMENT
ARGUS CONSULTING, INC.
6363 College Boulevard, Suite 600
Overland Park, Kansas 66211
816.228.7500 FAX 816.228.7535
www.argusconsulting.com

PROJECT NO:	15004.22
DATE:	03/19/15
DESIGNED BY:	WBJ
DRAWN BY:	SMF
CHECKED BY:	DWF
CAD FILE NAME:	15004.22CA1402

OPS1 OPERATIONS BLDG AND FL1 FUEL LAB FLOOR PLANS

DRAWING NO.: A-1402

ISSUED FOR CONSTRUCTION

SEP 27 2017

PLEASE RECYCLE

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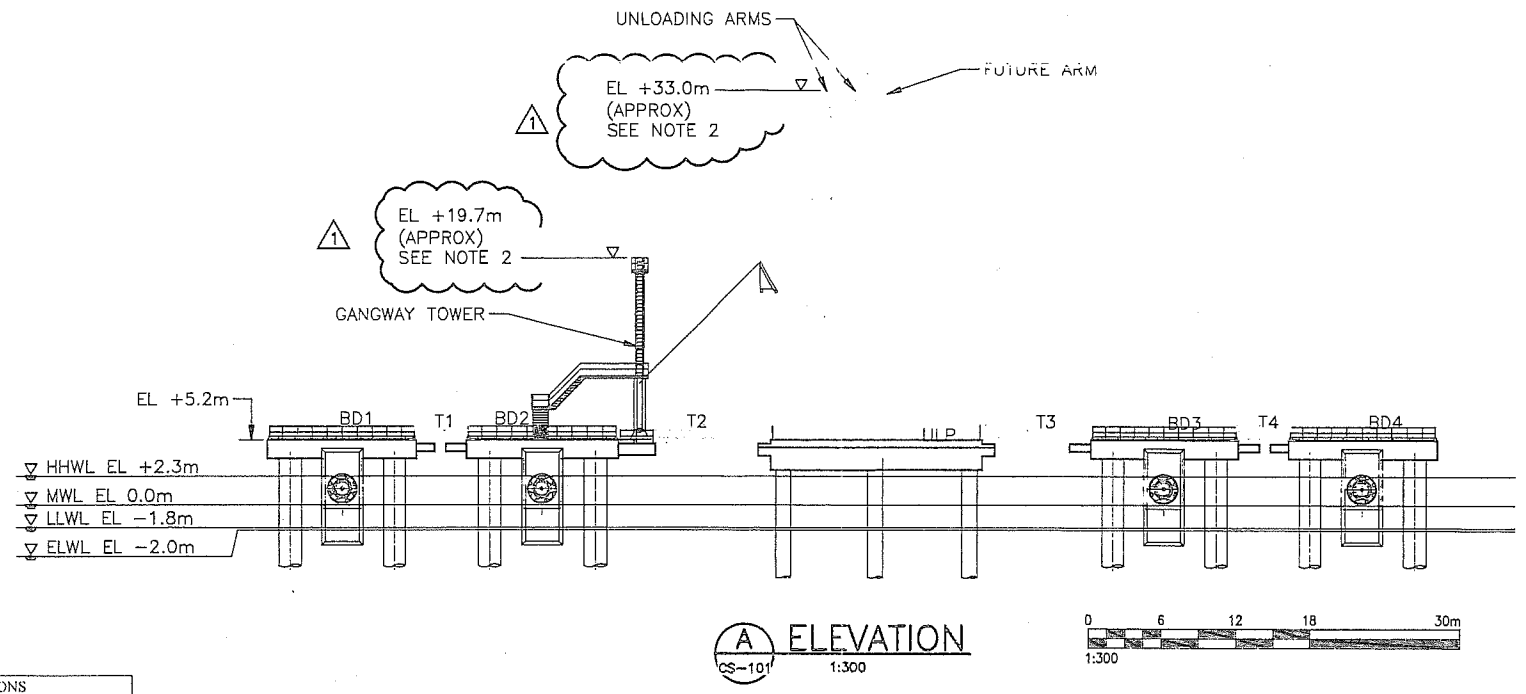
Plan #9



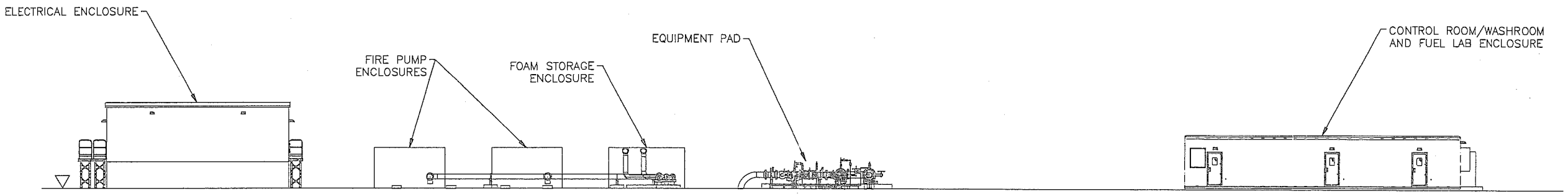
A ELEVATION
CS-101
1:300

0 6 12 18 30m
1:300

NOTES:

1. ELEVATIONS ARE TO GEODETIC DATUM.
1 2. ELEVATIONS OF VENDOR SUPPLIED MECHANICAL EQUIPMENT SHOWN ARE APPROXIMATE AND SUBJECT TO CHANGE ONCE EQUIPMENT IS ORDERED AND SHOP DRAWINGS PRODUCED.

BUILDING AREA AND STRUCTURE ELEVATIONS			
BUILDING NAME	FLOOR AREA (M^2)	STRUCTURE HEIGHT (M)	STRUCTURE ELEVATION (M)
CONTROL ROOM AND WASHROOM ENCLOSURE	43.29	3.5	9.0
FUEL LAB ENCLOSURE	21.65	3.5	9.0
FIRE PUMP ENCLOSURE 1	33.51	2.6	8.1
FIRE PUMP ENCLOSURE 2	33.51	2.6	8.1
FOAM STORAGE ENCLOSURE	28.01	2.6	8.1
ELECTRICAL ENCLOSURE	45.97	5.5	11.0
DOCK UNLOADING ARMS	N/A	33.0	37.8
DOCK GANGWAY TOWER	N/A	19.7	24.5
NOTE: THE MARINE UNLOADING ARMS ELEVATION ARE TO BE DETERMINED BY THE MANUFACTURER. APPROXIMATE ELEVATIONS OF THE STRUCTURE ARE LISTED ABOVE.			
SITE AREA: 40,468 M^2 LOT COVERAGE AREA: 0.52%			



B ELEVATION
CS-101
1:150

0 3 6 9 15m
1:150

ISSUE NO.	DRAWING REVISIONS	ISSUE DATE
2	ISSUED FOR DEVELOPMENT PERMIT REVIEW	05/05/2017
1	ELEVATIONS ADDED	04/27/2017
0	ISSUED FOR CONSTRUCTION	02/14/2017

Fuel Facilities Corporation

VANCOUVER AIRPORT FUEL DELIVERY PROJECT
MARINE RECEIVING AREA
MARINE DESIGN PACKAGE
VANCOUVER AIRPORT FUEL FACILITIES CORPORATION
RICHMOND, BRITISH COLUMBIA

SEAL

LOGO

Argus
ENGINEERING | PLANNING | MANAGEMENT
ARGUS CONSULTING, INC.
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Overland Park, Kansas 66211
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www.argusconsulting.com

PROJECT NO:	15004.22C
DATE:	12/18/15
DESIGNED BY:	FS
DRAWN BY:	AVM
CHECKED BY:	RB
CAD FILE NAME:	15004.22C-G031

ELEVATION

DRAWING NO.: G-031

ISSUED FOR DEVELOPMENT PERMIT REVIEW

SEP 27 2017

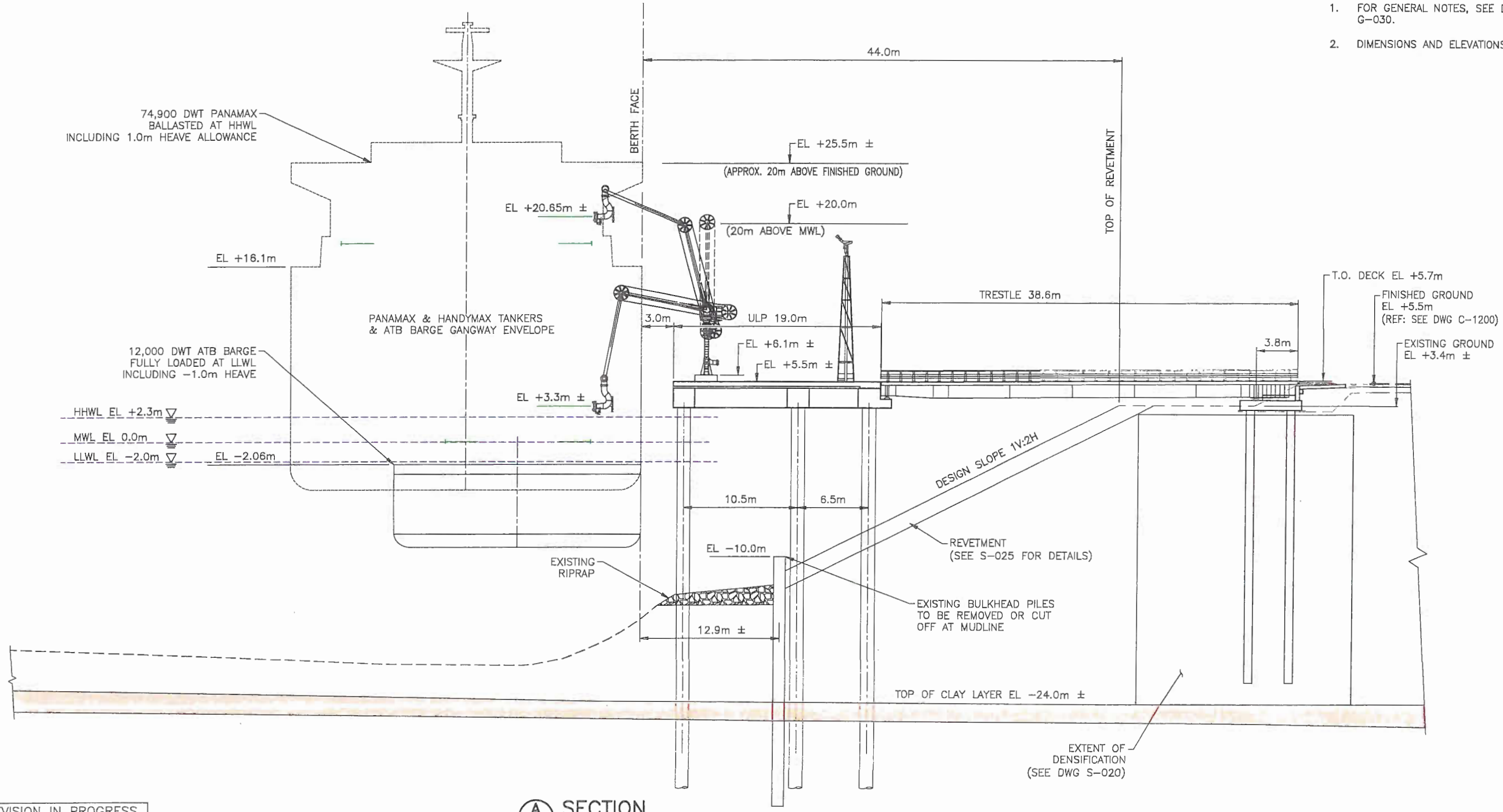
PLEASE RECYCLE

Plotted: Y:\Comm\YVR – Vancouver\15004 VAFDP\Dwgs\22-Marine\22A – Permit\Gen\15004.22C-G031 ELEVATION 2017-05-01\15004.22C-G031.dwg on 05/5/17 at 8:13 AM by NPARK using acad.stb

Plan #10

NOTES:

1. FOR GENERAL NOTES, SEE DWGS G-003 & G-030.
2. DIMENSIONS AND ELEVATIONS IN METRES (m).



A G-030 SECTION 1:200

REVISION IN PROGRESS
NOT FOR ISSUE
DATE: 2017/06/21 - 1:34pm

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

0 4 8 12 20m
1:200

ISSUE NO.	DRAWING REVISIONS	ISSUE DATE

Fuel Facilities Corporation
108-12300 Horseshoe Way
Richmond BC, V7A 4Z1
604-271-7113
www.ffcgroup.ca
www.vancouverairportfuel.ca

VANCOUVER AIRPORT FUEL DELIVERY PROJECT
MARINE RECEIVING AREA
MARINE DESIGN PACKAGE
VANCOUVER AIRPORT FUEL FACILITIES CORPORATION
RICHMOND, BRITISH COLUMBIA

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moffatt & nichol
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VANCOUVER, BC CANADA V5Z 4J7
604-707-9004

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ARGUS CONSULTING, INC.
6363 College Boulevard, Suite 600
Overland Park, Kansas 66211
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www.argusconsulting.com

PROJECT NO:	15004.22C
DATE:	10/20/15
DESIGNED BY:	SP
DRAWN BY:	AVM
CHECKED BY:	RB
CAD FILE NAME:	15004.22C-G034

UNLOADING PLATFORM SECTION

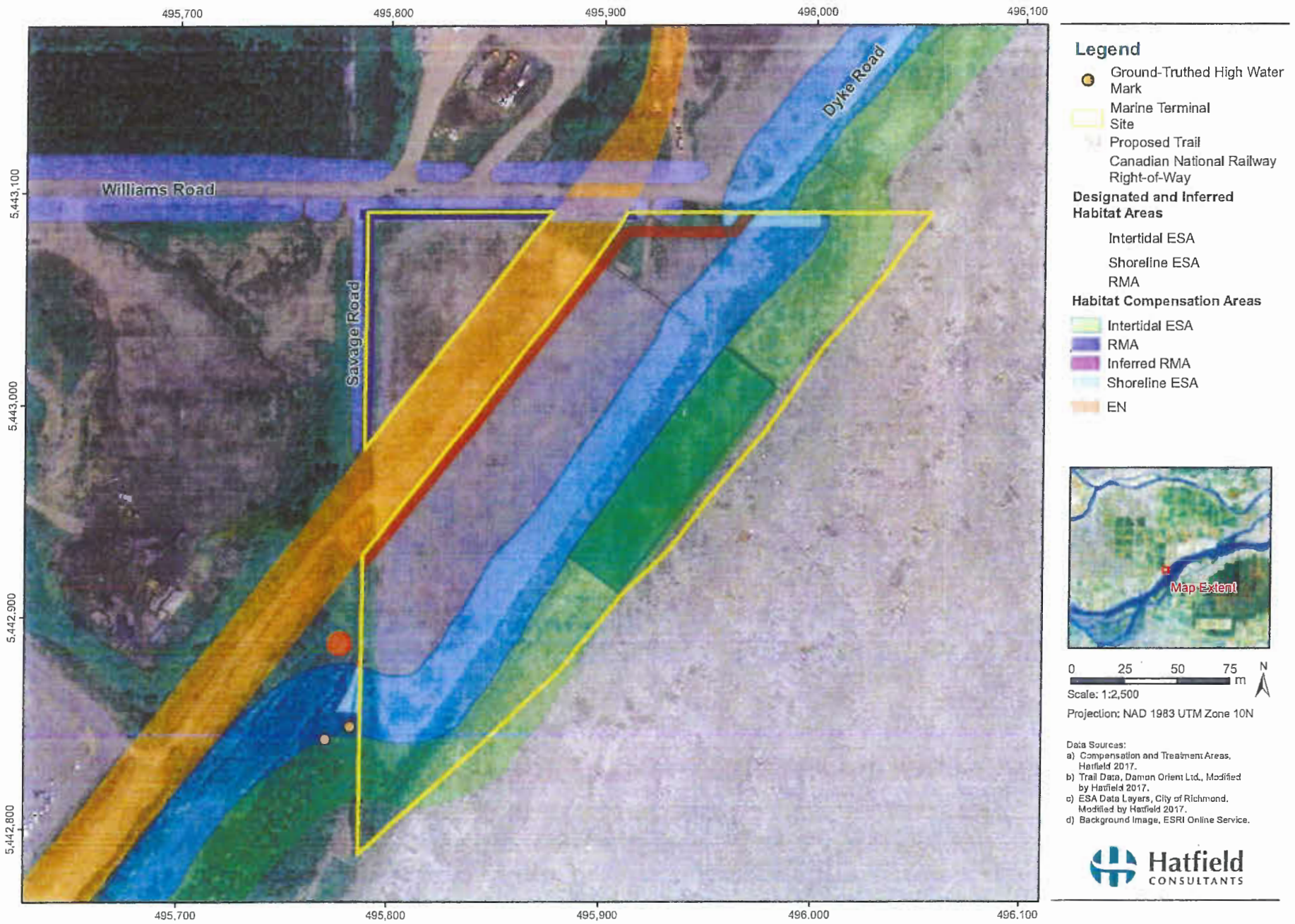
DRAWING NO.: G-034

Plotted: P:\8338 VC Vancouver Airport Fuel Delivery Project\CADD_Active\15004.22C-G034.dwg on 06/21/17 at 1:34 PM by AMANUZON using Argus.stb

Plan #11

ISSUED FOR CONSTRUCTION
SEP 27 2017

Figure 1 Vancouver Airport Fuel Delivery Project – Marine terminal proposed habitat compensation areas



This plan is reprinted from the
ESA and RMA Environmental Impacts Report
by
Hatfield Environmental Consultants

SEP 27 2017

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landscape architects
306 - 4464 West 10th Avenue
Vancouver, BC, Canada
V6R 2H9
t. 604-222-9200
e. dvo@telus.net
w. damonoriente.ca

Project
VAFFC MARINE TERMINAL FACILITY
15040 Williams Road, Richmond BC

Drawing
PROPOSED COMPENSATION AREAS

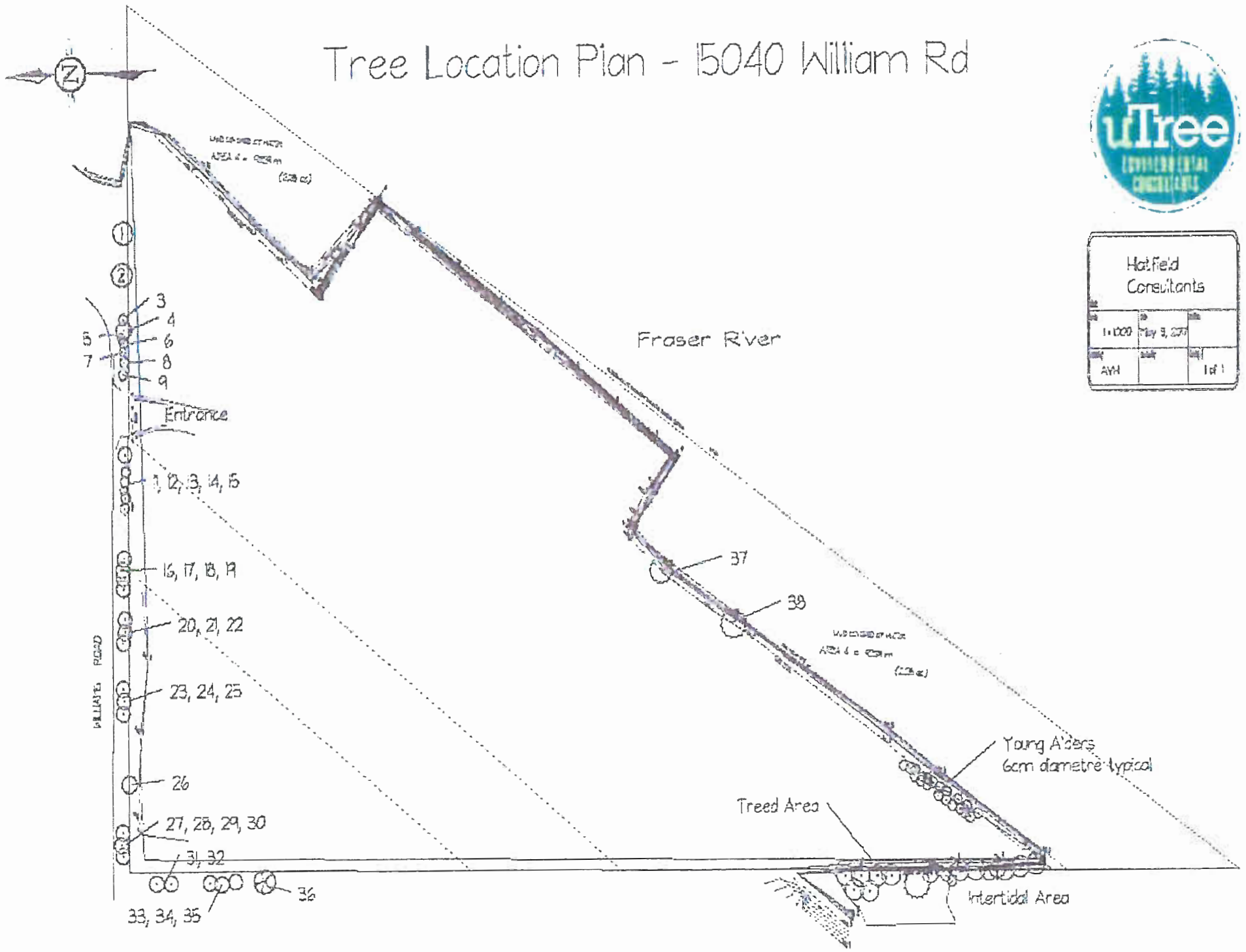
Issue:
30 June 2017 Development Permit Application Resubmission

Scale: nts
Date:
Project Number: 2014-280

Dwg
L0.03

Plan #12

Tree Location Plan - 15040 William Rd



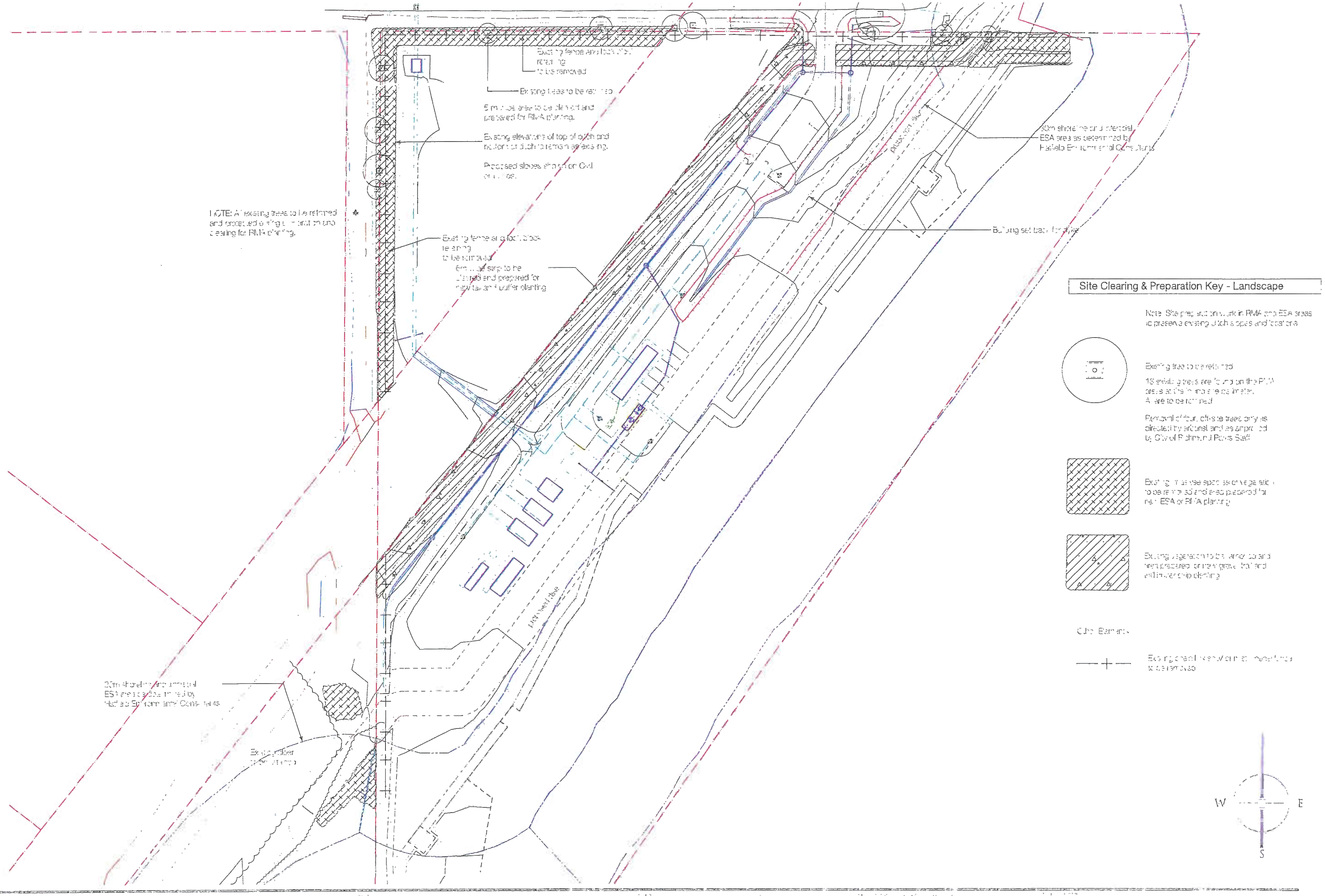
Hatfield Consultants

1:000	May 3, 2017	
AWH		1 of 1

uTree Environmental Consultants.
p 604-328-0614 e awanderlehn@gmail.com w www.utree.com

SEP 2 7 2017

Plan #13



SEP 27 2017

DAMON ORIENTE LTD. | VAFFC MARINE TERMINAL FACILITY | SITE PREPARATION & CLEARING | Dwg L1.01

Plan #14

Property Line

Existing trees to be retained - typ

Savage Rd R.O.W.
5 m. from H.W.L / top of ditch
cleared and replanted
as per Hatfield prescription.
Planting details sheet L4.03.

Existing fence and lock block retaining
to be removed.

Williams Rd. ditch.
5 m. from H.W.L / top of ditch cleared and replanted
as per Hatfield prescription.
Planting details sheet L4.02.

Existing fence and lock block retaining
to be removed.

Proposed gravel
access road to
back-flow preventer

New 3.0 m. wide gravel public trail.
1.5 m. wide planting strip each side of trail.
General layout on engineering drawings and L1.01 &
L1.02

Existing CN Rail
Right-of-Way
100' / 33.04 m. width

Property Line

Property Line

ESA areas, within 30 m. Shoreline setback.
Area cleared and replanted
as per Hatfield prescription.
Planting details sheet L08 3 L09

Approximate 30 m. shoreline ESA line

Proposed dike - top of dike

Dike building setback

New landscaped terraces on water side of trail.
Planting pockets created with found rock.
Planting details on sheets L3.01 & L3.02

proposed dike

proposed dike

Approximate high water line

Future trail connection to the Riverfront Walk
trail to the southwest

30 m. shoreline ESA line

Approximate high water line

General Planting Areas Key

ESA & RMA Treatment Areas

Trail Buffer Planting Areas

Onsite Landscape Areas

W E S

SEP 27 2017

ON ORIENTE LTD.

Project
VAFFC MARINE TERMINAL FACILITY

Dwg
OVERALL SITE LANDSCAPE WORKS

Scale 1:500
Date February 2017
Development Permit
Building Permit

Dwg
L0.01

Plan #15

1.5 m wide planted buffer strip each side of new gravel trail

See sheets L3.01 & L3.02

Section 1 Sheet L2.01

New security fence approximately midway up slope.

See Civil drawings for fence alignment

Areas of stacked rock retaining on slope to create planting areas

Trail slopes up towards river @ 7.6%

Trail 1.7 m

Trail 1.647 m

Trail 3.031 m

Trail 3.045 m

CB inlet 2.089 m

CB inlet 1.191 m

CB inlet 3.000 m

Top slope 4.025 m

Section 2 Sheet L2.01

Top of dyke

Proposed dike

30m shoreline and Intertidal ESA area as determined by Hatfield Environmental Consultants from City of Richmond Data

B. ditch as existing 0.47m

T. ditch as existing 1.05m

B. ditch as existing 0.66m

T. ditch as existing 1.63m

B. ditch as existing 0.66m

T. ditch as existing 1.42m

2m

3m

4m

5m

See Sheet L1.03

See Sheet L1.03

SEP 2 7 2017

DAMON ORIENTE LTD.

Project
VAFFC MARINE TERMINAL FACILITY

Drawing
TRAIL LAYOUT - NORTH

Scale 1:250

Date February 2017

Development Permit # DP 16-741?-1

Building Permit #

Project Number 2014-081

Dwg
L1.02

Plan #16

See Sheet L1.02

See Sheet L1.02

B. ditch as existing
0.78 m

T. ditch as existing
2.70 m

BOTTOM OF SLOPE

DIRT PATH

BSLOPE

TDITCH

BDITCH

PATH CL

METAL FENCE

BOTTOM OF DITCH

TOP OF DITCH

CHAIN LINK FENCE

GATE

3m

4m

2m

Trail
4.77 m

Trail section showing condition of greatest elevation difference between trail and adjacent facility grade.

Trail slopes 6.5m to SW @ 12%

Section 3
Sheet L2.01

New chain link security fence
See Detail 4 Sheet L2.01

New surface drainage ditch
See Civil drawings

CB inlet
2.45 m

T. ditch as existing
TDITCH 2.82 m

T. ditch as existing
TDITCH 2.76 m

B. ditch as existing
BDITCH 0.78 m

Trail
2.633 m

3m

4m

3m

5m

Top slope
5.024 m

proposed dike

proposed dike

30m shoreline and Intertidal ESA area as determined by
Hatfield Environmental Consultants based on City of Richmond Data

W E S

SEP 27 2017

DP 17-774744

DAMON ORIENTE LTD.
landscape architects

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Project
VAFFC MARINE TERMINAL FACILITY
10040 Williams Road, Richmond BC

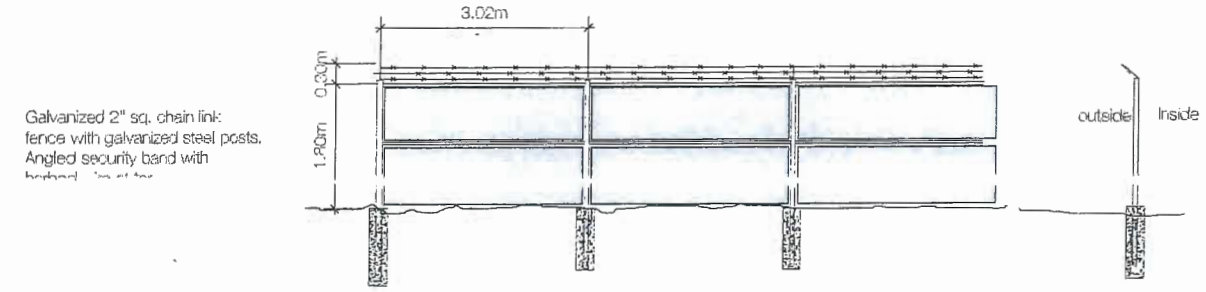
Drawing
TRAIL LAYOUT - SOUTH

Issue 19 May 2017 Development Permit Application
30 June 2017 Development Permit Application Resubmission

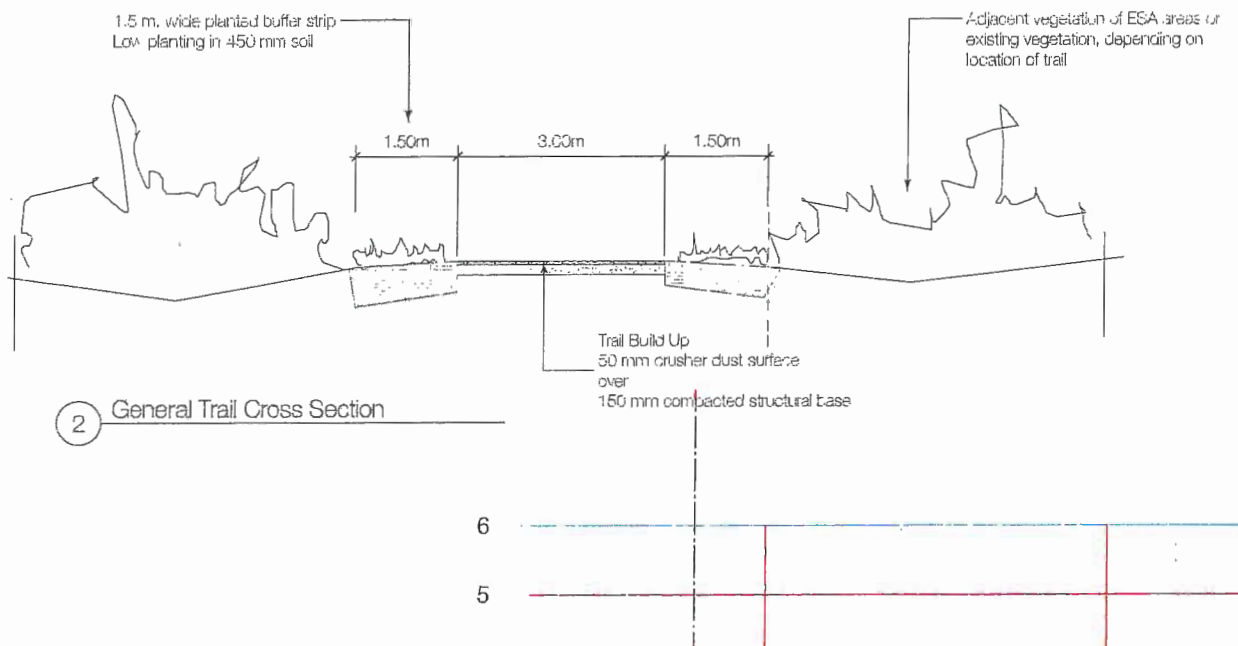
Scale: 1:200
Date: February 2017
Development Permit No: DP-16-774744
Building Permit No.
Project Number: 2014-280

Dwg
L1.03

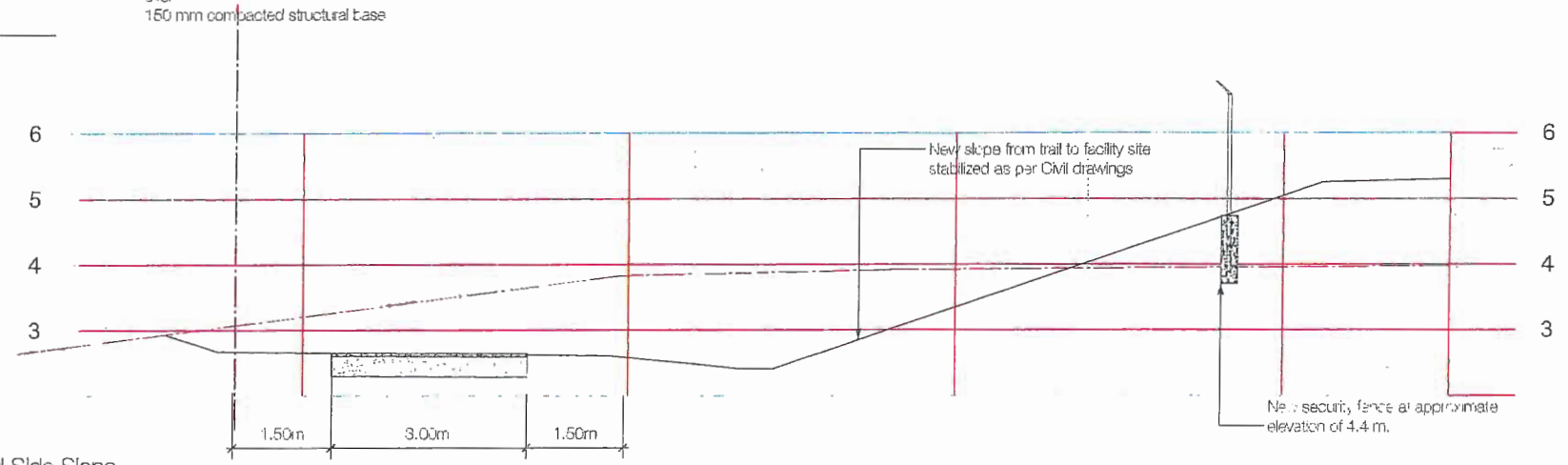
Plan #17



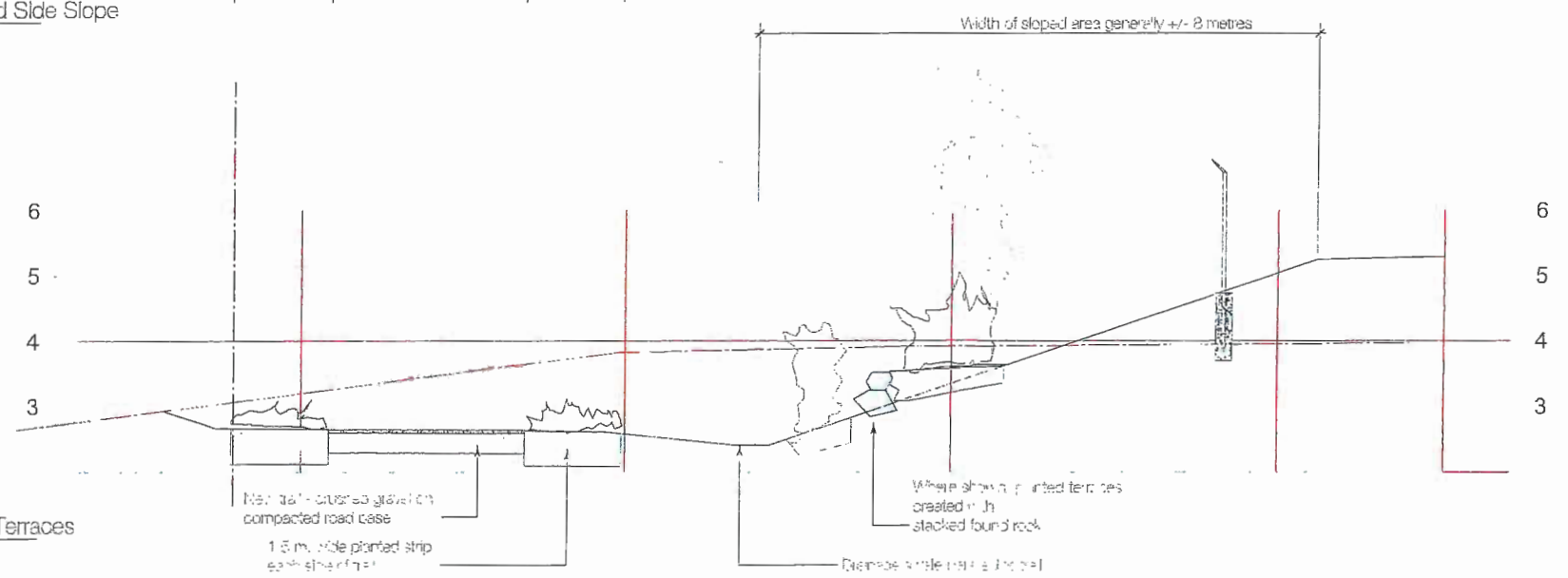
1 Security Fence - Typical



2 General Trail Cross Section



3 Trail Through Facility Site - Standard Side Slope



4 Trail Through Facility Site - Planted Terraces

DAMON ORIENTE LTD.

Project
VAFFC MARINE TERMINAL FACILITY

Drawing
TRAIL SECTIONS

Scale 1:50
Date February, 2017
Development Permit No. DP 17-1
Building Permit No.
Project No. 2014-360

Dwg
L2.01

SEP 27 2017

Plan #18

CENTRELINE OF ROAD

EDGE OF ASPHALT

Groundcover

Groundcover and Grasses

Groundcover and Shrubs

Top of dyke

proposed dike

Building setback for dyke

Groundcover and Shrubs

Groundcover and Grasses

30 m. shoreline ESA setback line

Groundcover

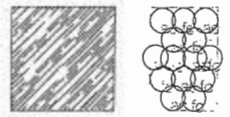
Groundcover

See Sheet L3.02

See Sheet L3.02

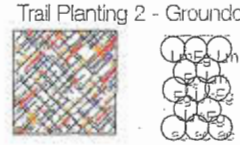
Trail Buffer Planting Areas Key

Trail Planting 1 - Groundcover



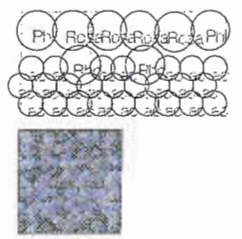
Au	Arctostaphylos uva-ursi	Kinnikinnick	4 plants per sq. m.
Fc	Fragraria chiloensis	Coastal strawberry	4 plants per sq. m.

Trail Planting 2 - Groundcover & Grasses



Au	Arctostaphylos uva-ursi	Kinnikinnick	2 plants per sq. m
Pg	Elymus glaucus	Blue lyme grass	3 plants per sq. m
Lm	Leymus mollis	Dune grass	3 plants per sq. m

Trail Planting 2 - Groundcover & Shrubs



Rosa	Rosa gymnocarpa	Baldhip rose	1 plants per sq. m
Rhg	Rhus glabra	Smooth sumac	0.5 plants per sq. m.
Ph	Philadelphus lewisii	Mock orange	0.25 plants per sq. m.
Au	Arctostaphylos uva-ursi	Kinnikinnick	2 plants per sq. m

W E S

SEP 27 2017

DAMON ORIENTE LTD.

Project
VAFFC MARINE TERMINAL FACILITY

Drawing
TRAIL PLANTING AREA 1

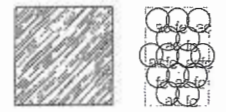
Dwg
L3.01

Plan #19

See Sheet L3.01

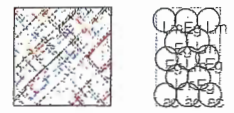
General Planting Areas Key

Trail Planting 1 - Groundcover



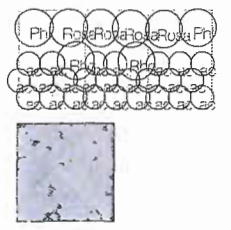
Ea	Arctostaphyllos uva-ursi	Kinnikinnick
Fc	Fragraria chiloensis	Coastal strawberry

Trail Planting 2 - Groundcover & Grasses

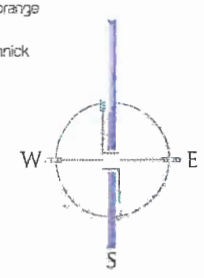


Ea	Arctostaphyllos uva-ursi	Kinnikinnick
Eg	ELymus glaucus	Blue lyme grass
Lm	Leymus mollis	Dune grass

Trail Planting 3 - Groundcover & Shrubs



Rosa	Rosa gymnocarpa	Baldhio rose
Rhg	Rhus glabra	Smooth sumac
Phl	Philadelphus lewisii	Mock orange
Ea	Arctostaphyllos uva-ursi	Kinnikinnick



SEP 27 2017

DP 17 0117

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Project
VAFFC MARINE TERMINAL FACILITY
7500 Westminster Road, Richmond BC

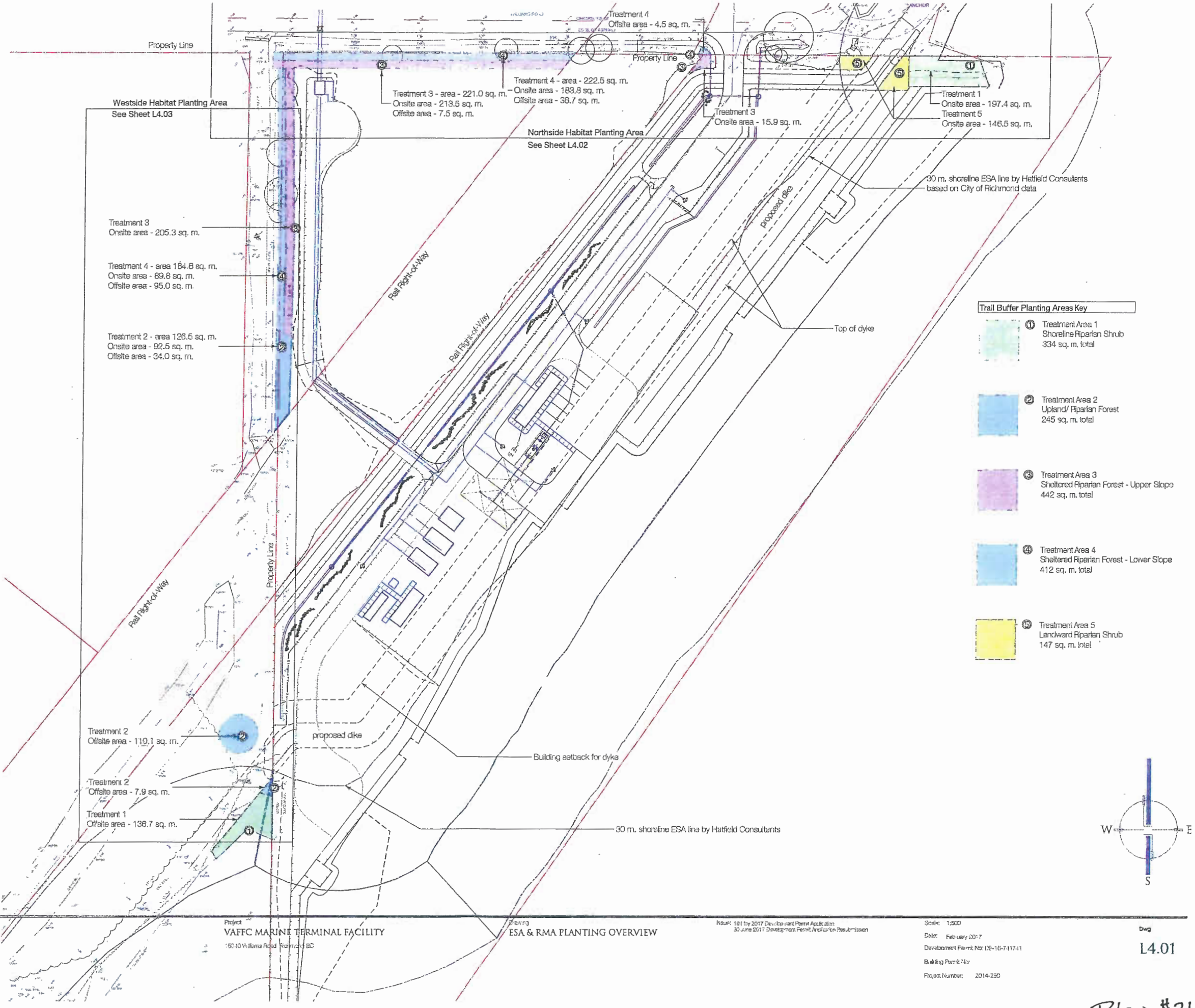
Drawing
TRAIL PLANTING AREA 2

Issued 19 May 2017 Preliminary Permit Application
23 June 2017 Development Permit Application Resubmission

Scale: 1:200
Date: February 2017
Development Permit No: DP 16-717117
Building Permit No:
Project Number: 2014-250

Dwg
L3.02

Plan #20



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Project
VAFFC MARINE TERMINAL FACILITY
5540 Williams Road, Richmond BC

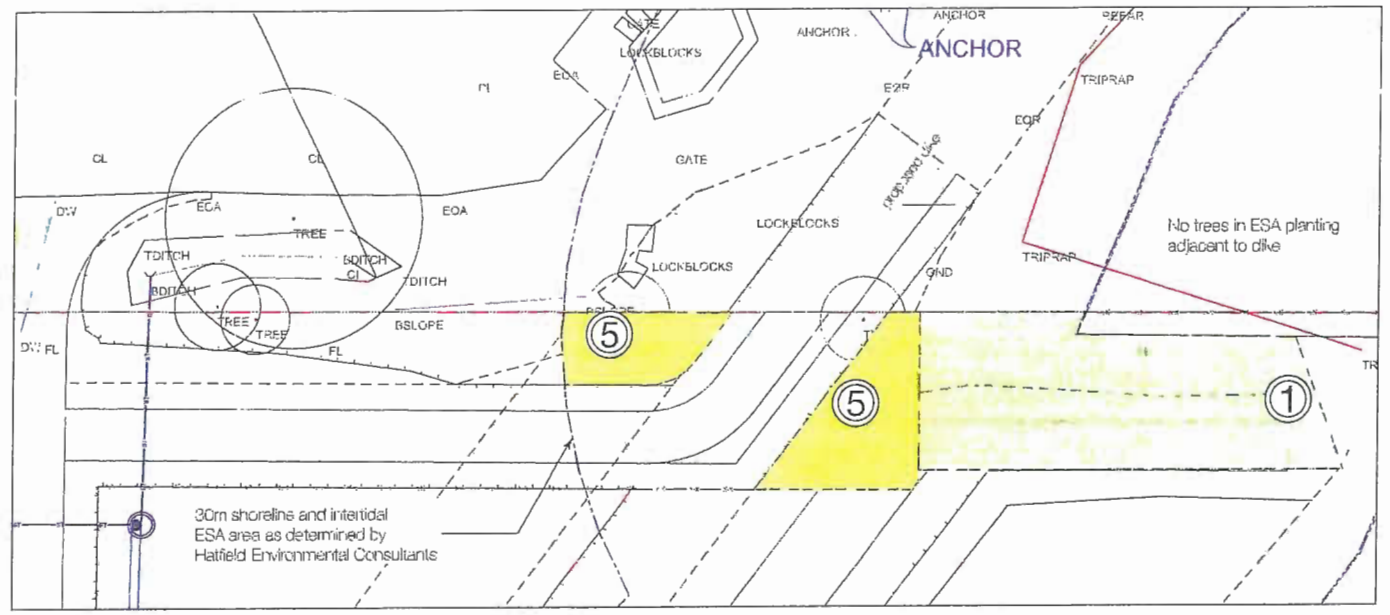
Drawing
ESA & RMA PLANTING OVERVIEW

Issue: 101 for 2017 Development Permit Application
30 June 2017 Development Permit Application Resubmission

Scale: 1:500
Date: February 2017
Development Permit No: DP-16-747141
Building Permit No:
Project Number: 2014-250

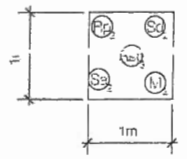
Dwg
L4.01

Plan #21



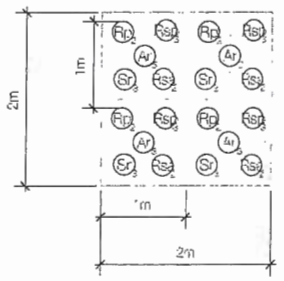
1 Northeast Shoreline ESA Areas

Treatment Area 1 - Shoreline Riparian Shrub

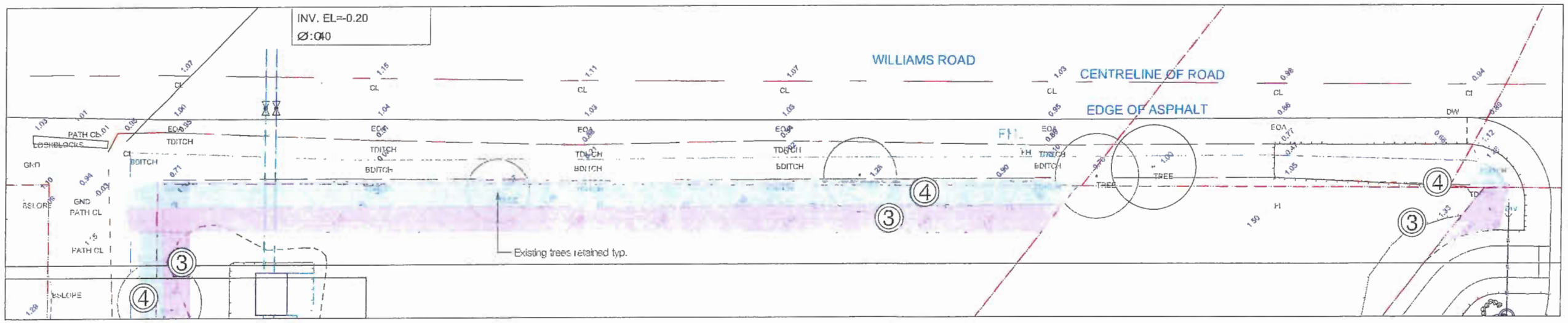


- Mahonia nervosa
- Rubus parviflorus
- Rubus spectabilis
- Spirea douglasii
- Symphorcarpus albus

Treatment Area 5 - Landward Riparian Shrub

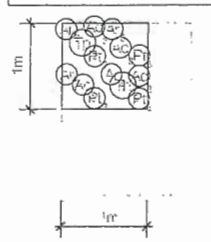


- Alnus rubra
- Rubus parviflorus
- Rubus spectabilis
- Ribes sanguineum
- Sambucus racemosa



2 Willams Road RMA Areas

Treatment 3 Sheltered Riparian Forest - Upper Slope



- Alnus rubra
- Acer circinatum
- Populus trichocarpa
- Thuja plicata
- Tsuga heterophylla
- Physocarpus albus
- Polystichum munitum
- Rubus spectabilis
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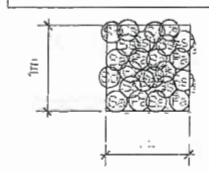
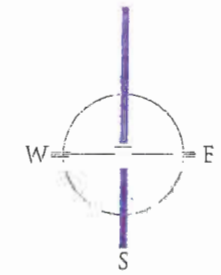
Treatment 4 Sheltered Riparian Forest - Lower Slope



- Cornus stolonifera
- Physocarpus albus
- Rubus spectabilis
- Salix sitchensis
- Spirea douglasii
- Symphorcarpus albus



SEP 27 2017

DAMON ORIENTE LTD.

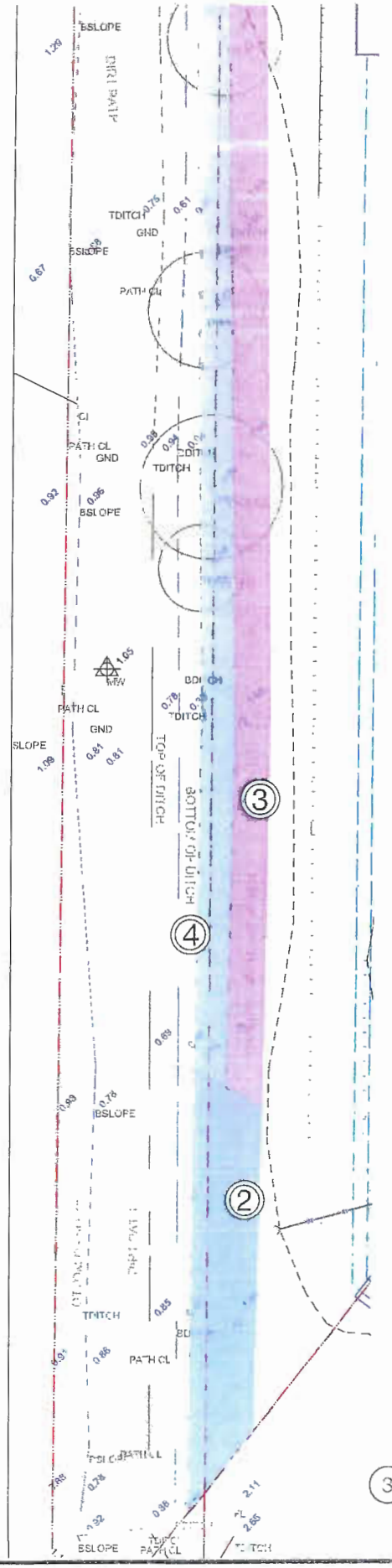
Project
VAFFC MARINE TERMINAL FACILITY

Drawing
NORTH SIDE ESA & RMA PLANTING

Scale 1:250
Date February 2017
Development Permit & DP: 17-1171
Building Permit No.
Project Number 2014-080

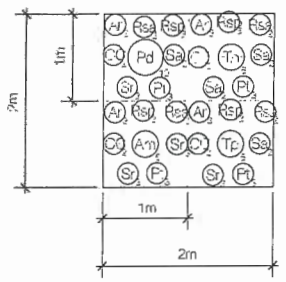
Dwg
L4.02

Plan #22



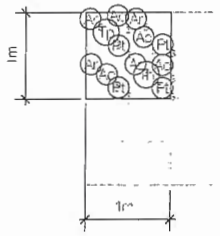
3 Savage Road R.O.W RMA Areas

Treatment 2 - Upland/ Riparian Forest



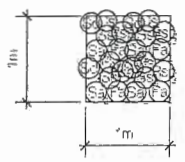
- Acer macrophyllum
- Alnus rubra
- Populus trichocarpa
- Pseudotsuga douglasii
- Thuja plicata
- Tsuga heterophyla
- Corylus cornuta v. Californica
- Rubus spectabilis
- Ribes sanguineum
- Sambucus racemosa
- Symphoricarpus albus

Treatment 3 - Sheltered Riparian Forest - Upper Slope

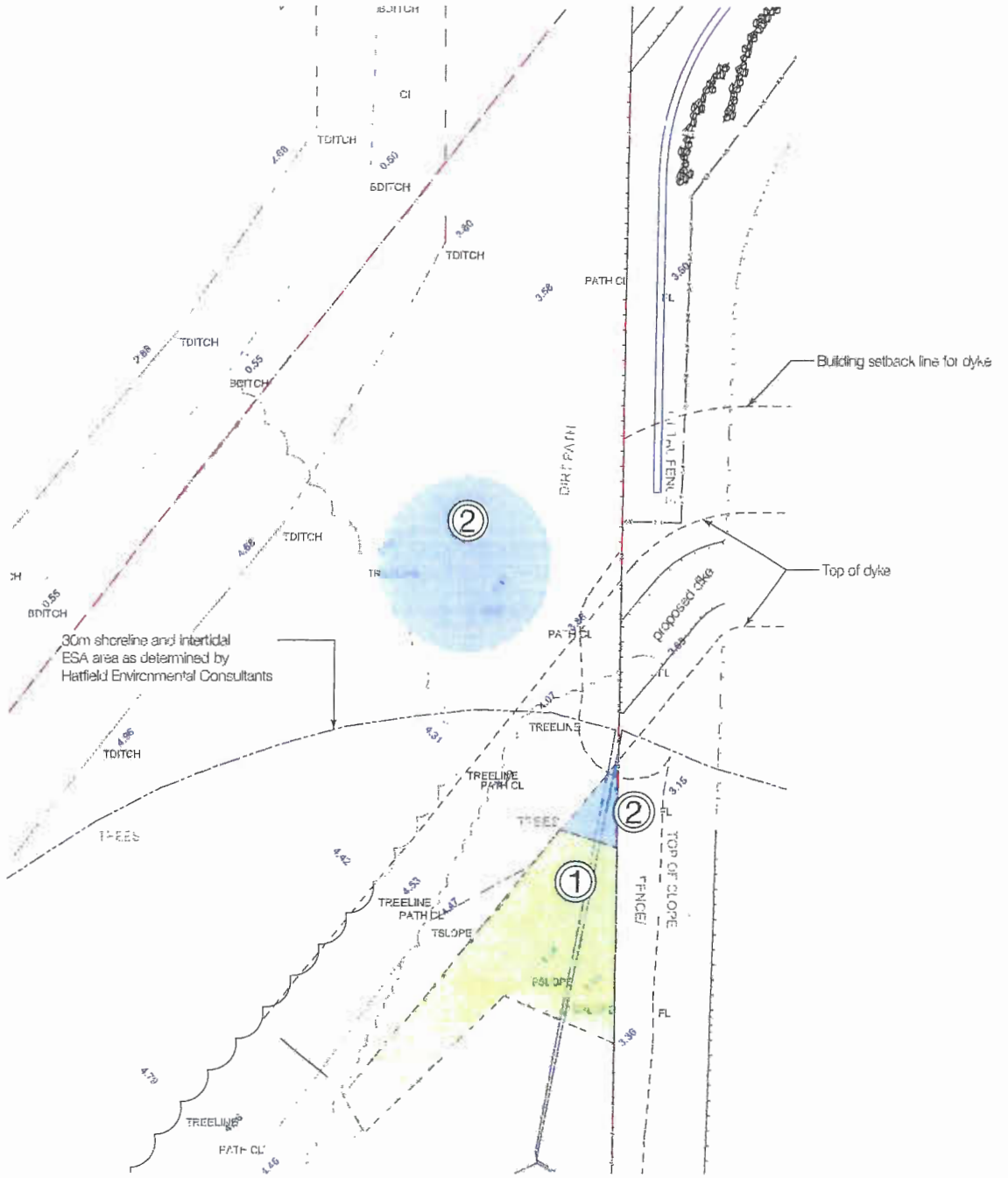


- Alnus rubra
- Acer circinatum
- Populus trichocarpa
- Thuja plicata
- Tsuga heterophyla
- Physocarpus albus
- Polystichum munitum
- Rubus spectabilis
- Symphoricarpus albus

Treatment 4 - Sheltered Riparian Forest - Lower Slope

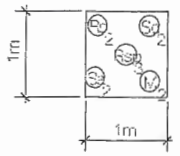


- Cornus stolonifera
- Physocarpus albus
- Rubus spectabilis
- Salix sitchensis
- Spirea douglasii
- Symphoricarpus albus



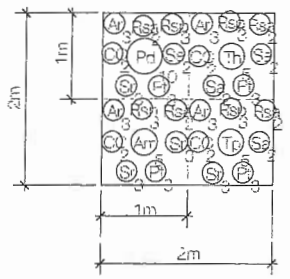
4 Southwest Corner ESA Area

Treatment Area 1 - Shoreline Riparian Shrub

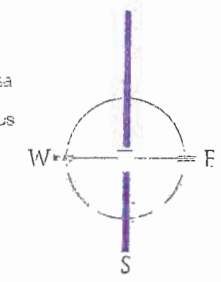


- Mahonia nervosa
- Rubus parviflorus
- Rubus spectabilis
- Spirea douglasii
- Symphoricarpus albus

Treatment Area 5 - Landward Riparian Shrub



- Acer macrophyllum
- Alnus rubra
- Populus trichocarpa
- Pseudotsuga douglasii
- Thuja plicata
- Tsuga heterophyla
- Corylus cornuta v. Californica
- Rubus spectabilis
- Ribes sanguineum
- Sambucus racemosa
- Symphoricarpus albus



SEP 2 7 2017

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Project
VAFFC MARINE TERMINAL FACILITY

Drawing
WESTSIDE ESA & RMA PLANTING

Dwg
L4.03

Plan #23

Plant List for ESA, RMA Planting Areas

Trees

ID	Quantity	Latin Name	Common Name	Scheduled Size	Notes
	0				
	80	Acer circinatum	Vine maple	#3 pot	
	7	Acer macrophyllum	Bigleaf maple	#5 pot	
	112	Alnus rubra	Red alder	#3 pot	
	17	Corylus cornuta var. 'Californica'	Beaked hazlenut	#2 pot	
	74	Populus trichocarpa	Black cottonwood	#3 pot	
	4	Pseudotsuga menziesii	Douglas fir	#10 pot	
	13	Thuja plicata	Western redcedar	#5 pot	
	12	Tsuga heterophylla	Western hemlock	#5 pot	

Shrubs & Herbs

ID	Quantity	Latin Name	Common Name	Scheduled Size	Notes
	0				
	62	Cornus stolonifera	Redosier dogwood	#2 pot	
	33	Mahonia nervosa	Dull Oregon grape	#2 pot	
	72	Physocarpus albus	Pacific ninebark	#2 pot	
	40	Polystichum munitum	Swordfern	#2 pot	
	34	Ribes sanguineum	Red flowering currant	#2 pot	
	55	Rubus parviflorus	Thimbleberry	#2 pot	
	450	Rubus spectabilis	Salmonberry	#2 pot	
	69	Sambuccus racemosa	Red elderberry	#2 pot	
	62	Salix sitchensis	Sitka willow	#2 pot	
	149	Spiraea douglasii	Steeplebush	#2 pot	
	148	Symphoricarpus albus	Snowberry	#2 pot	

Plant List for Trail Buffer Planting Areas

Shrubs & Herbs

ID	Quantity	Latin Name	Common Name	Scheduled Size	Notes
	0				
	80	Mahonia aquafolium	Oregon grape	#2 pot	
	324	Mahonia nervosa	Dull Oregon grape	#2 pot	
	325	Rosa gymnocarpa	Baldhip rose	#2 pot	

Groundcover & Grasses

ID	Quantity	Latin Name	Common Name	Scheduled Size	Notes
	0				
	1740	Arctostaphylls uva-ursi	Kinnikinnick	10 cm pot	
	1395	Elymus glacus	Blue lyme grass	10 cm pot	
	160	Fragraria chiloensis	Coastal strawberry	10 cm pot	
	1365	Leymus mollis	Dune grass	10 cm pot	

Plant List for On-site Slope Areas Adjacent to the Trail

Trees

ID	Quantity	Latin Name	Common Name	Scheduled Size	Notes
A.l	11	Amelanchier laevis	Allegheny Serviceberry	#5 pot	
Be.pap	2	Betula papyrifera	Paper birch	#2 pot	
P.con	5	Pinus contorta	Shore pine	#10 pot	

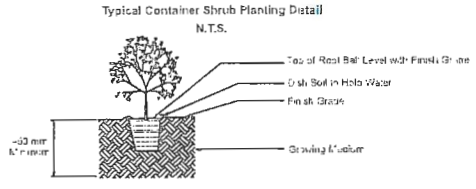
Shrubs

ID	Quantity	Latin Name	Common Name	Scheduled Size	Notes
cs	8	Cornus sericea 'stolonifera'	Redosier Dogwood	#2 pot	
gs	21	Gaultheria shallon	Salal	#1 pot	
Hol.d	10	Holodiscus discolor	oceanspray	#2 pot	
M.aq	5	Mahonia aquafolium	Oregon grape	#2 pot	
pm	43	Polystichum munitum	Western swordfern	#1 pot	
R.san	13	Ribes sanguineum 'King Edward VII'	King Edward VII Flowering Currant	#2 pot	
sp.d	13	Spiraea douglasii	Hardhack spiraea	#2 pot	
	0				

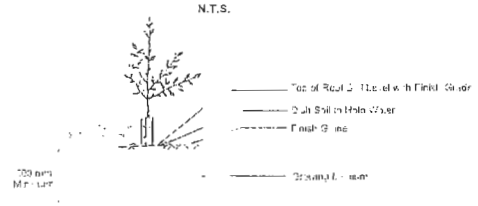
General Landscape Specifications

- Areas requiring topsoil shall be fine graded by raking out spoil material and debris such as rocks, asphalt and concrete over 50 mm in diameter, and scarified to a minimum depth of 150 mm immediately before placing topsoil.
- Topsoil and any amendments to the growing medium shall meet the criteria described in the British Columbia Landscape Standards for background (natural) areas (refer to adjacent table for particle size, acidity and drainage specifications).
- Topsoil shall be tested by an accredited soil testing laboratory, prior to delivery.
- Screened topsoil must be applied with a minimum thickness of 450 mm in shrub planting areas and 600 mm in treed areas. Topsoil must be free of subsoil, wood (including woody plant parts) toxic materials, stones over 30 mm, foreign objects, propagules of plant species designated as noxious under the BC Weed Control Act and Regulation and other invasive or undesirable plant species
- All plant material that has not been salvaged from the construction footprint shall be of guaranteed nursery stock, densely branched, well-established (minimum soil density of 50 e), free of invasive/noxious plant material and meet the criteria specified in City of Richmond Engineering and Public Works Department Supplementary Specifications and Detail Drawings, Version 3, 2016, Schedule G – Tree Planting on Sidewalks and Boulevards (they replace the specifications in Sec on 32 93 01 – Planting of Trees, Shrubs, and Ground Covers in the MMCD Platinum Edition).
- Plants in containers shall have a well-established root system, reaching the sides of the container but not being root bound. Soil must hold together when a plant is removed from its container.
- The City of Richmond's Engineering and Public Works department must be notified once nursery stock has arrived on site, for inspection prior to planting. Fall planting (following the last drought period in September or October), or spring planting (March or April) is recommended.
- Native trees, shrubs and herbs must be set plumb and fully immersed in growing medium, such that the top of the rootball is set at or slightly above the finished grade. Planting wells will be established to increase the capture and retention of water. The soil around each new plant will be tamped and watered in layers. Trees will be securely staked on both sides.
- The soil must be fertile once the revegetation work is complete. A fall rye should be spread in the enhancement areas to prevent erosion and provide some shelter for new plants until they become fully established
- Habitat enhancement works should be supervised by a certified landscape architect (or horticulturalist) to ensure compliance with the BC Landscape Standards and City and Richmond specifications for the planting of trees, shrubs, and ground cover.
- The contractor shall provide maintenance including, watering, removal of invasive species and replacement of dead stock for a period of three (3) years following planting.

Typical Container Shrub Planting Distail
N.T.S.



Typical Container Tree Planting Detail
N.T.S.



Topsoil (growing medium) specifications.

Soil Attribute	Criteria
Organic matter content	≤ 10% by dry weight
Particle size distribution	30 – 50% by dry weight
Silt and clay content	Max 5% by dry weight
Organic carbon	10 – 31% by dry weight
Hydraulic conductivity	2 cm/hour
pH	5.5 – 7.5

Hatfield	Vancouver Airport Fuel Delivery Project – Habitat Enhancement On/By Marine Terminal		
DESIGN: LO	DRAWN: TK	PROFESSIONAL SEAL	DRAWING NUMBER: 6773-01
REVISION: 0	DATE: Feb 2, 2017		

Treatment 1 (Shoreline Riparian Shrub) – 197 m²

Common name	Botanical Name	% of Area	Stock Size	Planting Density
Salmonberry	*Rubus spectabilis*	50	No. 3 pot	1 plant per 1 m²
Thimbleberry	*Rubus parviflorus*	10	No. 2 pot	1 plant per 1 m²
Steeplebush	*Spirea douglasii*	20	No. 2 pot	1 plant per 1 m²
Snowberry	*Symphoricarpos albus*	10	No. 2 pot	1 plant per 1 m²
Dull Oregon Grape	*Mahonia nervosa*	10	No. 2 pot	1 plant per 1 m²

Treatment 2 (Upland/Riparian Forest) – 246 m²

Common name	Botanical Name	% of Area	Stock Size	Planting Density
Coastal Douglas-fir	*Pseudotsuga douglasii*	6	No. 10 pot	1 plant per 4 m²
Western redcedar	*Thuja plicata*	6	No. 5 pot	1 plant per 4 m²
Western hemlock	*Tsuga heterophylla*	7	No. 5 pot	1 plant per 4 m²
Bigleaf maple	*Acer macrophyllum*	6	No. 5 pot	1 plant per 2 m²
Red alder	*Alnus Rubra*	17	No. 3 pot	1 plant per 1 m²
Black cottonwood	*Populus trichocarpa*	12	No. 3 pot	1 plant per 1 m²
Salmonberry	*Rubus spectabilis*	14	No. 3 pot	1 plant per 1 m²
Beaked hazelnut	*Corylus cornuta var. Californica*	7	No. 2 pot	1 plant per 1 m²
Red elderberry	*Sambucus racemosa*	15	No. 3 pot	1 plant per 1 m²
Red-flowering currant	*Ribes sanguineum*	5	No. 2 pot	1 plant per 1 m²
Snowberry	*Symphoricarpos albus*	7	No. 2 pot	1 plant per 1 m²

Treatment 3 (Sheltered Riparian Forest – Upper Slope) – 442 m²

Common name	Botanical Name	% of Area	Stock Size	Planting Density
Western redcedar	*Thuja plicata*	8	No. 5 pot	1 plant per 4 m²
Western hemlock	*Tsuga heterophylla*	7	No. 5 pot	1 plant per 4 m²
Red alder	*Alnus Rubra Populus*	10	No. 3 pot	1 plant per 1 m²
Black cottonwood	*trichocarpa Rubus*	10	No. 3 pot	1 plant per 1 m²
Salmonberry	*spectabilis*	23	No. 3 pot	1 plant per 1 m²
Pacific ninebark	*Physocarpus albus*	7	No. 2 pot	1 plant per 1 m²
Vine maple	*Acer circinatum*	18	No. 3 pot	1 plant per 1 m²
Snowberry	*Symphoricarpos albus*	8	No. 2 pot	1 plant per 1 m²
Sword fern	*Polystichum munitum*	9	No. 2 pot	1 plant per 1 m²

Treatment 4 (Sheltered Riparian Forest – Lower Slope) – 412 m²

Common name	Botanical Name	% of Area	Stock Size	Planting Density
Redosier dogwood	*Cornus stolonifera*	15	No. 2 pot	1 plant per 1 m²
Sitka willow	*Salix sitchensis*	15	No. 2 pot	1 plant per 1 m²
Salmonberry	*Rubus spectabilis*	25	No. 2 pot	1 plant per 1 m²
Pacific ninebark	*Physocarpus albus*	10	No. 2 pot	1 plant per 1 m²
Snowberry	*Symphoricarpos albus*	15	No. 2 pot	1 plant per 1 m²
Steeplebush	*Spirea douglasii*	20	No. 2 pot	1 plant per 1 m²

Treatment 5 (Landward Riparian Shrub) – 147 m²

Common name	Botanical Name	% of Area	Stock Size	Planting Density
Red alder	*Alnus rubra*	18	No. 2 pot	1 plant per 1 m²
Red elderberry	*Sambucus racemosa*	22	No. 3 pot	1 plant per 1 m²
Salmonberry	*Rubus spectabilis*	33	No. 2 pot	1 plant per 1 m²
Thimbleberry	*Rubus parviflorus*	15	No. 2 pot	1 plant per 1 m²
Red-flowering currant	*Ribes sanguineum*	15	No. 2 pot	1 plant per 1 m²

Hatfield	Vancouver Airport Fuel Delivery Project – Habitat Enhancement On/By Marine Terminal		
DESIGN: LO	DRAWN: TK	PROFESSIONAL SEAL	DRAWING NUMBER: 6773-01
REVISION: 1	DATE: June 26, 2017		

SEP 27 2017

Plan #24

Table 1 Habitat Balance Sheet for the Marine Terminal Site Development.

Location	Habitat (m^2)				Comments
Habitat Impact Summary					
Marine Terminal Property	**Existing**	**Post-construction**	**Net Change**	**Enhancement Area**	
Shoreline ESA	208.0	344.0	+136.0	+344.0	Existing ESA is an area of fill and gravel, and largely barren. Two young trees and one small marginal habitat patch containing native red alder and black cottonwood saplings with an understory of invasive shrubs and herbs will be lost to development. A 2.4:1 compensation for this loss will be achieved by enhancing Shoreline ESA in northeast corner of the property (344 m^2) and adjacent to the property (see below). Overall, 70% of ESA enhancement works would be onsite.
Intertidal ESA	Refer to comments				Green-coded low productivity habitat. Replacing the 3,256 m^2 wharf structure with clean, stable bank armour will restore approximately 36,000 m^3 of open river flow environment and provide approximately 3,800 m^3 of new, stable micro-refugia for flora and fauna. Upgrading concrete rubble rip-rap on either side of the existing wharf footprint will improve stability and quality of substrate refugia over 4,400 m^3 (total of 8,000 m^3 at base of slope along marine terminal property).
Williams Road RMA	176.3	413.2	+236.9	+413.2	These RMAs are degraded by invasive species and dust generated by the high volume of Ecowaste truck traffic. Only the trees are native and these will not be eliminated by the development. Although there is no defensible ecological rationale for it, 2.2:1 habitat compensation is proposed, by removing the existing fences to restore the full 5 m width of each RMA, and by regrading the sites and replacing invasive shrubs and herbs with native vegetation. Overall, 82% of RMA enhancement works would be onsite.
Savage Road RMA (inferred)	95.0	387.6	+292.6	+387.6	
Proposed Habitat Compensation					
Adjacent to Property					
Shoreline ESA	N/A	N/A	N/A	+144.6	To further compensate for marginal habitat loss from the marine terminal property Shoreline ESA, invasive plants southwest of the property, by red-coded intertidal habitat, will be replaced with native plants.
Williams Road RMA	50.7	50.7	0	50.7	A portion of the RMAs are beyond the property boundary, which will thus involve limited offsite enhancement work (11% for Williams Road RMA; 25% for Savage Road RMA).
Savage Road RMA (inferred)	129.0	129.0	0	129.0	
Upland Habitat	N/A	N/A	N/A	+110.1	A portion of the CN ROW in the Williams Road RMA will be compensated for by replacing invasive species with native ones between the Savage Road RMA and Shoreline ESA, as a contribution to the local Ecological Network (the remaining 72 m^2 of the ROW compensation was shifted to the onsite Shoreline ESA).
Gains and Losses					
Terrestrial Habitat				+1,579.2 m^2	2:1 habitat enhancement in Shoreline ESAs for a 208 m^2 onsite shoreline disturbance and a portion of the Williams RMA overlapping with the CN ROW (53% on site). Approximately 2:1 habitat compensation and enhancement to RMAs (54% on site).
Aquatic Habitat				+3,800.0 m^3	Improvements to Intertidal ESA by replacing vertical steel-pile wharf with clean, stable bank armour.

SEP 27 2017

This schedule is reprinted from the
ESA and RMA Environmental Impacts Report
by
Hatfield Environmental Consultants

Hatfield
CONSULTANTS

MEMO

Date: October 31, 2017 HCP Ref No.: VAFFC6773

From: Hatfield Consultants

To: Mark McCaskill, FSM Management Group Inc.

Subject: Vancouver Airport Fuel Delivery Project: City of Richmond Development Permit Panel Session – Memorandum Addressing Outstanding Staff Comments on VAFFC DP-16-741741

This memorandum is in response to City of Richmond's Development Permit (DP) Panel comments at the October 11, 2017, panel session.

The Panel moved and seconded that the DP application (DP-16-741741) be referred back to staff:

1. for the applicant to work with staff to:

   a) review the proposed mitigation, compensation and enhancement scheme for the Shoreline Environmentally Sensitive Area (ESA) based primarily on existing ESA condition in the subject site, and investigate opportunities for additional on-site ESA planting;

   b) review the proposed compensation/enhancement planting scheme for the Shoreline ESA and consider introducing more mature and substantive planting;

   c) consider introducing some planting in the Intertidal ESA in addition to the proposed removal of existing and development/construction of new structures and shoreline within the shoreline and intertidal ESA;

   d) investigate opportunities for further on-site ESA compensation and enhancements especially within the Shoreline ESA and other areas along the proposed public trail and in the northern portion of the site in addition to the proposed off-site ESA enhancements; and

2. for staff to review the adequacy of the pedestrian viewing platform cash-in-lieu contribution and report back (note, this is not included in the scope of this memorandum).

The Project Team has since worked with City staff to ensure the Panel's comments have been adequately addressed, as follows:

1. ***Review the proposed mitigation, compensation and enhancement scheme for shoreline ESA based primarily on existing ESA condition in the subject site and investigate opportunities for additional on-site ESA planting***

The mitigation, compensation and enhancement scheme for the Shoreline ESA has been reviewed and additional on-site ESA planting is proposed. Because the entire coastline of the City constitutes a City-

designated ESA regardless of land cover, the Panel requested that the portion of the existing, barren land that overlaps with this Shoreline ESA designation be subject to additional planting as much as possible. With safety, dike integrity, and operational constraints in mind, the following additional on-site planting is proposed in this ESA:

- The southwest corner of the Shoreline ESA on the site will be planted with additional trees at the core, and additional shrubs and herbs around the periphery for a total of **352 m²**. A mix of tall- and short-growing shrubs will be interspersed among the trees, and along the edge of the tree patch to the north and southeast. Dwarf shrubs and herbs will be most suitable along the fence line to not interfere with site security monitoring measures. The additional planting in this corner of the ESA will also enhance the value of the proposed adjacent offsite compensation area bordering the high-productivity shoreline zone downstream.
- An additional **350 m²** strip of short shrubs and herbs will be planted in the northeast corner of the Shoreline ESA behind the mooring structure, to further contribute to the local Ecological Network of the neighbouring onsite and offsite compensation areas, which border a moderately-productive shoreline zone.

This additional **702 m²** of on-site Shoreline ESA planting is illustrated in the attached schematic drawing. It will result in three times as much onsite planting in the Shoreline ESA (**1,046 m²** instead of 344 m²) compared with the initial proposal, which represents a **5.1:1** onsite plant replacement ratio for the 208 m² patch of native vegetation currently on the property (and a **5.7:1** ratio overall with offsite habitat enhancement works, compared to the previous 2.4:1 ratio).

2. ***Review the proposed compensation/enhancement planting scheme for the shoreline ESA and consider introducing more mature and substantive planting***

The new treed planting area in the onsite Shoreline ESA will include one Douglas-fir and two hemlocks of a Class 15 pot size. In the previous treed compensation areas, 6 Douglas-firs will be increased in size from Class 10 to Class 15 pots; 14 western hemlocks (*Tsuga heterophylla*) and 14 western redcedars (*Thuja plicata*) will be increased in size from Class 5 to Class 15 pots accordingly. Conifers can be increased slightly to a Class 15 pot size but deciduous trees are best kept small. Densely planted, small trees can better outcompete Himalayan blackberry (*Rubus armeniacus*) in particular, which is a major threat to natural areas in Richmond.

To further accommodate the City's request for more substantive trees, the landscaped portions of the site (in non-ESA/RMA areas) will have larger trees consistent with ~~of~~ a decorative landscape approach, using the following balled and burlapped trees: 17 shore pines (*Pinus contorta*) and 10 Douglas-firs (*Pseudotsuga menziesii*) 3 m tall; 2 paper birch (*Betula papyrifera*) 2.5 m tall; and 15 Allegheny serviceberry trees (*Amelanchier laevis*) with a caliper of 5 cm.

3. ***Consider introducing some planting in the intertidal ESA in addition to the proposed removal of existing and development/construction of new structures and shoreline within the shoreline and intertidal ESA***

Hatfield's fisheries subject matter expert has further evaluated the scientific validity for introducing suitable planting to the newly designed Intertidal ESA verses natural re-colonization.

The likelihood of successful planting and survivorship within the Intertidal ESA is low. Direct evidence is demonstrated by the scarcity of vegetation within the existing intertidal zone at the site. Scientific literature highlights the important role environmental conditions play in long-term and sustainable establishment. The realization of including such ecological features is driven by a number factors, most notably by the defined project requirements, geomorphic processes, prevailing energy regime (i.e., hydraulic conditions), and scour conditions[1,2]. High-energy (velocity) river flows can severely impede any planting (thus ecological succession) of the intertidal area, which are conditions regularly experienced at the site. Bank stabilization systems using vegetation have not been standardized for general application under particular flow conditions. There is a lack of knowledge about the properties of the materials being used in relation to force and stress generated by flowing water and there are known impediments in obtaining consistent performance from countermeasures that rely on living materials[2].

Considering the intertidal area's limited (low) ecological productivity ("green coded"), the engineering requirements for the site development, and existing physical river conditions (e.g., river hydraulics, geomorphology, scour), this intertidal area would not benefit from introducing plants. Further, Fisheries and Oceans Canada (DFO), who are the responsible authority for the protection of fish and fish habitat in the foreshore (intertidal) and nearshore (subtidal) boundaries of the Fraser River, has reviewed the proposed site development and determined that adverse effects to fish and fish habitat (i.e., serious harm) will not result. No authorization under the *Fisheries Act* or approval under the *Species at Risk Act* are required to proceed with the site development, thus no habitat enhancement or creation (i.e., habitat offsetting) is required.

An important context for this Intertidal ESA is also provided through the City's guidance material for DP applications within City-designated ESA's highlighting that new construction within designated ESAs that will not result in damage to sensitive features within the ESA (e.g., trees, shrubs, wetlands, marshes or fish habitat) are exempt from the DP ESA process[3]. The Intertidal ESA on the site will not result in damage to any sensitive features (i.e., fish habitat as determined by DFO); rather, it will restore a large section of the intertidal area to a free-flowing environment and will create a contiguous and shallower sloped profile with improved stability, condition and ecological function.

The removal of the existing bulkhead wharf as well as the addition and re-grading of a new rip rap revetment (36,000 m^3 open river flow environment restored; 3,800 m^3 of new artificial 'reef' habitat created; and 4,000 m^3 of substrate improved) is intended to strike a balance between providing critical long-term erosional protection to the banks of the Fraser River supporting the integrity of the marine terminal infrastructure while including lower grade (i.e., shallower slope) and coarser (rougher) rock material that will afford equal or improved habitat function compared to current conditions and functionality. Rip rap revetments have their greatest benefits within brackish and salt water habitats; fill structures constructed of

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[1] Adams, M.A. 2002. Shoreline Structures Environmental Design: A Guide for Structures Along Estuaries and Large Rivers. Fisheries and Oceans Canada, Vancouver, BC and Environment Canada, Delta< BC. 68p. + appendices.

[2] Baird, D.C., L. Fotherby, C.C. Klumpp, and S.M. Sculock. 2015. Bank Stabilization Design Guidelines. Bureau of Reclamation. Technical Services Center, Denver, Colorado. Sedimentation and River Hydraulics Group, 86-68240. Report # SRH-2015-25 277p. + appendices.

[3] https://www.richmond.ca/plandev/devzoning/permit.htm

rip rap are, in essence, an artificial reef[1] and the size of voids between rocks offers advantageous refugia for key species of fish and lower trophic organisms[1,4].

Given the rationale provided above, it is our fisheries expert's qualified professional opinion that planting within the Intertidal ESA is not supported based on the proposed engineering design criteria.

4. ***Investigate opportunities for further on-site ESA compensation and enhancements especially within the shoreline ESA and other areas along the proposed public trail and in the northern portion of the site in addition to the proposed off-site ESA enhancements***

Opportunities for further onsite compensation and enhancements in the Shoreline ESA, along the public trail, and in the northern area of the site have been identified. Additional onsite Shoreline ESA compensation and enhancement areas are previously discussed in bullet #1.

Although the loss of a 208 m^2 patch of native vegetation in the Shoreline ESA has more than adequately been compensated for through the habitat enhancement proposed in the DP and in this memorandum, the amount of on-site landscaping will also be increased by **645 m^2** as follows: **400 m^2** in the northeast corner, next to the Shoreline ESA and the public trail leading to it, and **245 m^2** along the Williams Road RMA. This brings the total onsite landscaping to **2,053 m^2** from the existing 1,408 m^2 (**748 m^2** in the trail right-of ways, and **660 m^2** along the terraces bordering the south side of the trail). Landscape vegetation will benefit wildlife using the proposed, local compensation habitat areas, and will increase the aesthetics of the site to trail users.

In conclusion, we are of the qualified professional opinion that these additional compensation and enhancement measures on the site adequately respond to the Panel's comments, and, in combination with the offsite measures, are more than adequate from an ecological network and functionality perspective.

Sincerely,

Angus Johnston, MSc, RPBio, EP
Senior Manager and Associate Partner
Hatfield Consultants

Linda Dupuis, MSc, RPBio
Senior Manager and Biologist, Wildlife Group
Hatfield Consultants

Cory Bettles, MSc, RPBio
Senior Fisheries Manager
Hatfield Consultants

[4] Schmetterling D.A., C.G. Clancy, and T.M. Brandt. 2001. Effects of rip-rap bank reinforcement on stream salmonids in the western United States. Fisheries 26(7):6-13.

ATTACHMENT C

DAMON ORIENTE LTD.
LANDSCAPE ARCHITECTS

#306 – 4464 West 10th Avenue
Vancouver, BC, V6R 2H9
Canada

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31 October 2017

RE: Marine Terminal Fuel Facility Site
REVISED Estimate of Landscape Construction Costs for On-Site Landscape Areas Adjacent to Trail Buffer and Expanded Landscape Areas On-Site.

This letter provides a summary of our estimate of probable landscape construction costs for the above named area. It has been prepared to cover the onsite planting areas on the slope adjacent to the on-site area of the trail. This estimate is based on the revised landscape drawings dated 31 October 2017.

We have divided the work into general categories typical for landscape construction. Each category cost is developed using material costs which have integrated allocations for delivery, installation and machine time factored in to the total item cost.

This estimate assumes that grading and necessary excavation will be performed as part of the overall site construction work, undertaken by the facility and civil works contractors. Site access is direct, with gentle slopes and direct delivery to the installation locations anticipated.

The estimated total increases from $29,903.50 to $99,177.10.

On Site Trail Slope Planting			
	Planting soil	652 cu. m.	$35,887.50
	Plants, installed	5330	$20,793.50
	Estimated Construction Cost		$56,681.00
	Maintenance for three years		$33,480.00
Subtotal			$90,161.00
Contingency at 10%			$9,016.10
Estimated Total Cost			$99,177.10

Maintenance includes watering once per week, three months per year, for three years, and weeding once per month, eight months per year, for three years.

end

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31 October 2017

RE: Marine Terminal Fuel Facility Site
REVISED Estimate of Landscape Construction Costs for Development Permit Areas

This letter provides a revised summary of our estimate of probable landscape construction costs for the above named project. It includes the onsite and offsite RMA and ESA habitat planting areas as well as the onsite trail and landscape buffer planting.

This estimate is based on the landscape drawings submitted as part of the development permit application, revised 31 October 2017. Tree sizes have been increased and additional on-site ESA areas added. The estimate total increases from $241,168.70 to $283,167.50.

We have divided the work into general categories typical for landscape construction. Each category cost is developed using material costs which have integrated allocations for delivery, installation and machine time factored in to the total item cost.

These estimates assume that the site grading and necessary excavation will be performed as part of the overall site construction work, undertaken by the facility and civil works contractors. Site access appears to be direct, with gentle slopes and direct delivery to the installation locations anticipated.

Summary Table of Area Cost Estimates		
	On Site ESA & RMA Planting	$86,673.00
	Off Site ESA & RMA Planting	$19,178.00
	On Site Trail and Buffer Strip Planting	$95,414.00
Subtotal		**$201,265.00**
	Maintenance for Three Years	$48,240.00
	Monitoring for Three Years	$7,920.00
Subtotal		**$257,425.00**
Contingency at 10%		$25,742.50
Estimated Total Cost		**$283,167.50**

The area breakdowns are on the following page.

Maintenance includes watering once per week, three months per year, for three years, and weeding once per month, eight months per year, for three years. Monitoring will be once per year by a QEP and includes an annual report.

Damon Oriente Ltd.

On Site ESA & RMA planting area		2,282 sq. m.	UPDATED
	Planting soil	925 cu. m.	$50,831.00
	Plants, installed	1876 asst'd sizes	$35,842.00
	Estimated Item Total		**$86,673.00**

Off Site ESA & RMA Planting			UNCHANGED
	Planting soil	142 cu. m.	$7,837.00
	Plants, installed	537 asst'd sizes	$11,341.00
	Estimated Item Total		**$19,178.00**

On Site Trail and Buffer Strip Planting			UNCHANGED
	Planting soil	390 cu. m.	$21,450.00
	Plants, installed	5389 asst'd sizes	$34,964.00
	Trail, gravel on compacted base	780 sq. m. (260 lin. m. x 3 m width)	$39,000.00
	Estimated Item Total		**$95,414.00**

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ATTACHMENT D

FSM MANAGEMENT GROUP

SOLVE • BUILD • MANAGE

VAFFC / Vancouver Airport
Fuel Facilities Corporation
AN FSM GROUP MANAGED CORPORATION

Date: July 4, 2017

David Brownlee, M.A.
Planner, Special Projects
Policy Planning Division

City of Richmond
6911 No. 3 Road,
Richmond BC V6Y 2C1

MEMORANDUM

RE: OBSERVATION PLATFORM - VANCOUVER AIRPORT FUEL DELIVERY PROJECT – CITY OF RICHMOND DEVELOPMENT PERMIT COMMENT RESPONSES

Dear David,

To follow up on our response, June 26, 2017, in regards to the comment made by the City of Richmond in regards to the requested observation platform.

As the City of Richmond has yet to provide detail in regards to the requirements of the requested observation platform FSM has enlisted a general contractor to provide a generic example of a platform design and cost.

The attached sketch and costs are based on a basic wood frame construction using standard construction practices.

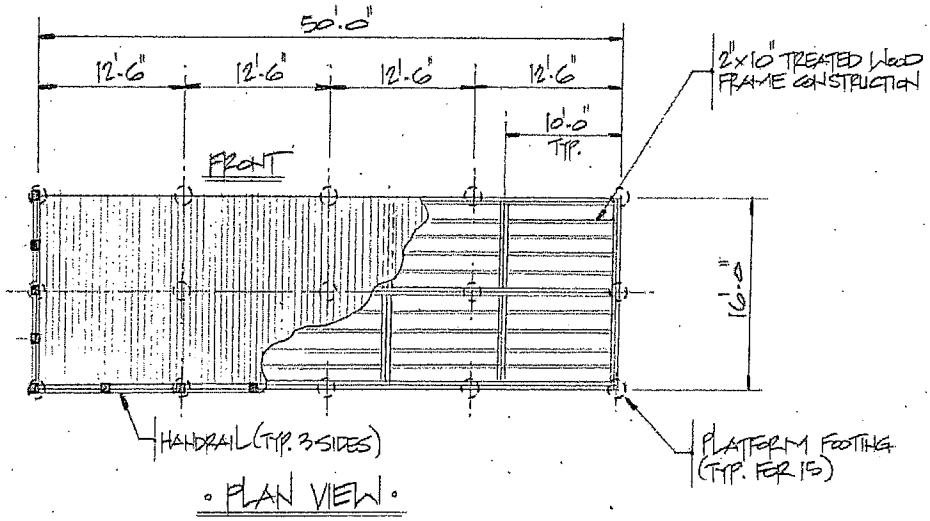
Please review the attached proposal and provide detailed feedback.

Regards,

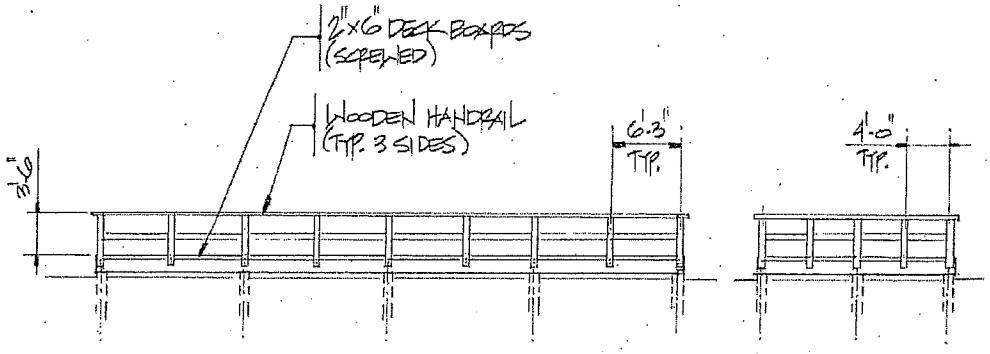
Mark McCaskill
Sr. Project Manager

Reference: **Vancouver Airport Fuel Delivery Project (VAFDP)**
City of Richmond Comments on VAFFC Development Permit Application
Marine Facility - Proposed Dyke Trail Observation Platform

Budget Price for Design, Construction of 5m x 15m observation platform:	$45,910
Allowance for Appurtenances (benches, signage)	$5,500
Contingency (@ approx. 20%)	$10,210
TOTAL (rounded up)	**$62,000**



• PLAN VIEW •



• REAR ELEVATION VIEW •

• SIDE VIEW •

* NOTE: ALL LUMBER TO BE TREATED

Observation Platform - Detailed Cost Estimate

The detailed estimate, shown below, includes an allowance for benches and signage and a 20% contingency allowance. Parks Department staff have reassessed the proposed conceptual design and the associated cost estimate as acceptable for the general location.

Observation Platform - Detailed Cost Estimate

ITEM	COST ESTIMATE
Formal design and drawing	$3,500.00
Platform frame materials	$2,692.00
Finished decking materials	$2,385.00
Handrail materials	$848.00
Miscellaneous materials (joist hangers, screws, hardware and fasteners)	$1,760.00
Platform installation labour	$20,595.00
Footings supply and installation	$11,925.00
Survey (as-built)	$1,595.00
Local freight	$610.00
Allowance for Appurtenances (benches, signage)	$5,500.00
Contingency allowance (20%)	$10,210.00
Total Budget Estimate (rounded up)	$62,000.00

ATTACHMENT E

City of Richmond

Development Permit Considerations
Development Applications Department
6911 No. 3 Road, Richmond, BC V6Y 2C1

Address: 15040 Williams Road **File No.:** DP 16-741741

Prior to approval of the Development Permit, the developer is required to complete the following:

1. Receipt of a Letter of Credit/security for $361,248.80 inclusive of the following:
   - On-site ESA and RMA landscaping in the amount of $86,673.00.
   - On-site Trail and Buffer Strip in the amount of $95,414.00.
   - On-site Trail landscaping in the amount of $56,681.00.
   - Three years of maintenance (ESA/RMA/Trail/Trail Slope) in the amount of, $81,720.00.
   - Three years of monitoring (ESA/RMA/Trail) in the amount of $7,920.00.
   - 10% contingency in the amount of $32,840.80.

   (The above amounts being based on the costs estimate provided by Damon Oriente Ltd. Landscape Architects – letters dated October 31, 2017. The figures include a 10% contingency).

   Off-site ESA/RMA securities (estimated at $19,178.00 plus 1,917.80 contingency) will be addressed through a Servicing Agreement.
2. Submission of a contract entered into between the applicant and a Qualified Environmental Professional (QEP) to monitor all ESA, RMA and trail vegetation installations (on and off-site) plus the on-site trailside landscaping (400 m^2), the expanded trail buffer and slope planting (660 m^2) and the planting strip adjacent to the Williams Road RMA (245 m^2). The contract will also include provision for three years of post-installation monitoring with annual reporting for these landscape installations. The Contract should include the scope of work to be undertaken, including: the proposed number of site monitoring inspections, and a provision any remedial works during the monitoring period. Planting within RMA areas is to comply with Provincial RAR re-vegetation guidelines.
3. Submission of a contract to ensure that pruning and limb removal of retained trees is under supervision of a certified arborist, invasive vegetation removal within the tree protection area by hand only and activity within the drip line of retained trees to be done under the supervision of a Qualified Environmental Professional (QEP) or a certified arborist as outlined in the arborist's report.
4. Installation of appropriate tree protection fencing around all trees identified for retention by the Arborist (uTree Environmental Consultants Report). Fencing is to be installed to the City's standards as part of the development prior to any construction activities occurring on-site.
5. Submission of payment in the amount of $62,000 to the City of Richmond, as a voluntary contribution for the design and future construction of a pedestrian observation platform overlooking the Fraser River and located to the east of Williams Road at the City's discretion. Timing of the platform construction may be affected by future dike improvements.
6. Submission of payment in the amount of $6,480.00 to the City of Richmond, as a voluntary contribution for the design and future installation of an interpretive signage package for the pedestrian trail system through the subject site. The detailed design and installation has been included in the

Servicing Agreement requirements for the pedestrian trail and will be to the satisfaction of the Senior Manager of Parks Department.

7. Registration of a 6 m wide statutory right-of-way (ROW) with public right-of-passage (PROP) through 15040 Williams Road to accommodate a public trail in an alignment generally along the southern side of the CN Rail right-of-way as indicated in the Development Permit application and to the satisfaction of the Senior Manager of Parks Department. After completion of the Servicing Agreement maintenance period, the City will be responsible for maintenance and liability associated with the SRW.
8. Registration of a 7.5 m wide statutory right-of-way (ROW) for dike through 15040 Williams Road in an alignment generally near the property's foreshore with the Fraser River as indicated in the Development Permit application and to the satisfaction of the General Manager of Engineering Department. After completion of the Servicing Agreement maintenance period, the City will be responsible for maintenance and liability associated with the SRW. The SRW will provide the City with rights for access and the ability to maintain the works. The agreement should include a minimum building setback from the SRW of 7.0 m.
9. Registration of a flood plain covenant on Title identifying a minimum habitable elevation of 3.0 / 4.35 m GSC split approximately at the alignment of the southern edge of the CN Rail right-of-way.
10. Registration of a legal agreement on Title to ensure that landscaping planted as part of the on-site ESA and the on-site RMA is maintained and will not be abandoned or removed. Registration of a statutory right-of-way, and/or other legal agreements or measures, as determined to the satisfaction of the Director of Development.
11. Discharge of the existing foreshore covenant (BG 285960).
12. Registration of a legal agreement on Title to require the owner to design and construct bank protection along the river to the satisfaction of the General Manager, Engineering and the Inspector of Dikes and to provide the City with access to the land to inspect and maintain the works should the owner fail to do so. The owner will be responsible for the ongoing maintenance and liability of the works. The intent of the covenant is to ensure that the area outside of the 7.5 m right-of-way (ROW) will be constructed and maintained in a manner that protects the dike and cannot be modified without consent of the City of Richmond and the Provincial Inspector of Dikes.

Prior to Building Permit Issuance, the developer must complete the following requirements:

1. Enter into a Servicing Agreement* for the design and construction of a dike across 15040 Williams Road within the 7.5 m wide right-of-way (ROW) and integration with existing dikes on adjacent properties acceptable to the General Manager, Engineering.
2. Enter into a Servicing Agreement* for the design and construction of a 6 m wide park trail across 15040 Williams Road and integration with existing trails on adjacent properties acceptable to the Senior Manager of Parks Department. Works include, but may not be limited to, a 3 m wide aggregate trail surface with vegetation strips on both sides, design and installation of an interpretive signage package for the pedestrian trail, to the satisfaction of the Senior Manager of Parks Department.
3. Enter into a Servicing Agreement* for the design and construction of utility and frontage works and the off-site ESA/RMA landscaping enhancement areas identified as per the landscaping plans submitted under DP 16-741741. Works include, but may not be limited to the following:

Water Works:

a. Using the OCP Model, there is 583 L/s of water available at a 20 psi residual at the Williams Road frontage. Based on your proposed development, your site requires a minimum fire flow of 250 L/s.
b. The Developer is required to:
    - Submit Fire Underwriter Survey (FUS) or International Organization for Standardization (ISO) fire flow calculations to confirm development has adequate fire flow for onsite fire protection. Calculations must be signed and sealed by a Professional Engineer and be based on Building Permit Stage Building designs.
    - Install a single water service connection to serve the development site. The service connection can be split at the property line, and two meters installed (one for fire, one for domestic use) inside meter chamber(s).
    - Install backflow prevention device at property line.
    - Provide statutory right-of-way (ROW) for meter and meter chamber.
c. At Developer's cost, the City is to:
    - Complete all tie-ins for the proposed works to existing City infrastructure.

Storm Sewer Works:

a. The Developer is required to:
    - Design and construct a storm sewer outfall into the RMA ditch utilizing appropriate sediment and erosion control methods, such as deltalok bags, and provide a functional plan within the first Servicing Agreement submission for review and approval by the City.
    - Install an oil and grit separator upstream of the proposed outfall, and provide the City with a separator maintenance plan within the first Servicing Agreement submission for review and approval.

Sanitary Sewer Works:

a. The Developer is required to:
    - N/A.

Frontage Improvements:

a. The Developer is required to:
    - Coordinate with BC Hydro, Telus and other private communication service providers:
    - When relocating/modifying any of the existing power poles and/or guy wires within the property frontages.

- To locate all above ground utility cabinets and kiosks required to service the proposed development within the developments site (see list below for examples). A functional plan showing conceptual locations for such infrastructure shall be included in the development process design review. Please coordinate with the respective private utility companies and the project's lighting and traffic signal consultants to confirm the requirements (e.g., statutory right-of-way dimensions) and the locations for the aboveground structures. If a private utility company does not require an aboveground structure, that company shall confirm this via a letter to be submitted to the City. The following are examples of statutory right-of-ways that shall be shown in the functional plan and registered prior to Servicing Agreement design approval:
- BC Hydro PMT – 4 mW X 5 m (deep).
- BC Hydro LPT – 3.5 mW X 3.5 m (deep).
- Street light kiosk – 1.5 mW X 1.5 m (deep).
- Traffic signal kiosk – 2 mW X 1.5 m (deep).
- Traffic signal UPS – 1 mW X 1 m (deep).
- Shaw cable kiosk – 1 mW X 1 m (deep) – show possible location in functional plan.
- Telus FDH cabinet-1.1 m W X 1 m (deep – show possible location in functional plan.
- Implement a riparian enhancement planting plan in the 5.0 m RMA watercourse along the Williams Road frontage.

Dike Improvements:

a. The developer is required to satisfy the following for the dike:
   - The dike shall be designed by a Professional Geotechnical Engineer.
   - The elevation of the dike crest shall be raised to minimum 4.7 m geodetic, and designed to accommodate a future elevation of 5.5 m. On the waterside of the dike, the slope shall be maximum 2:1. On the landside of the dike, the slope shall be maximum 3:1.
   - The crest of the dike shall be minimum 4.0 m wide.
   - Provide a 7.5 m statutory right-of-way for the dike.
   - There shall be a minimum building setback of 7.0 m from the dike right-of-way.
   - The drip line of any trees shall be set back at least 8.0 m from the future toe of the dike.
   - Above ground pipes crossing the dike right-of-way shall be removable to allow for dike inspection and maintenance.
   - Design the dike and operations in a manner that allows for vehicular and man access along the dike upon the City's request.
   - The dike along the frontage of the development site shall be tied in to the adjacent dikes to the north and south at a maximum slope of 3:1. Developer to be responsible to locate the dike to the north and south for a smooth transition. No retaining walls within the dike crest or slope area are allowed.

- All dike construction, including materials, shall be in conformance with City standard drawing MB-98 or MB-99, Dike Design and Construction Guide – Best Management Practices for British Columbia (2003), and Environmental Guidelines for Vegetation Management on Flood Protection Works to Protect Public Safety and the Environment (1999).
- The design and construction of the dike shall be done to the satisfaction of the General Manager, Engineering and Public Works, and any other relevant dike approving authorities.
- Discharge existing foreshore covenant and register a new foreshore covenant to ensure that the area outside of the 7.5 m right-of-way will be constructed and maintained in a manner that protects the dike and cannot be modified without consent of the City of Richmond and Inspector of Dikes.

General Items:

a. The Developer is required to:
   - Develop a sediment and erosion control and protection fencing plan for the proposed works to minimize impact to the 5.0m RMA along Williams Road during construction, to the satisfaction of the City. A functional plan must be reviewed and approved by the City prior to Development Permit issuance.
   - Provide, within the first Servicing Agreement submission, a geotechnical assessment of preload and soil preparation impacts on the existing utilities fronting the development site and provide mitigation recommendations.
   - Enter into, if required, additional legal agreements, as determined via the subject development's Servicing Agreement(s) and/or Development Permit(s), and/or Building Permit(s) to the satisfaction of the Director of Engineering, including, but not limited to, site investigation, testing, monitoring, site preparation, de-watering, drilling, underpinning, anchoring, shoring, piling, pre-loading, ground densification or other activities that may result in settlement, displacement, subsidence, damage or nuisance to City and private utility infrastructure.
   - Prepare and submit a design and sealed cost estimate (inclusive of a 10% contingency) as prepared by a qualified professional for the construction of a foreshore observation deck to the satisfaction of the Senior Manager, Parks Department and the Director, Engineering Department.
   - Submit a voluntary cash contribution for the construction of the foreshore observation deck to the satisfaction of the Senior Manager, Parks Department and the Director, Engineering Department.
b. Plan and undertake the off-site ESA and RMA landscaping as per the landscaping plans submitted under DP 16-741741. A Qualified Environmental Professional (QEP) to monitor all planting ESA, RMA and trail vegetation installations and to provide three years of post-installation monitoring with annual reporting for the on-site and the off-site ESA, the RMA enhancement areas and the pedestrian trail vegetation installation. Planting within RMA areas is to comply with Provincial RAR re-vegetation guidelines.
c. Ensure that all pruning and limb removal of retained trees is to be under supervision of a certified arborist, invasive vegetation removal within the tree protection area is by hand only and activity within the drip line of retained trees to be done under the supervision of a Qualified Environmental Professional (QEP) or a certified arborist as outlined in the arborist's report.

4. City arborist (Conor Sheridan: 604-244-1208, CSheridan@richmond.ca) to be notified prior to commencement of works within the drip line of existing retained off-site trees. Provide three business days minimum notice.
5. City Parks to review all off-site planting after it is in place (contact Steve Priest, Supervisor of Horticulture: 604-244-1208, and Miriam Plishka, Park Planner: 604-233-3310). Once plant material and placement have been accepted by the City, the maintenance period will commence.
6. Submission of a final sign-off letter of from CN Railway, to the satisfaction of the City's Director of Transportation and the Director of Engineering, for the VAFFC Marine Terminal project at 15040 Williams Road. If CN Railway's approval includes conditions or requirements, the proponent must provide means to meet those conditions/requirements to the satisfaction of the City's Director of Transportation.
7. Submission of a Construction Parking and Traffic Management Plan to the Transportation Department. Management Plan shall include location for parking for services, deliveries, workers, loading, application for any lane closures, and proper construction traffic controls as per Traffic Control Manual for works on Roadways (by Ministry of Transportation) and MMCD Traffic Regulation Section 01570.
8. Obtain a Building Permit for any construction hoarding. If construction hoarding is required to temporarily occupy a public street, the air space above a public street, or any part thereof, additional City approvals and associated fees may be required as part of the Building Permit. For additional information, contact the Building Approvals Department at 604-276-4285.

Notes:

* This requires a separate application and approval.

- Where the Director of Development deems appropriate, the preceding agreements are to be drawn not only as personal covenants of the property owner but also as covenants pursuant to Section 219 of the Land Title Act.

  All agreements to be registered in the Land Title Office shall have priority over all such liens, charges and encumbrances as is considered advisable by the Director of Development. All agreements to be registered in the Land Title Office shall, unless the Director of Development determines otherwise, be fully registered in the Land Title Office prior to enactment of the appropriate bylaw.

  The preceding agreements shall provide security to the City including indemnities, warranties, equitable/rent charges, letters of credit and withholding permits, as deemed necessary or advisable by the Director of Development . All agreements shall be in a form and content satisfactory to the Director of Development.

- Additional legal agreements, as determined via the subject development's Servicing Agreement(s) and/or Development Permit(s), and/or Building Permit(s) to the satisfaction of the Director of Engineering may be required including, but not limited to, site investigation, testing, monitoring, site preparation, de-watering, drilling, underpinning, anchoring, shoring, piling, pre-loading, ground densification or other activities that may result in settlement, displacement, subsidence, damage or nuisance to City and private utility infrastructure.

- Applicants for all City Permits are required to comply at all times with the conditions of the Provincial *Wildlife Act* and Federal *Migratory Birds Convention Act*, which contains prohibitions on the removal or disturbance of both birds and their nests. Issuance of Municipal permits does not give an individual authority to contravene these legislations. The City of Richmond recommends that where significant trees or vegetation exists on site, the services of a Qualified Environmental Professional (QEP) be secured to perform a survey and ensure that development activities are in compliance with all relevant legislation.

Signed Date

REVISED PLAN SUBMISSION

Figure 1 Vancouver Airport Fuel Delivery Project – Marine Terminal site location.

Legend

- Canadian National Railway Right-of-Way
- VAFFC Marine Terminal Site

0 100 200 300 meters

Scale: 1:10,000

Projection: NAD 1983 UTM Zone 10N

Data Sources:
a) Imagery, Esri Basemap

N

Hatfield CONSULTANTS

K:\Data\Project\VAFFC6773\A_MXD\Wildlife_Survey\VAFFC6773_Fig1_Project_Site_20170120_v5_1_sj.mxd

This plan is reprinted from the
ESA and RMA Environmental Report
by
Hatfield Environmental Consultants

NOV 29 2017

DP 16-741741

DAMON ORIENTE LTD.
landscape architects

#306 - 4464 West 10th Avenue
Vancouver, BC, Canada
V6R 2H9

t. 604-222-9200
e. dvo@telus.net
w. damonoriente.ca

Project
VAFFC MARINE TERMINAL FACILITY

15040 Williams Road, Richmond BC

Drawing
MARINE TERMINAL SITE LOCATION

Issue:

Scale: nts

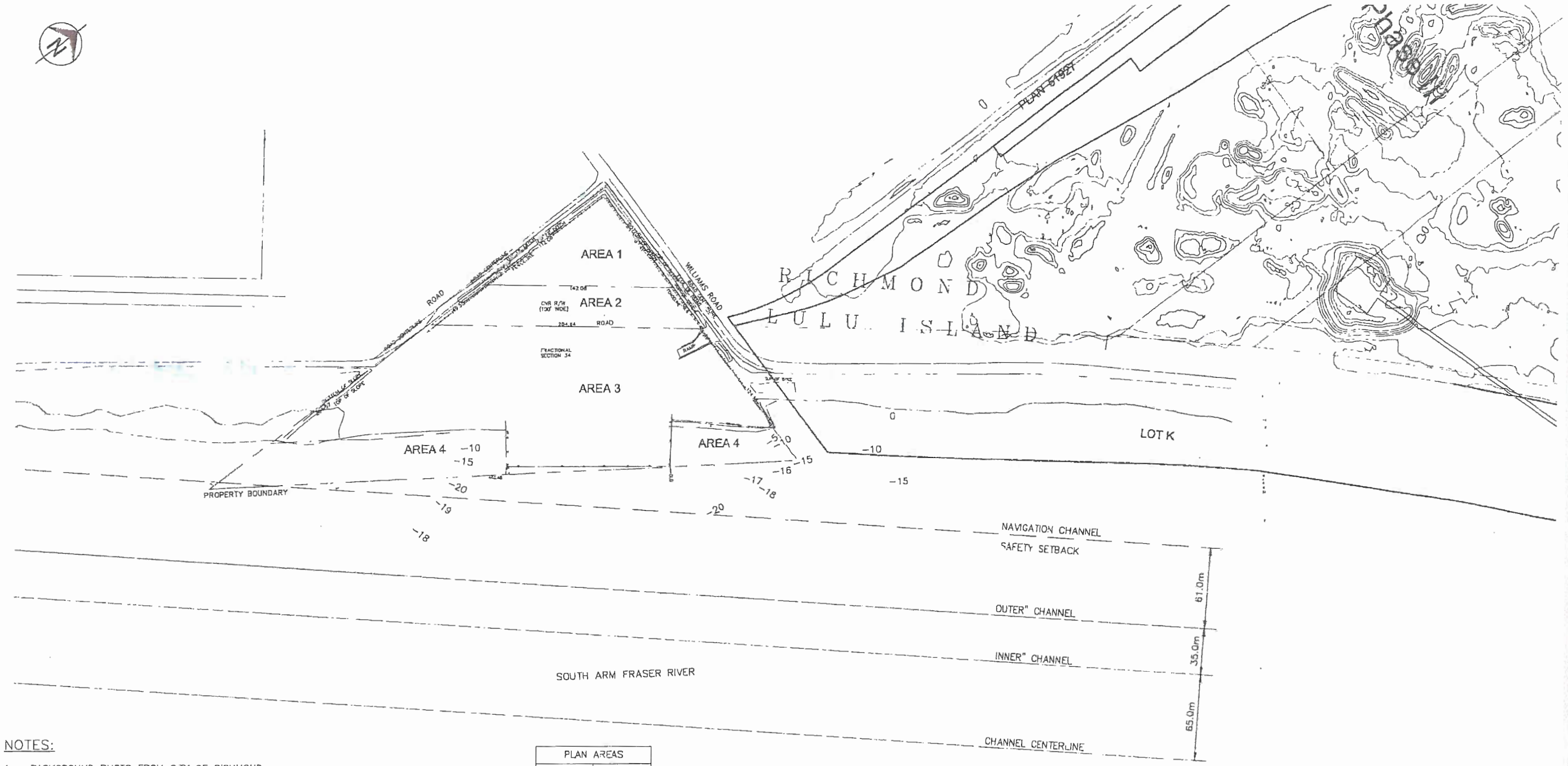
Date:

Project Number: 2014-280

31 Oct. 2017 Development Permit Application Resubmission - ADP Comments

Dwg
L0.02

Reference



NOTES:

1. BACKGROUND PHOTO FROM CITY OF RICHMOND.
2. TOPOGRAPHIC SURVEY PREPARED BY MATSON, PEAK AND TOPLISS. DRAWING REFERENCE V-06-15234-TPG. SURVEY DONE BY SEPTEMBER 12-14, 2006
3. ALL ELEVATIONS ARE REFERENCED TO GEODETIC DATUM.

PLAN AREAS	
LOCATION	AREA (m^2)
AREA 1	4985
AREA 2	5298
AREA 3	26388
AREA 4	9229
TOTAL	45810

1 EXISTING SITE PLAN
1:1500

0 30 60 90 150m
1:1500

ISSUE NO	DRAWING REVISIONS	ISSUE DATE
0	ISSUED FOR CONSTRUCTION	12/14/2017

Fuel Facilities Corporation

VANCOUVER AIRPORT FUEL DELIVERY PROJECT
MARINE RECEIVING AREA
MARINE DESIGN PACKAGE
VANCOUVER AIRPORT FUEL FACILITIES CORPORATION
RICHMOND, BRITISH COLUMBIA

SEAL

moffatt & nichol

Argus ENGINEERING | PLANNING | MANAGEMENT
ARGUS CONSULTING INC
6183 College Boulevard, Suite 600
Overland Park, Kansas 66211
816 228 7500 FAX 816 228 7535
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PROJECT NO	15004 22C
DATE	12/21/15
DESIGNED BY	FS
DRAWN BY	AVM
CHECKED BY	RB
CAD FILE NAME	15004 22C 0009

EXISTING SITE PLAN

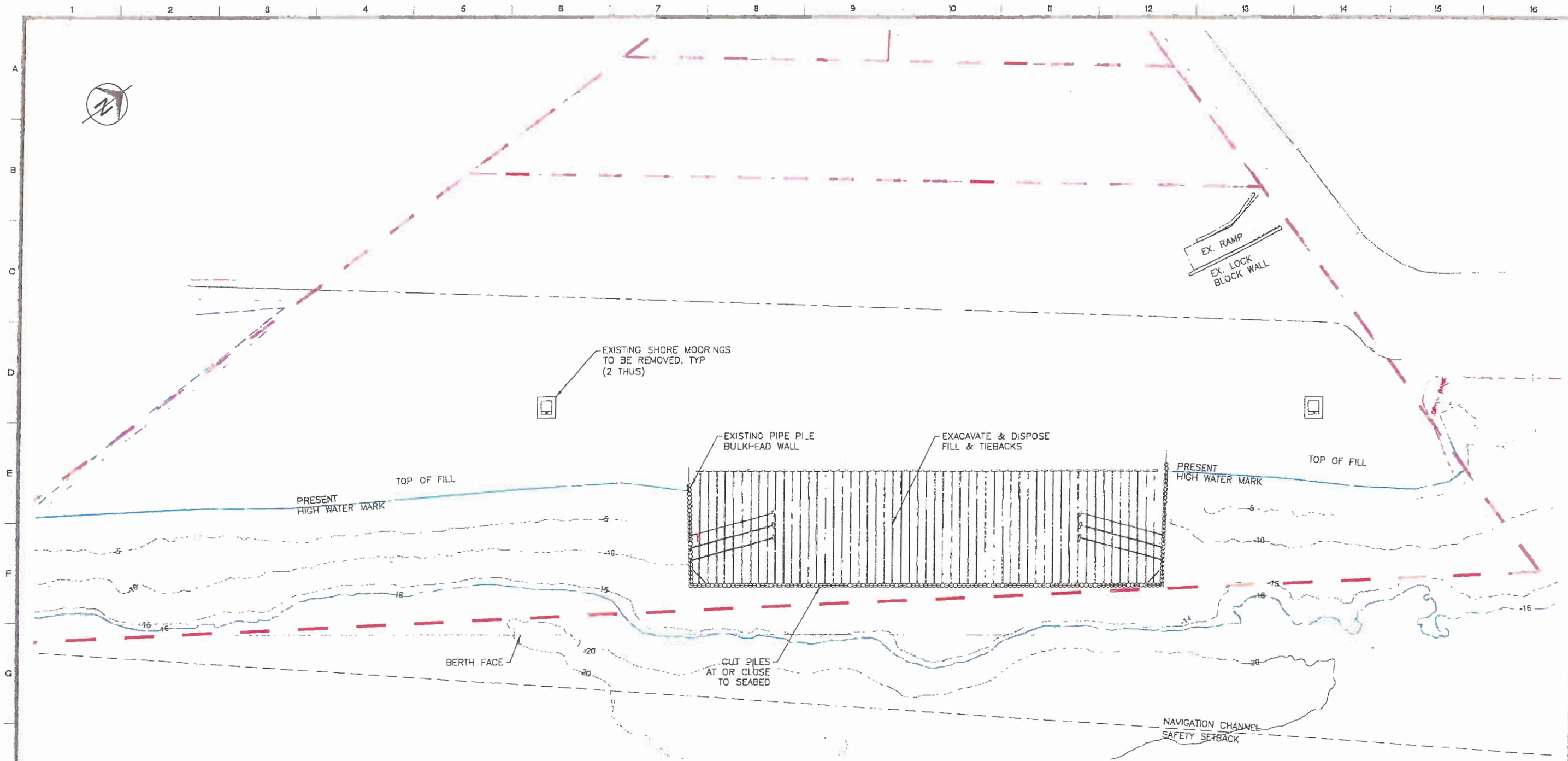
G-009

PLEASE RECYCLE

NOV 29 2017

ISSUED FOR CONSTRUCTION

Plan #1



1 DEMOLITION PLAN
1:500

ISSUE NO.	DRAWING REVISIONS	ISSUE DATE
0	ISSUED FOR CONSTRUCTION	02/14/2017

Fuel Facilities Corporation

VANCOUVER AIRPORT FUEL DELIVERY PROJECT
MARINE RECEIVING AREA
MARINE DESIGN PACKAGE
VANCOUVER AIRPORT FUEL FACILITIES CORPORATION
RICHMOND, BRITISH COLUMBIA

moffatt & nichol

Argus
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ARGUS CONSULTING INC
6363 College Boulevard Suite 600
Overland Park, Kansas 66211
913.228.7500 FAX 913.228.7535
www.argusconsulting.com

PROJECT NO	15004.22C
DATE	12/16/15
DESIGNED BY	RB
DRAWN BY	AAM
CHECKED BY	RB
CAD FILE NAME	15004.22C-G020

MARINE TERMINAL DEMOLITION PLAN

G-020

ISSUED FOR CONSTRUCTION

NOV 29 2017

DP 1

PLEASE RECYCLE

Pltlac: P:\8338 VC Vancouver Airport Fuel Delivery Project\CADD_Active\15004 22C-G020.dwg on 03/7/17 at 1:18 PM by AMANDZUN using Argus 2013.stb

Plan #2

BUILDING AREA AND STRUCTURE ELEVATIONS			
BUILDING NAME	FLOOR AREA (M 2)	STRUCTURE HEIGHT (M)	STRUCTURE ELEVATION (M)
CONTROL ROOM AND WASHROOM ENCLOSURE	43.29	3.5	9.0
FUEL LAB ENCLOSURE	21.65	3.5	9.0
FIRE PUMP ENCLOSURE 1	33.51	2.6	8.1
FIRE PUMP ENCLOSURE 2	33.51	2.6	8.1
FOAM STORAGE ENCLOSURE	28.01	2.6	8.1
ELECTRICAL ENCLOSURE	45.97	5.5	11.0
DOCK UNLOADING ARMS	N/A	33.0	37.8
DOCK GANGWAY TOWER	N/A	19.7	24.5
NOTE: THE MARINE UNLOADING ARMS ELEVATION ARE TO BE DETERMINED BY THE MANUFACTURER. APPROXIMATE ELEVATIONS OF THE STRUCTURE ARE LISTED ABOVE.			
SITE AREA: 40,468 M^2 LOT COVERAGE AREA: 0.52%			

BACKFLOW PREVENTOR AND WATER SHUTOFF BUILDING

CLASS 1 enclosure:
"Urban Bike Locker" or equivalent
http://www.urbanracks.com/bikelockers.html#image-3
Based in Surrey, BC

CLASS 2 Rack:
"Urban Hanger Rack" Model UB2000 or equivalent
http://www.urbanracks.com/hangerrack.html
Based in Surrey, BC

WP1

CLASS 2 BICYCLE PARKING (3 SPACES)

CURB

ASPHALT ANCHORS (TYP)

CLASS 1 BICYCLE PARKING (QTY. 1)

SIDEWALK

300x300 TIMBER BARRIER

1.12m

2.085m

3.2m

OVERHEAD POWER POLE TRANSITION TO BELOWGROUND ELECTRICAL DUCT BANK

VEHICLE PARKING
4 - SPACES @ 3.2m
1 - HANDICAP SPACE @ 3.7m x 5.5m
5 SPACES TOTAL

MILLIAMS ROAD

ACCESS ROAD TO BACKFLOW PREVENTOR BUILDING

DYKE NATURE TRAIL

OIL WATER SEPARATOR

ABOVEGROUND WASTE TANK

CN RAIL ROW

FOAM STORAGE ENCLOSURE

DIESEL POWERED FIRE PUMP ENCLOSURE

TRANSFORMER

GENERATOR

ELECTRICAL ENCLOSURE (SEE A-1401)

6.0m ENTRANCE/EXIT FIRE CRASH GATE

UTILITIES TO/FROM MARINE FACILITY (WORK OUTSIDE PROPERTY BOUNDARY NOT INCLUDED IN CITY OF RICHMOND PROJECT PERMIT)

NEW ELECTRICAL SERVICE CONNECTION TO EXISTING POWER POLE

7.0 M DYKE SETBACK

PROPOSED DYKE ROW

DYKE ROAD

TRASH AND RECYCLE RECEPTICLE

CONTROL ROOM AND WASHROOM ENCLOSURE (SEE A-1402)

SECURITY FENCE AND PROPERTY BOUNDARY

NEW MOORING STRUCTURE WITH QUICK RELEASE MOORING HOOK (TYP.)

MOORING DOLPHIN 1

MOORING DOLPHIN 2

UNLOADING ARMS WITH SPILL CONTAINMENT (DRAINS TO OIL WATER SEPARATOR)

EQUIPMENT PAD WITH CONTAINMENT

MOORING DOLPHIN 4

MOORING DOLPHIN 3

EXISTING PARCEL A WATER LOT AREA = 3,550 SQ.M.

PROPOSED PARCEL A WATER LOT AREA = 7,977 SQ.M.

CONTAINMENT WALL

UTILITY VESSEL LAUNCH

CONTAINMENT BOOM DEPLOYED WHEN SHIP AT BERTH

EXISTING BULKHEAD WALL TO BE REMOVED

BERTHING DOLPHIN 1

BERTHING DOLPHIN 2

BERTHING DOLPHIN 3

BERTHING DOLPHIN 4

CONTAINMENT WALL

0 15 30 45 75m
1:750

ISSUE NO.	DRAWING REVISIONS	ISSUE DATE
2	REVISED LOCATION OF UNLOADING ARMS INTO WATER LOT	08/18/2017
1	ADDED BICYCLE PARKING DETAIL	07/24/2017
0	ISSUED FOR DEVELOPMENT PERMIT REVIEW	12/02/2016

Fuel Facilities Corporation

108 - 12300 Horseshoe Way
Richmond, BC, V7A 4Z1
604-271-7113
www.tmgroup.ca
www.vancouverairportfuel.ca

VANCOUVER AIRPORT FUEL DELIVERY PROJECT
MARINE RECEIVING AREA
PERMIT PACKAGE
VANCOUVER AIRPORT FUEL FACILITIES CORPORATION
RICHMOND, BRITISH COLUMBIA

SEAL

LOGO

Argus
ENGINEERING | PLANNING | MANAGEMENT
ARGUS CONSULTING, INC.
6363 College Boulevard, Suite 600
Overland Park, Kansas 66211
815.228.7500 FAX 815.228.7535
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PROJECT NO:	15004.22
DATE:	05/22/2015
DESIGNED BY:	DWF
DRAWN BY:	GWF
CHECKED BY:	DWF
CAD FILE NAME:	CS1.01

OVERALL SITE PLAN

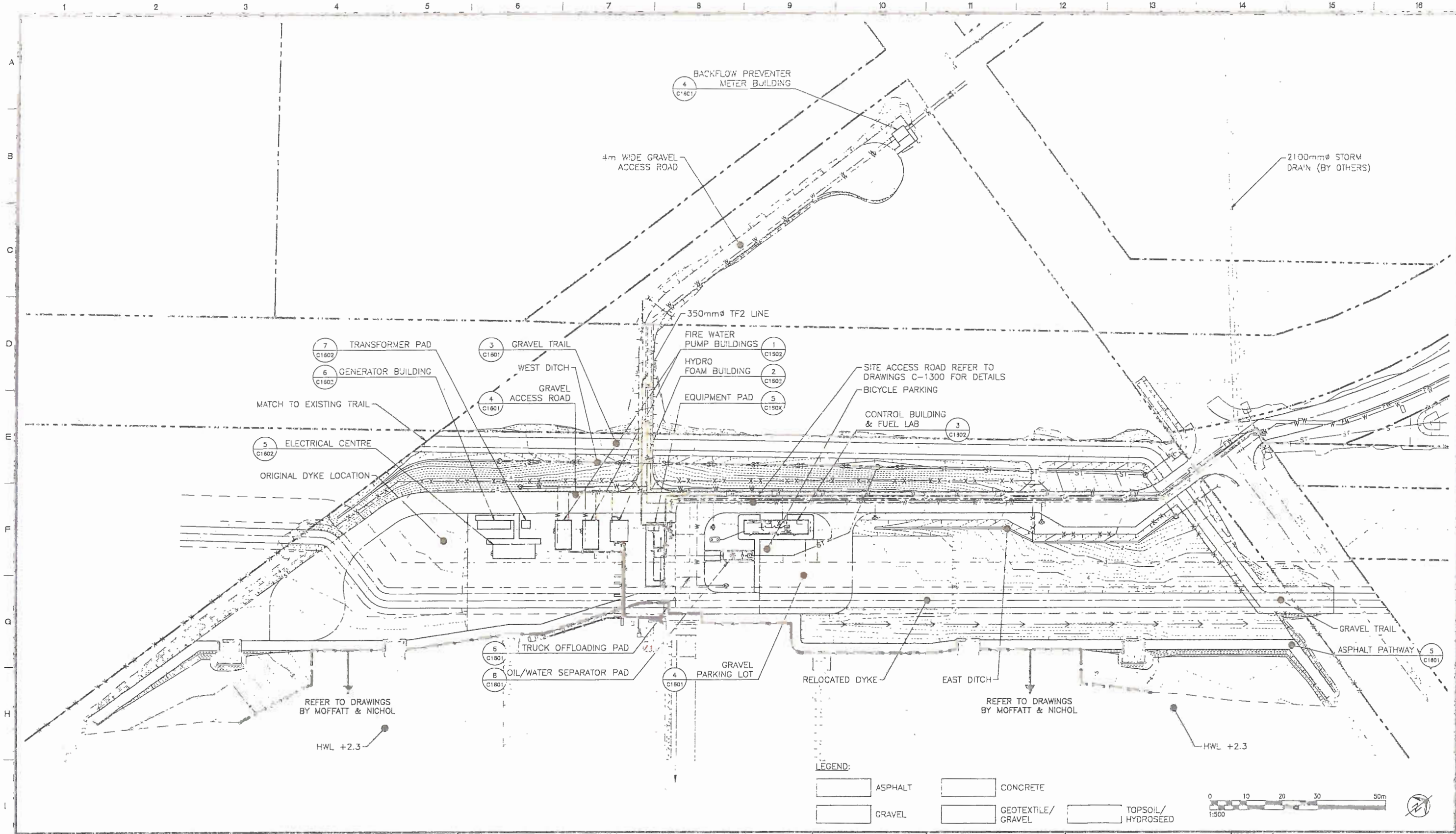
DRAWING NO.
CS-101

PLEASE RECYCLE

ISSUED FOR DEVELOPMENT PERMIT REVIEW
NOV 29 2017

Plotted: Y:\Comm\YVR - Vancouver\15004 VAFDP\Dwgs\22-Marine\22A - Permit\Civil\CS1.01.dwg on 08/18/17 at 5:51 PM by SNEWBOLD using acad.stb

Plan #3



ISSUE NO.	DESCRIPTIONS	ISSUE DATE
	ISSUED FOR DEVELOPMENT PERMIT REVIEW	05/05/2017

Fuel Facilities Corporation

VANCOUVER AIRPORT FUEL DELIVERY PROJECT
MARINE RECEIVING AREA
MARINE DESIGN PACKAGE

VANCOUVER AIRPORT FUEL FACILITIES CORPORATION
RICHMOND, BRITISH COLUMBIA

SEAL

DESIGN

TETRA TECH
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Vancouver BC
Canada V6C 1N5
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Fax:(604)684-0147
www.tetratech.com

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913.228.7500 FAX 913.228.7535
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PROJECT NO:	15004.220
DATE:	10/12/16
DESIGNED BY:	-
DRAWN BY:	-
CHECKED BY:	AK
CAD FILE NAME:	15004.220-C1112

SURFACING PLAN (COLOUR)

DRAWING NO: C-1112

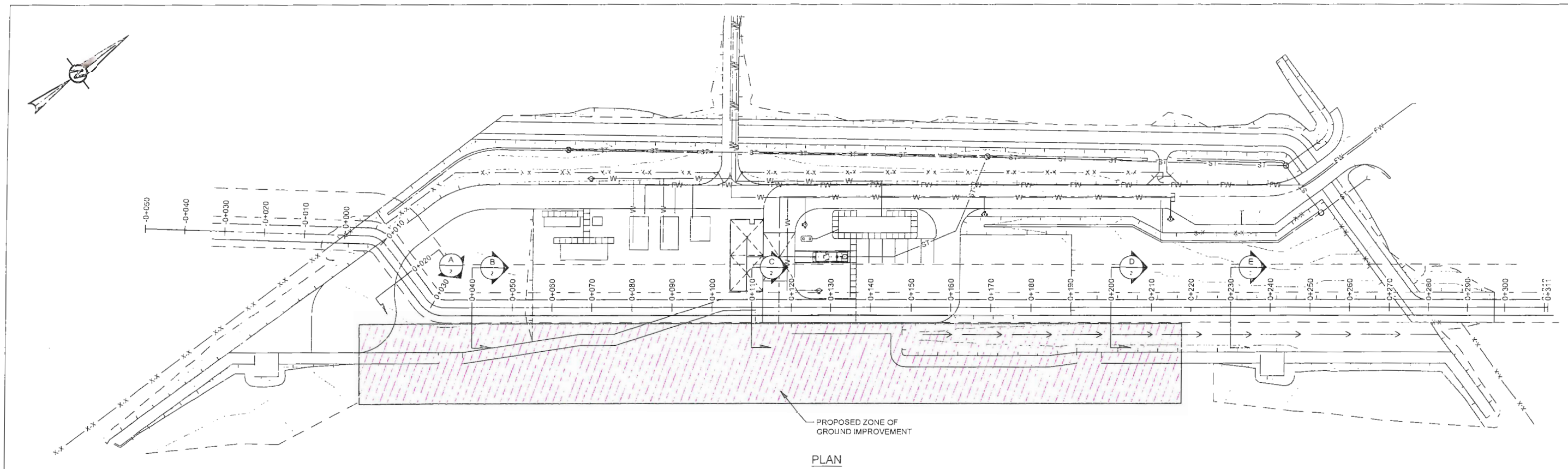
NOV 29 2017

ISSUED FOR DEVELOPMENT PERMIT REVIEW

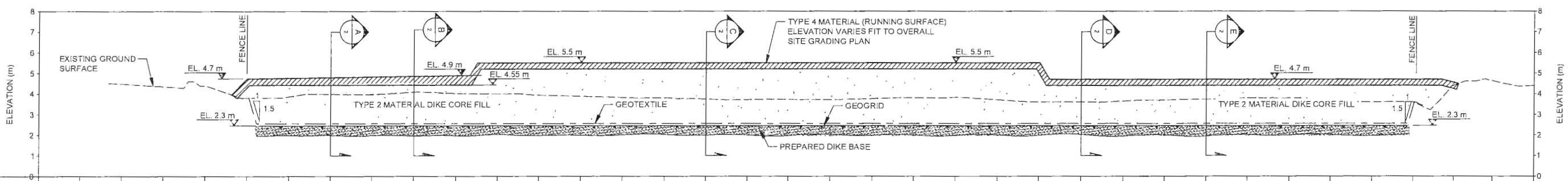
PLEASE RECYCLE

Plotted: D:\C3\1\C3\03503-01\15004.220\CADD\DWGS\SHTS\15004.220-C1112.dwg on 05/4/17 at 9:03 AM by TANNERJOHNSON using Argus.stb

Plan #4



PLAN



CHAINAGE	FINISHED GROUND	EXISTING GROUND
0+050		
0+040		4.48
0+030		4.35
0+020		4.40
0+010		3.80
0+000	4.73	3.86
0+010	4.74	3.98
0+020	4.78	3.97
0+030	4.81	4.09
0+040	4.65	4.02
0+050	4.89	4.00
0+060	5.50	3.94
0+070	5.50	3.88
0+080	5.50	3.82
0+090	5.50	3.80
0+100	5.46	3.74
0+110	5.42	3.71
0+120	5.50	3.72
0+130	5.49	3.72
0+140	5.48	3.76
0+150	5.49	3.80
0+160	5.50	3.82
0+170	5.50	3.71
0+180	5.50	3.60
0+190	5.50	3.60
0+200	4.70	3.65
0+210	4.70	3.70
0+220	4.70	3.73
0+230	4.70	3.80
0+240	4.70	3.78
0+250	4.70	3.67
0+260	4.70	3.60
0+270	4.70	3.59
0+280	4.70	4.40
0+290	4.57	4.62
0+300		4.40
0+310		

ELEVATION PROFILE

NOTE(S)

1 BASE DRAWING PROVIDED BY ARGUS CONSULTING
CAD FILE: L2.01.DWG DATED RECEIVED MAY 10 2017.
2 ELEVATION SHOWN ARE IN GEODETIC DATUM
3 DATUM NAD 83, PROJECTION ZONE 10
4 ALL MATERIALS AND CONSTRUCTION SHALL CONFORM TO THE FOLLOWING:
5 A) CURRENT EDITION OF THE CITY OF RICHMOND SUPPLEMENTARY SPECIFICATIONS AND DETAIL DRAWINGS AND ASSOCIATED EDITION OF THE MASTER MUNICIPAL CONSTRUCTION DOCUMENTS
5 B) PROVINCE OF BRITISH COLUMBIA MINISTRY OF ENVIRONMENT GUIDELINES: 'ENVIRONMENTAL GUIDELINES FOR VEGETATION MANAGEMENT ON FLOOD PROTECTION WORKS TO PROTECT PUBLIC SAFETY AND THE ENVIRONMENT' AND 'RIPRAP DESIGN AND CONSTRUCTION GUIDE' AND 'DIKE DESIGN AND CONSTRUCTION GUIDE. BEST MANAGEMENT PRACTICES FOR BRITISH COLUMBIA'.
6 COMPATIBILITY OF THE MATERIAL SHOULD BE CHECKED BEFORE AND DURING CONSTRUCTION TO CONFIRM WHETHER GEOTEXTILE FABRIC IS NEEDED

DRAFT

0 20 40
1:500 METRES
HORIZONTAL SCALE

0 5 10
1:100 METRES
VERTICAL SCALE

CLIENT
FSM MANAGEMENT GROUP

DATE	2017-08-18
DESIGNED	M. MIAO / J. JI
PREPARED	GB
REVIEWED	M. MIAO
APPROVED	J. JI

Golder Associates

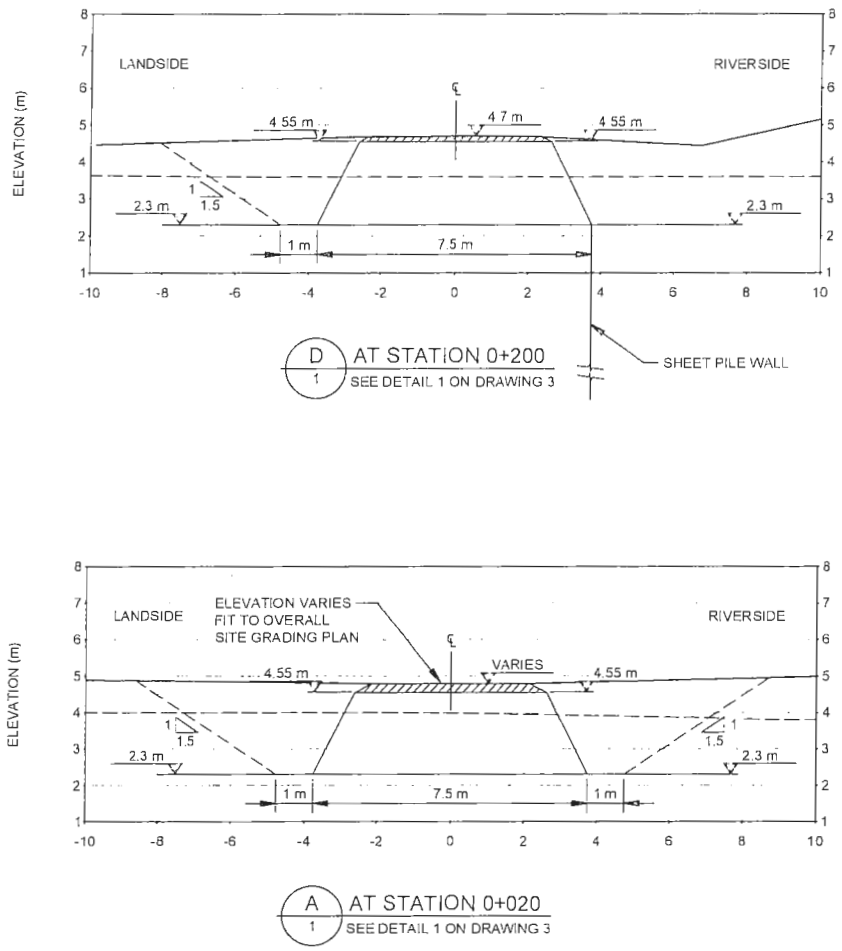
PROJECT
VANCOUVER AIRPORT FUEL DELIVERY PROJECT
NEW FLOOD PROTECTION DIKE
15040 WILLIAMS ROAD, RICHMOND, B.C.

TITLE
PLAN AND ELEVATION PROFILE

PROJECT NO.	PHASE	REV.	FIGURE
1406834	9442	B	1

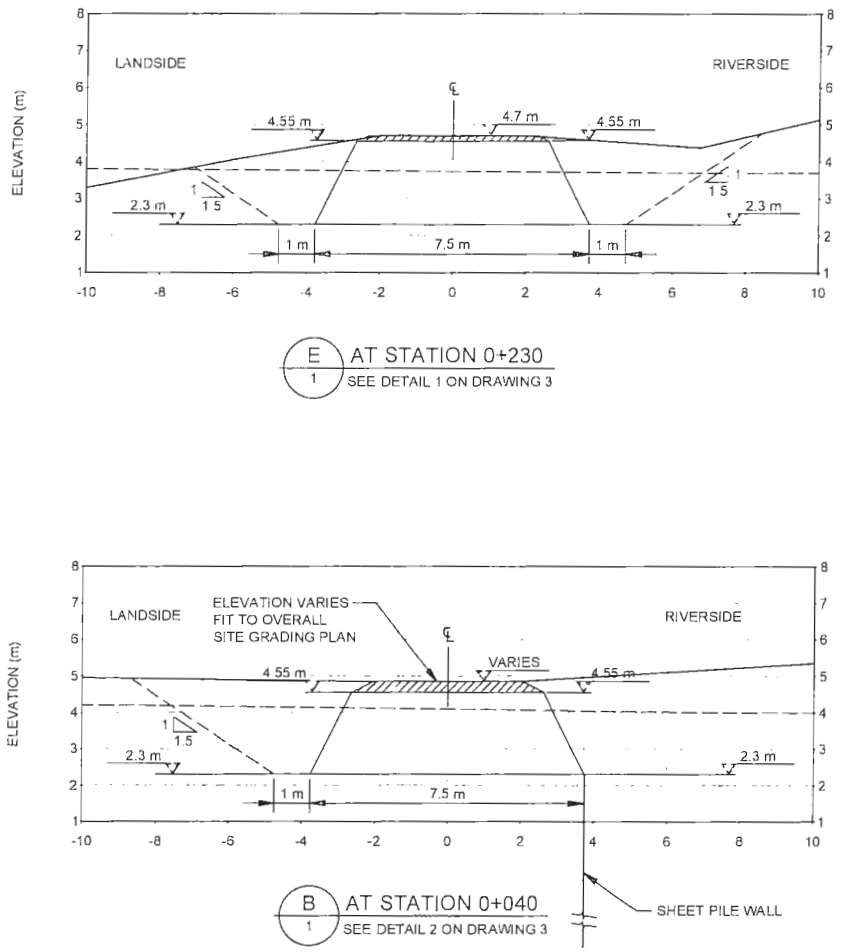
NOV 29 2017

Plan #5



D / 1 AT STATION 0+200
SEE DETAIL 1 ON DRAWING 3

SHEET PILE WALL

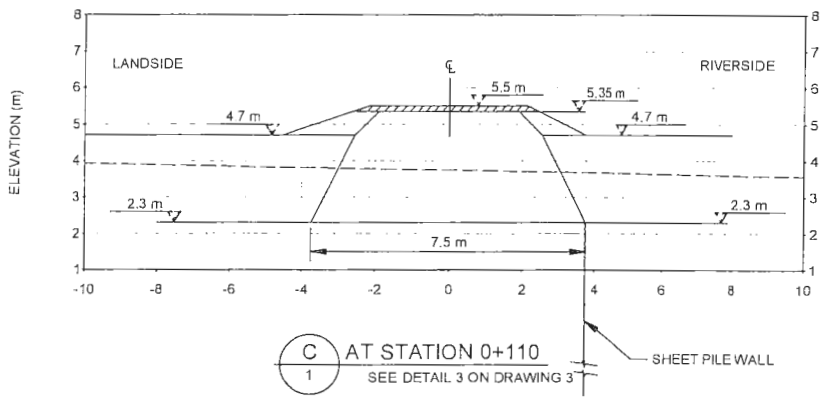


E / 1 AT STATION 0+230
SEE DETAIL 1 ON DRAWING 3

A / 1 AT STATION 0+020
SEE DETAIL 1 ON DRAWING 3

B / 1 AT STATION 0+040
SEE DETAIL 2 ON DRAWING 3

SHEET PILE WALL



C / 1 AT STATION 0+110
SEE DETAIL 3 ON DRAWING 3

SHEET PILE WALL

NOTE(S)
1. BASE DRAWING PROVIDED BY ARGUS CONSULTING
   CAD FILE: L2.01.DWG, DATED RECEIVED MAY 10, 2017
2. ELEVATION SHOWN ARE IN GEODETIC DATUM
3. DATUM NAD 83, PROJECTION ZONE 10

DRAFT

0 5 10
1:100 METRES

CLIENT
FSM MANAGEMENT GROUP

Golder Associates

DATE	2017-06-19
DESIGNED	M. MIAO / J. JI
PREPARED	GB
REVIEWED	M. MIAO
APPROVED	J. JI

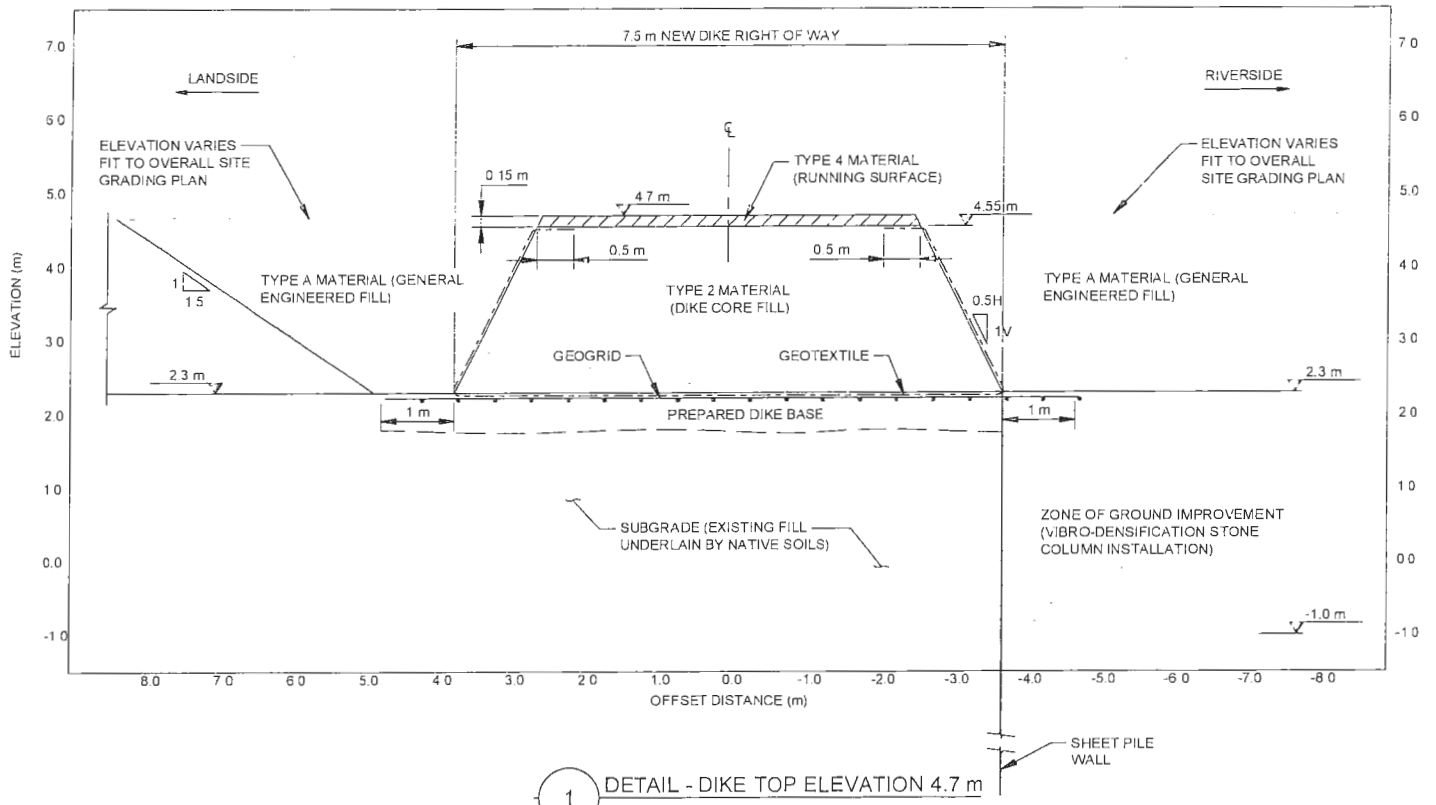
PROJECT
VANCOUVER AIRPORT FUEL DELIVERY PROJECT
NEW FLOOD PROTECTION DIKE
15040 WILLIAMS ROAD, RICHMOND, B.C.

TITLE
CROSS SECTIONS

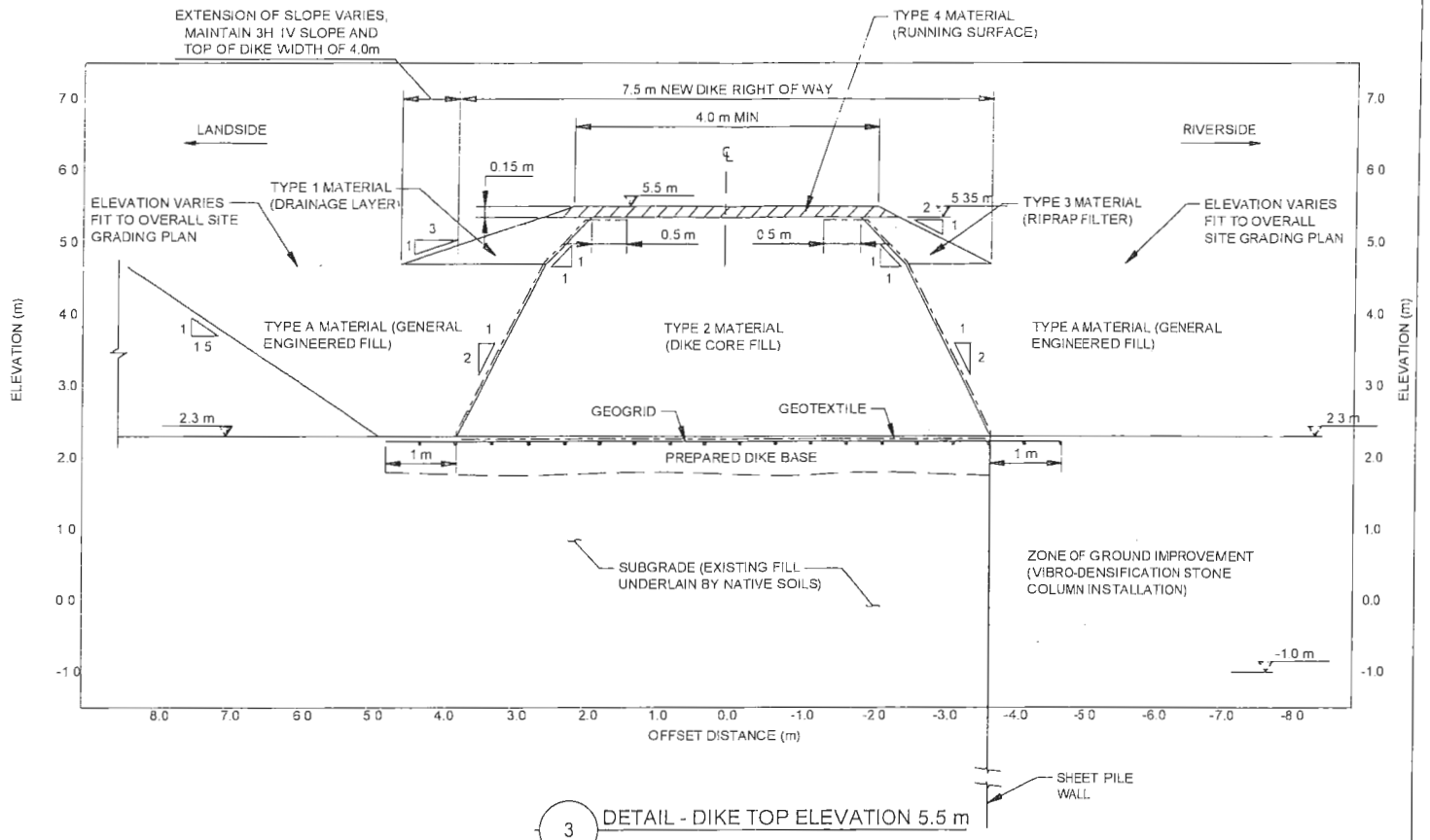
PROJECT NO.	PHASE	REV.	FIGURE
1406834	9442	B	2

NOV 29 2017

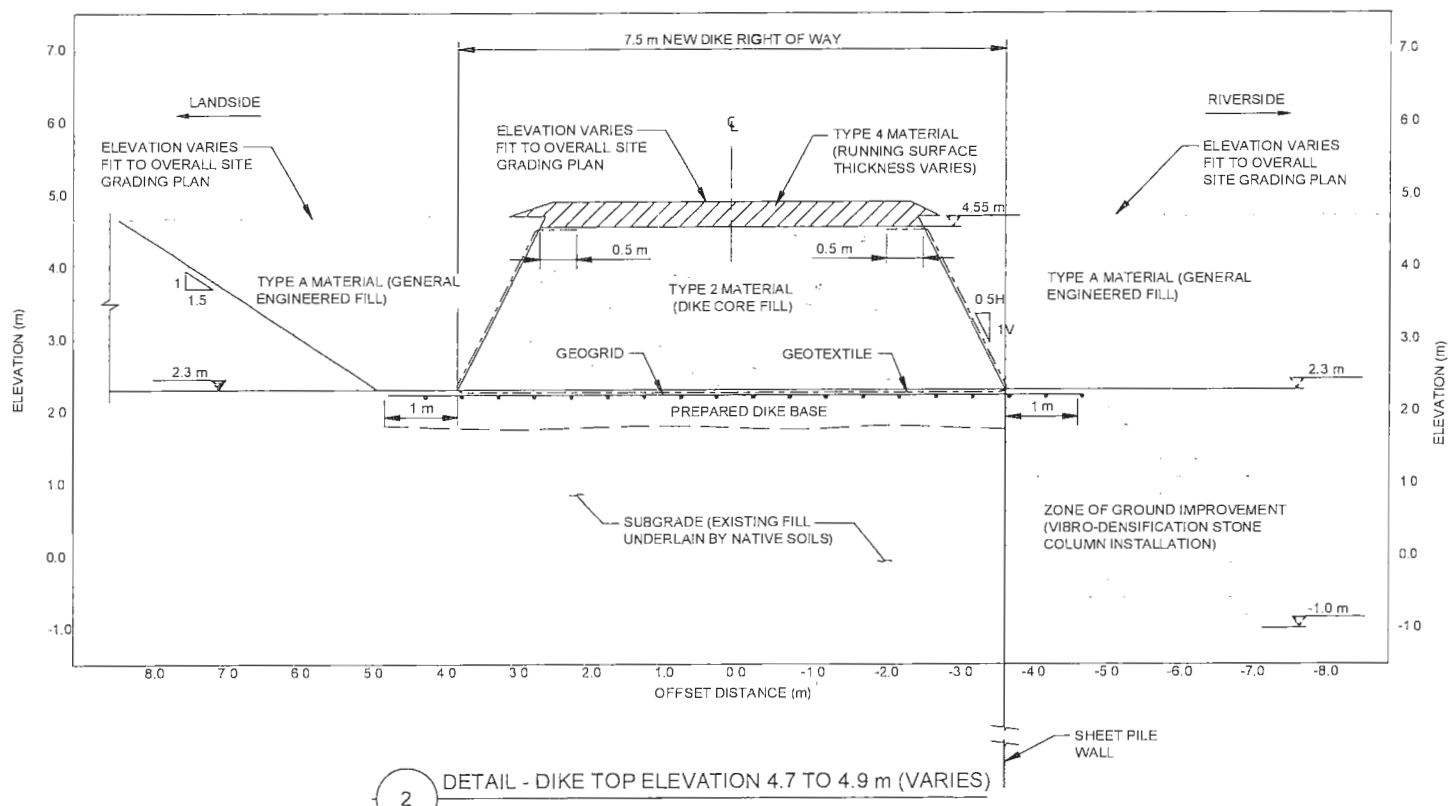
Plan #6



1 DETAIL - DIKE TOP ELEVATION 4.7 m



3 DETAIL - DIKE TOP ELEVATION 5.5 m



2 DETAIL - DIKE TOP ELEVATION 4.7 TO 4.9 m (VARIES)

TYPE 1 MATERIAL (DRAINAGE LAYER)
Type 1 material shall consist of clean well-graded 75 mm minus sand and gravel meeting the following gradation limits

PARTICLE SIZE (mm)	PERCENTAGE BY WEIGHT PASSING
75	100
37.5	60 - 100
19	35 - 80
9.5	26 - 60
4.75	20 - 40
2.36	15 - 30
1.18	10 - 20
0.6	5 - 15
0.3	3 - 10
0.075	0 - 5

TYPE 2 MATERIAL (BULK FILL OR DIKE CORE FILL)
Type 2 material shall consist of well-graded sand with 15 to 30 percent fines passing 0.075 mm sieve meeting the following gradation limits

PARTICLE SIZE (mm)	PERCENTAGE BY WEIGHT PASSING
19	100
4.75	80 - 100
0.425	25 - 90
0.15	18 - 50
0.075	15 - 30

TYPE 3 MATERIAL (RIPRAP FILTER)
Type 3 material shall consist of clean well-graded pit-run or processed sand, gravel and cobbles, or quarried stone meeting the following gradation limits

PARTICLE SIZE (mm)	PERCENTAGE BY WEIGHT PASSING
200	100
75	60 - 90
9.5	30 - 65
0.85	5 - 30
0.15	0 - 5

TYPE 4 MATERIAL (RUNNING SURFACE)
Type 4 material shall consist of clean well-graded 19mm minus sand and gravel or road mulch meeting the following gradation limits

PARTICLE SIZE (mm)	PERCENTAGE BY WEIGHT PASSING
19	100
12.5	75 - 100
9.5	60 - 90
4.75	40 - 70
2.36	27 - 55
1.18	16 - 42
0.6	8 - 30
0.3	5 - 20
0.075	2 - 8

TYPE A MATERIAL (GENERAL ENGINEERED FILL)
Type A material shall consist of clean well-graded 75 mm minus sand and gravel meeting the following gradation limits

PARTICLE SIZE (mm)	PERCENTAGE BY WEIGHT PASSING
75	100
37.5	30 - 100
19	20 - 100
4.75	10 - 60
1.18	6 - 32
0.3	4 - 15
0.075	0 - 5

NOTE(S)
1 BASE DRAWING PROVIDED BY ARGUS CONSULTING CAD FILE: L2.01.DWG DATED RECEIVED MAY 10 2017.
2 ELEVATION SHOWN ARE IN GEODETIC DATUM
3 DATUM NAD 83 PROJECTION ZONE 10

DRAFT

0 2 4
1:50 METRES

CLIENT
FSM MANAGEMENT GROUP

ISSUED	2017-08-18
DESIGNED	M. MIAO / J. JI
PREPARED	GB
REVIEWED	M. MIAO
APPROVED	J. JI

Golder Associates

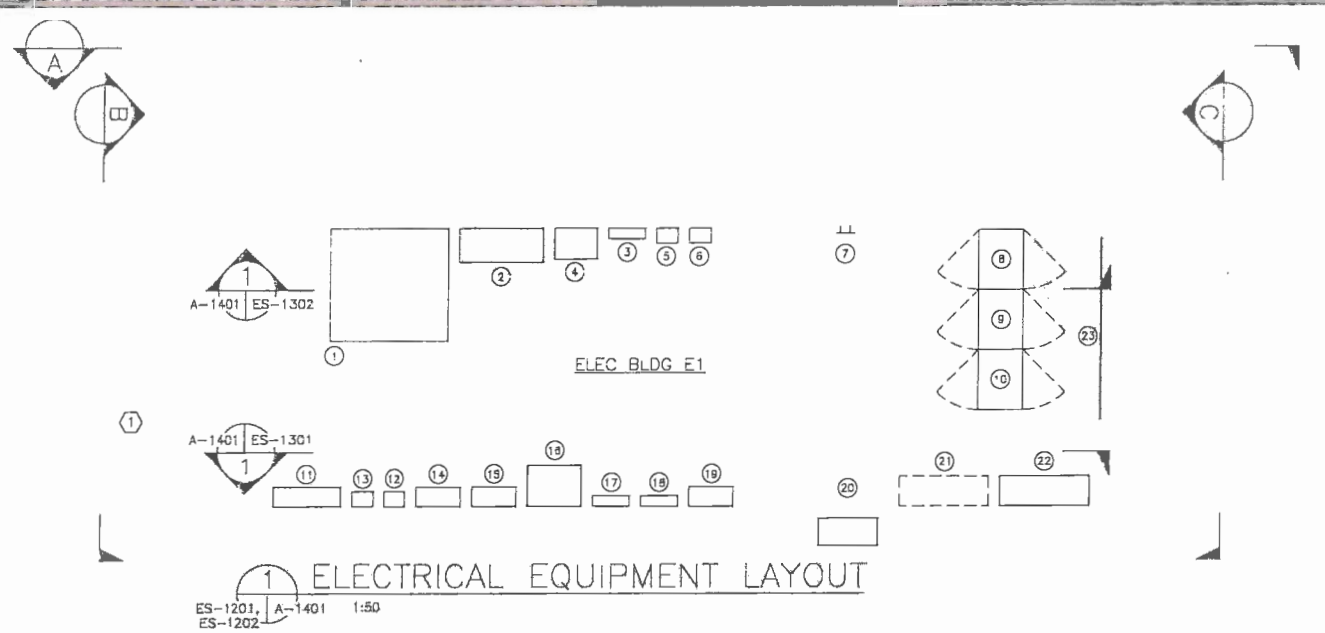
PROJECT
VANCOUVER AIRPORT FUEL DELIVERY PROJECT
NEW FLOOD PROTECTION DIKE
15040 WILLIAMS ROAD, RICHMOND, B.C.

TITLE
TYPICAL DETAILS

PROJECT	PHASE	REV.	FIGURE
1406834	9442	B	3

NOV 29 2017

Plan #7



1 ELECTRICAL EQUIPMENT LAYOUT
ES-1201, ES-1202 A-1401 1:50

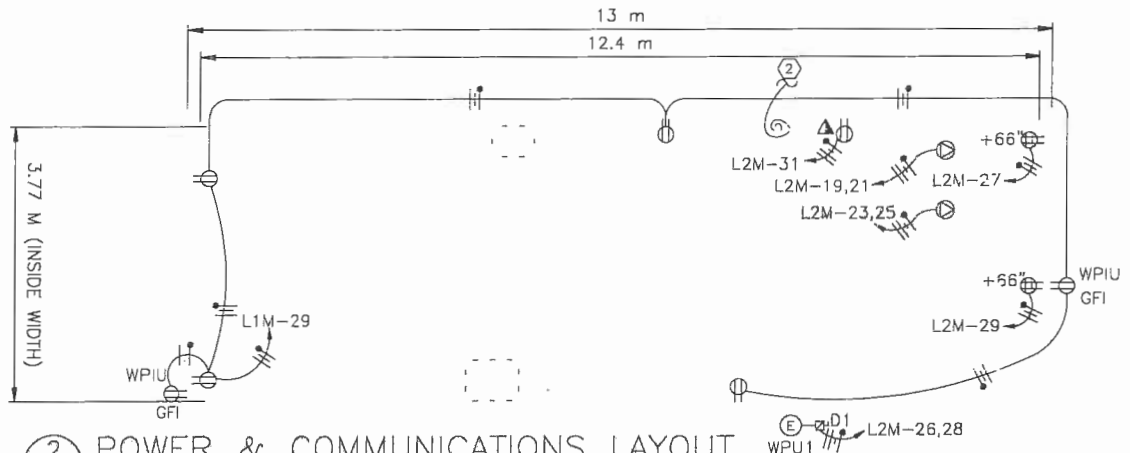
EQUIPMENT LIST			
ITEM(S)	QUANTITY	TAG(S)	DESCRIPTION
1	1	ATS1	AUTOMATIC TRANSFER SWITCH
2	1	MDP1	MAIN DISTRIBUTION PANELBOARD – NORMAL POWER
3	1	L1M	PANELBOARD L1M
4	1	T2M	TRANSFORMER
5	1	ST-SP-103	MOTOR STARTER
6	1	ST-SP-104	MOTOR STARTER
7	1	MGB1	MASTER GROUND BAR 1
8	1	CR1	COMMUNICATIONS RACK 1 (SHORE)
9	1	CR2	COMMUNICATIONS RACK 2 (PIER)
10	1	CR3	COMMUNICATIONS RACK 3 (FUTURE)
11	1	H1M	PANELBOARD H1M
12	1	ST-SP-101	MOTOR STARTER
13	1	ST-SP-102	MOTOR STARTER
14	1	H2M	PANELBOARD H2M
15	1	H2MB	PANELBOARD H2MB
16	1	T3M	TRANSFORMER
17	1	L2M	PANELBOARD L2M
18	1	L2MB	PANELBOARD L2MB
19	1	LCP1	PANELBOARD LCP1
20	1	WPU1	WALL PACKAGE UNIT 1
21	1	PLCC2	PROGRAMMABLE LOGIC CONTROLLER CAB 2 (FUTURE)
22	1	PLCC1	PROGRAMMABLE LOGIC CONTROLLER CAB 1
23	1	BKBD	PLYWOOD BACKBOARD

NOTES:

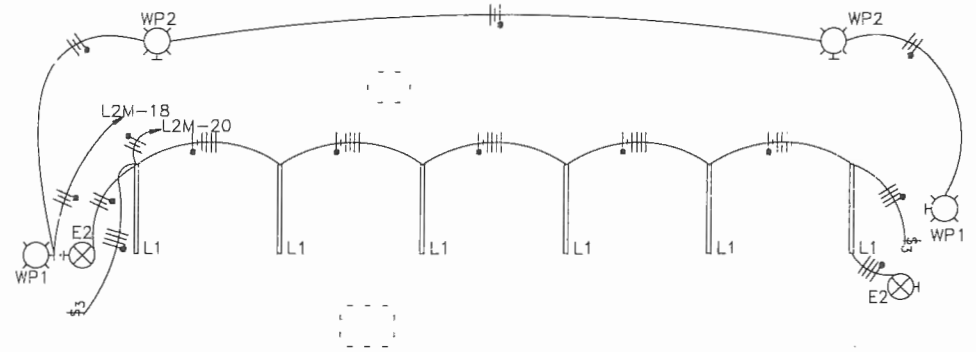
1. SEE DRAWINGS E-1001 AND E-1002 FOR LEGEND, ABBREVIATIONS AND GENERAL NOTES.
2. ELECTRICAL WORK SHOWN WITH DARK LINE WEIGHT SHALL BE PROVIDED.
3. SEE 1700 SERIES DRAWINGS FOR CABLE, DUCTBANK, LIGHTING, PANELBOARD, AND RACEWAY SCHEDULES.

⬡ KEYNOTES:

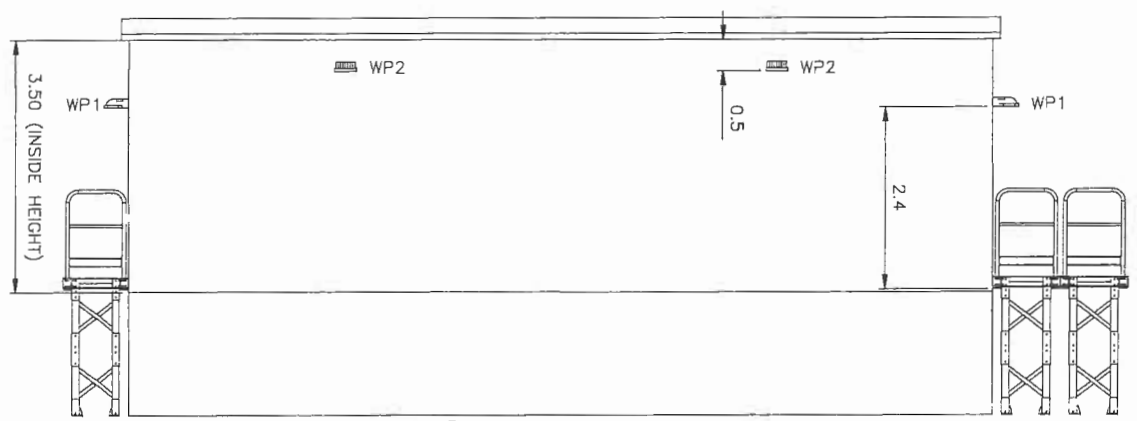
1. PROVIDE REMOVABLE RAIL WIDTH OF DOUBLE DOORS TO AID EQUIPMENT MOVEMENT. SEE STRUCTURAL DRAWINGS FOR DETAILS.
2. PROVIDE GROUND COILED. BOND TO BUILDING COUNTERPOISE FROM MASTER GROUND BAR. SEE DRAWING ES-1104 FOR CONTINUATION.



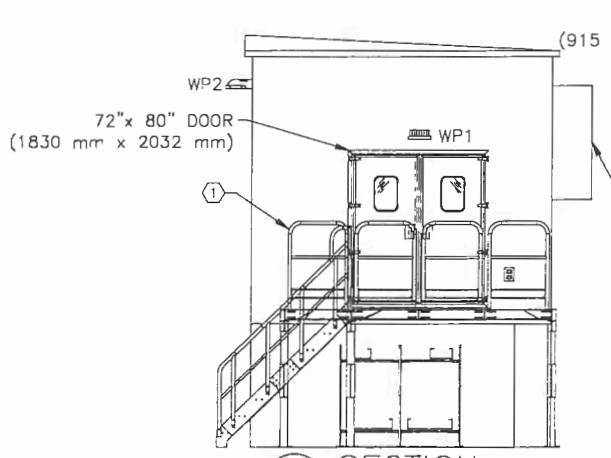
2 POWER & COMMUNICATIONS LAYOUT
ES-1201, ES-1202 A-1401 1:50



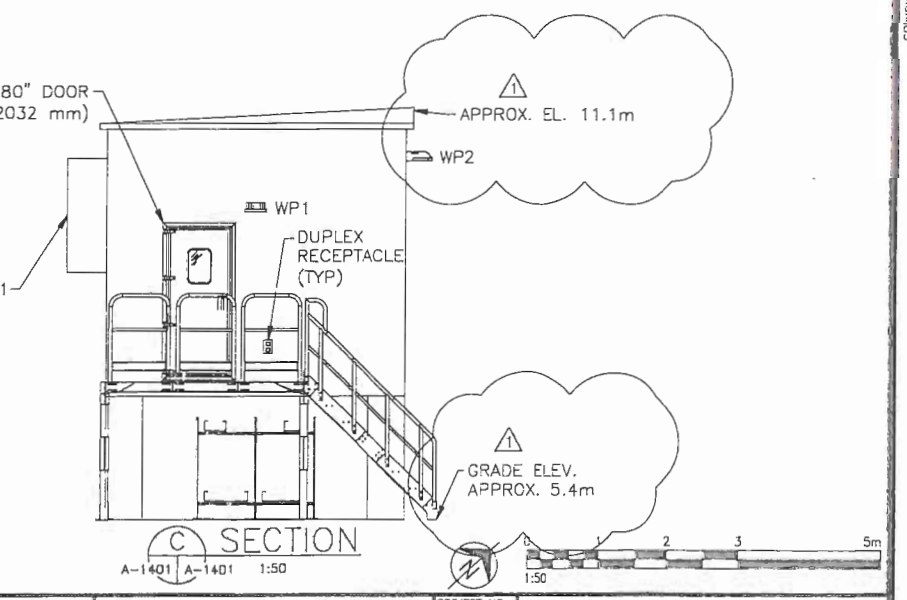
3 LIGHTING LAYOUT
ES-1201, ES-1202 A-1401 1:50



A SECTION
A-1401 A-1401 1:50



B SECTION
A-1401 A-1401 1:50



C SECTION
A-1401 A-1401 1:50

ISSUE NO.	DRAWING REVISIONS	ISSUE DATE
1	ADDED ELEVATION TEXT	08/18/2017
	ISSUED FOR CONSTRUCTION	02/14/17

Fuel Facilities Corporation

VANCOUVER AIRPORT FUEL DELIVERY PROJECT
MARINE RECEIVING AREA

VANCOUVER AIRPORT FUEL FACILITIES CORPORATION
RICHMOND, BRITISH COLUMBIA

SEAL

LOGO

ARGUS CONSULTING, INC.
6363 College Boulevard, Suite 600
Overland Park, Kansas 66211
816.228.7500 FAX 816.228.7535
www.argusconsulting.com

PROJECT NO:	15004.22
DATE:	03/19/16
DESIGNED BY:	WBJ
DRAWN BY:	SMF
CHECKED BY:	DWF
CAD FILE NAME:	15004.22C-A1401

E1 ELEC BLDG FLOOR PLAN

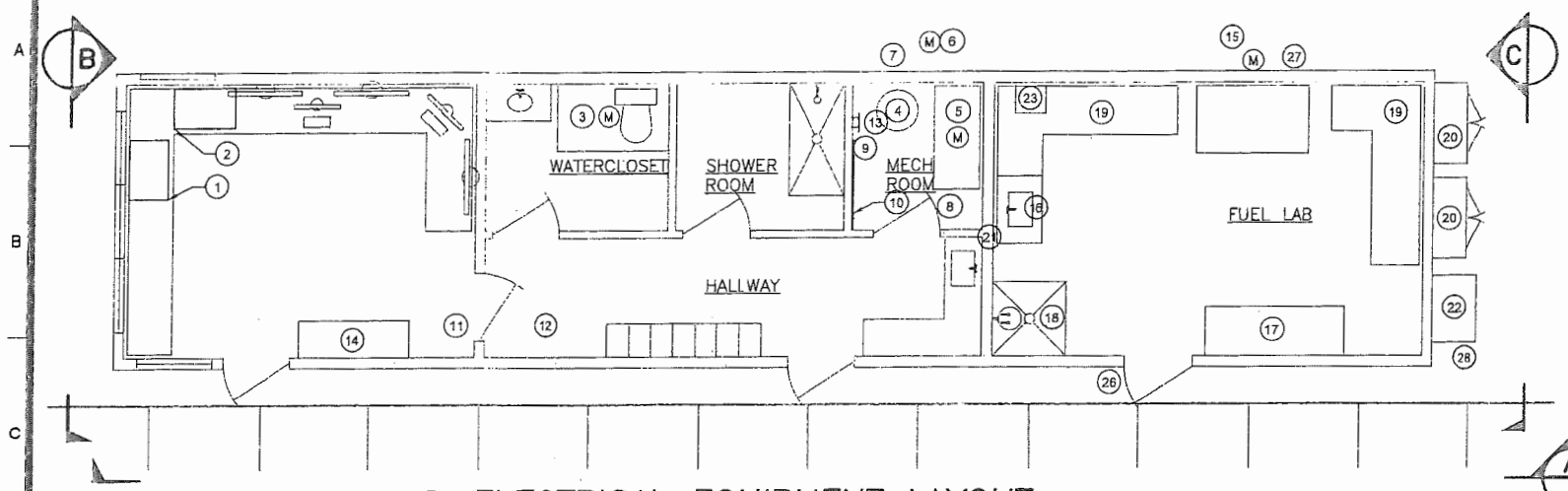
DRAWING NO.: A-1401

ISSUED FOR CONSTRUCTION NOV 27 2017

PLEASE RECYCLE

Plotted: Y:\Comm\YVR – Vancouver\15004 VAFDP\Dwgs\22-Marine\22C – Design\Arch\15004.22C-A1401.dwg on 08/18/17 at 5:53 PM by SNEWBOLD using acad.stb

Plan #8



1 ELECTRICAL EQUIPMENT LAYOUT
ES-1203 | A-1402 1:50

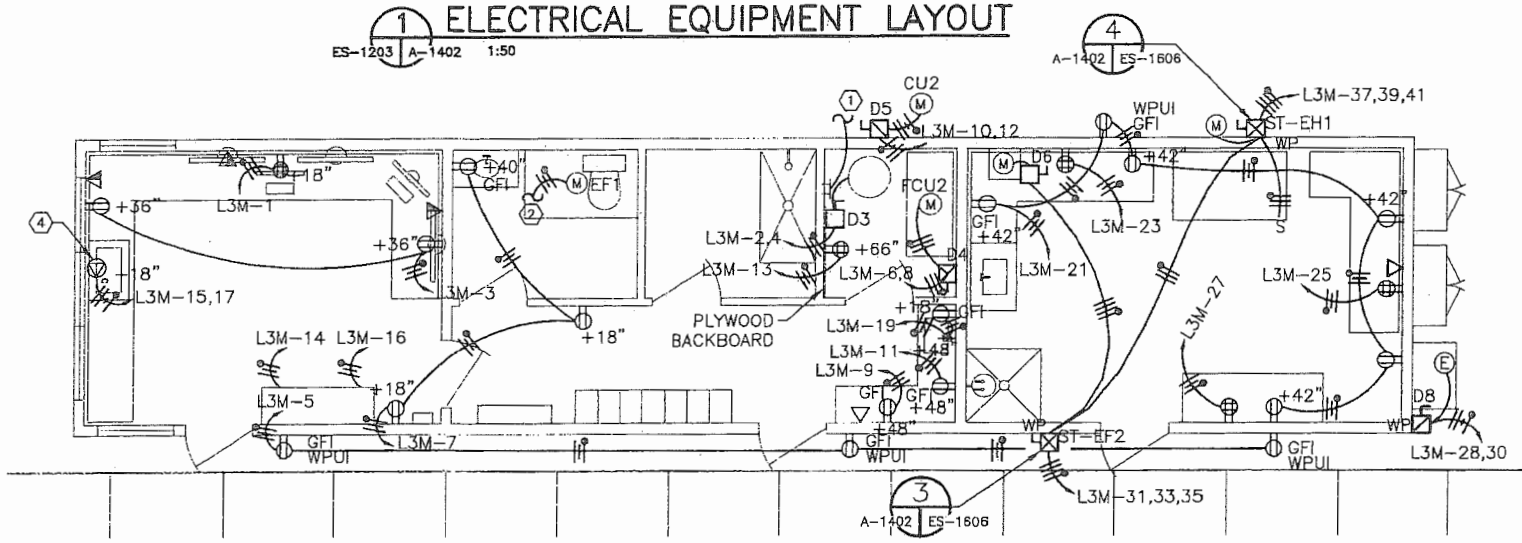
EQUIPMENT LIST			
ITEM(S)	QUANTITY	TAG(S)	DESCRIPTION
1	1	MR-CR-4	COMMUNICATIONS RACK 4
2	1	MR-CR-5	COMMUNICATIONS RACK 5
3	1	EF1	EXHAUST FAN 1
4	1	WH1	WATER HEATER 1
5	1	FCU2	FAN COIL UNIT 2
6	1	CU2	CONDENSING UNIT 2
7	1	D5	SERVICE DISCONNECT (CU2)
8	1	D4	SERVICE DISCONNECT (FCU2)
9	1	D3	SERVICE DISCONNECT (WH1)
10	1	BKBD	PLYWOOD BACKBOARD
11	1	GAP1	GENERATOR ANUNCIATOR PANEL
12	1	L3M	PANELBOARD L3M
13	1	MGB2	MASTER GROUND BAR 2
14	1	NODE1	FIRE ALARM CONTROL PANEL
15	1	EH1	EXHAUST HOOD
16	1	CT1	WATER ONLY SINK
17	1	CB1	WORKBENCH BASE CABINETS
18	1	EWSH1	EYE WASH / SHOWER STATION
19	2	CB2	CABINET BASE AND OVERHEAD UNIT (LEFT CORNER)
20	2	CO	OUTDOOR FUEL SAMPLE CABINETS
21	1	FW1	FIRE WALL BETWEEN OPERATIONS AND FUEL LAB
22	1	WPU2	WALL PACKAGE UNIT 2
23	1	EF2	EXHAUST FAN
24	1	D6	SERVICE DISCONNECT (EF2)
25	1	D7	SERVICE DISCONNECT (WPU2)
26	1	ST-EF2	MOTOR STARTER (EF2)
27	1	ST-EH1	MOTOR STARTER (EH1)

NOTES:

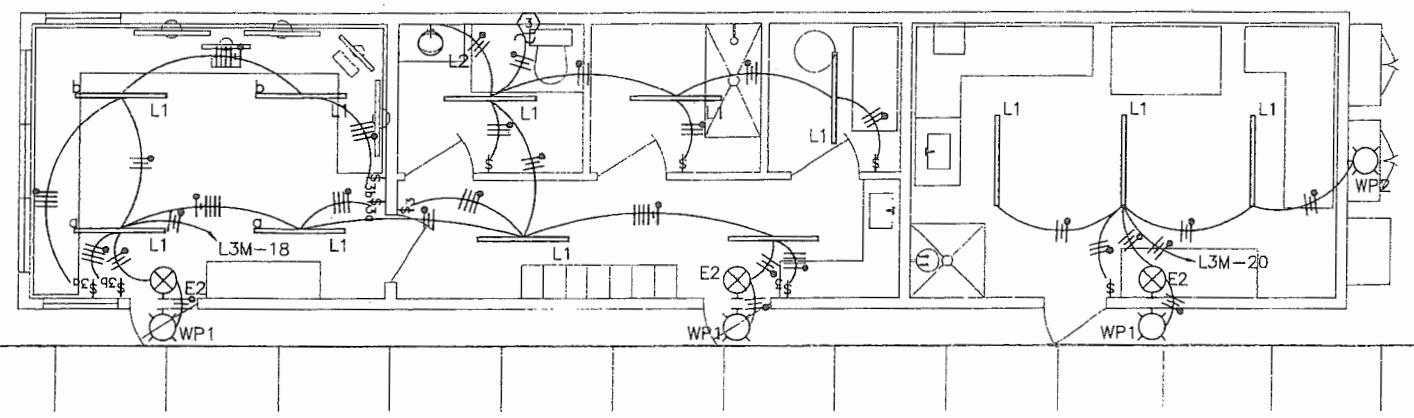
1. SEE DRAWINGS E-1001 AND E-1002 FOR LEGEND, ABBREVIATIONS AND GENERAL NOTES.
2. ELECTRICAL WORK SHOWN WITH DARK LINE WEIGHT SHALL BE PROVIDED.
3. SEE 1700 SERIES DRAWINGS FOR CABLE, DUCTBANK, LIGHTING, PANELBOARD, AND RACEWAY SCHEDULES.

KEYNOTES:

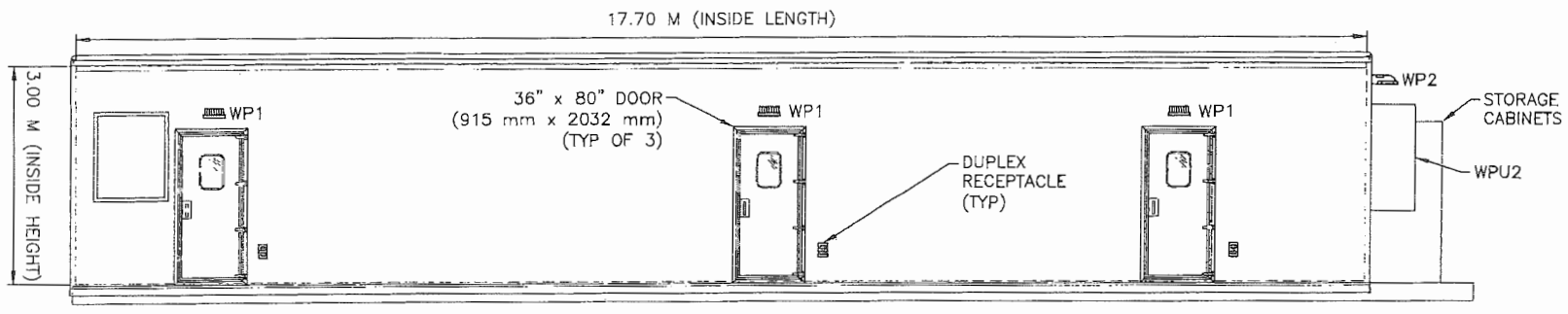
1. PROVIDE GROUND COILED IN MECHANICAL ROOM. BOND TO BUILDING COUNTERPOISE FROM MASTER GROUND BAR. SEE DRAWING ES-1104 FOR CONTINUATION.
2. SEE CONTINUATION FOR EXHAUST FAN ON DETAIL 3 LIGHTING LAYOUT ON THIS SHEET.
3. SEE CONTINUATION FOR EXHAUST FAN ON DETAIL 2 POWER LAYOUT ON THIS SHEET.
4. PROVIDE RECEPTACLE TO MATCH UPS EQUIPMENT PLUG.



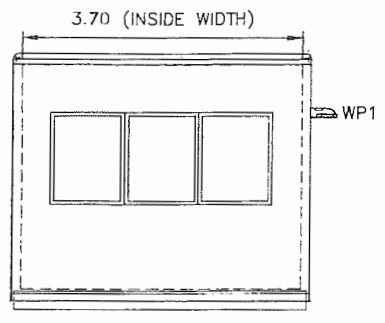
2 POWER & COMMUNICATIONS LAYOUT
ES-1203 | A-1402 1:50



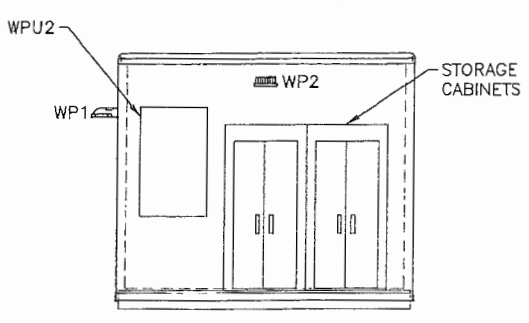
3 LIGHTING LAYOUT
ES-1203 | A-1402 1:50



A SECTION
ES-1203 | A-1402 1:50



B SECTION
ES-1203 | A-1402 1:50



C SECTION
ES-1203 | A-1402 1:50

N

0 0.15 1 1.5 2.5m
1:38

ISSUE NO.	DRAWING REVISIONS	ISSUE DATE
	ISSUED FOR CONSTRUCTION	02/14/17

Vancouver Airport Fuel Facilities Corporation
109-12300 Horseshoe Way
Richmond BC V7A 4Z1
604.271.7113
www.bmgroup.ca
www.vancouverairportfuel.ca

VANCOUVER AIRPORT FUEL DELIVERY PROJECT
MARINE RECEIVING AREA

VANCOUVER AIRPORT FUEL FACILITIES CORPORATION
RICHMOND, BRITISH COLUMBIA

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6363 College Boulevard, Suite 600
Overland Park, Kansas 66211
816.228.7500 FAX 816.228.7535
www.argusconsulting.com

PROJECT NO:	15004.22
DATE:	03/19/16
DESIGNED BY:	WBJ
DRAWN BY:	SMF
CHECKED BY:	DWF
CAD FILE NAME:	15004.22CA1402

OPS1 OPERATIONS BLDG AND FL1 FUEL LAB FLOOR PLANS

DRAWING NO.: A-1402

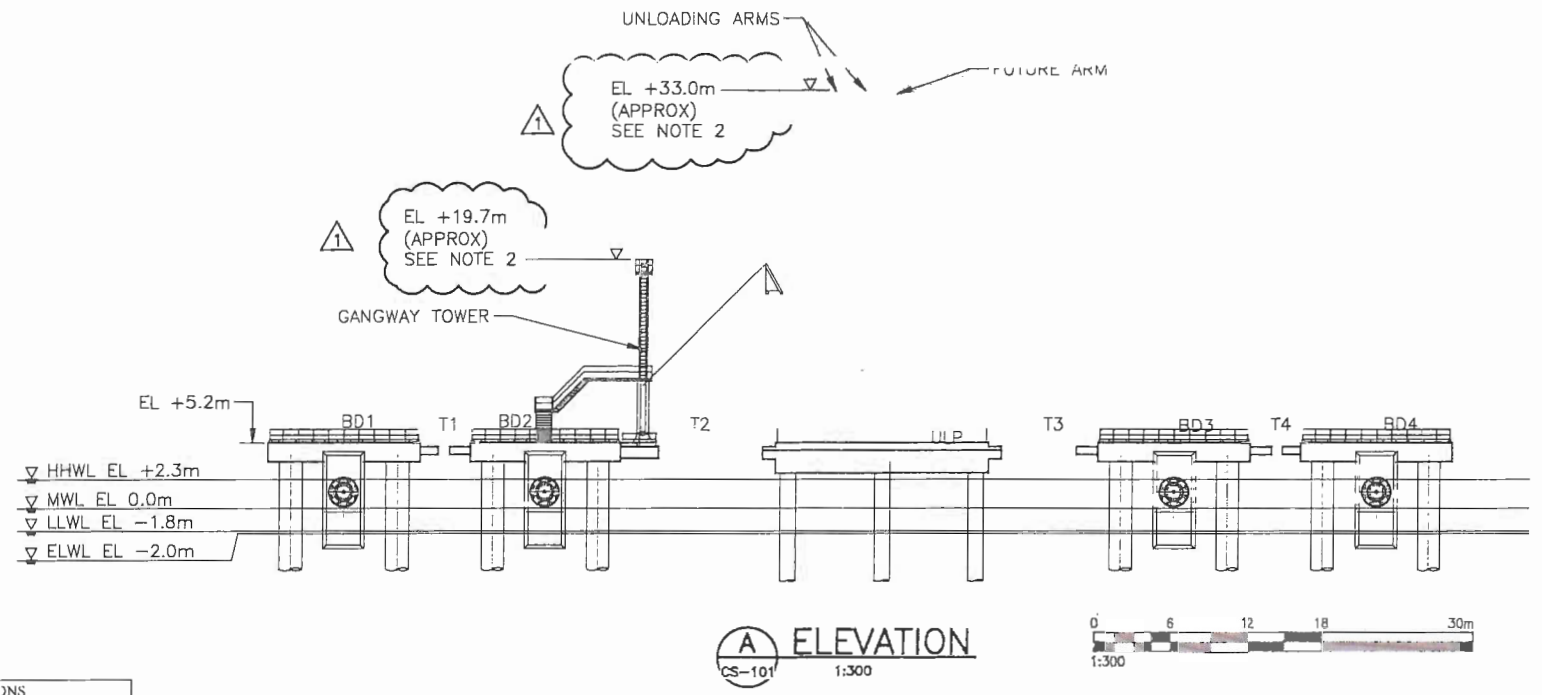
PLEASE RECYCLE

NOV 29 2017

ISSUED FOR CONSTRUCTION

Plan #9

Plotted: Y:\Comm\YVR – Vancouver\15004 VAFDP\Dwgs\22-Marine\22C – Design\Arch\15004.22CA1402.dwg on 03/6/17 at 1:58 PM by GCROWDER using acad.stb



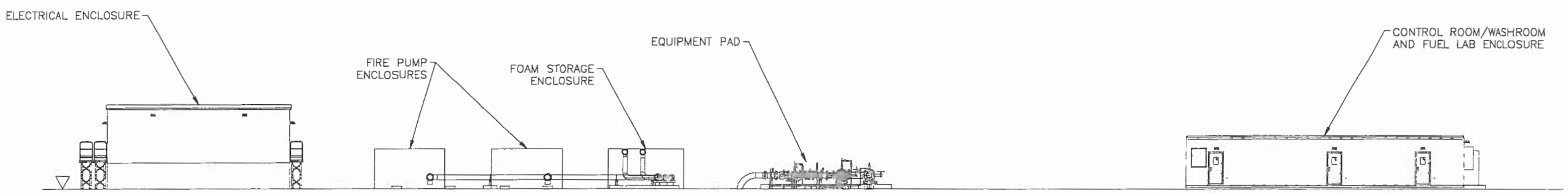
A CS-101 ELEVATION
1:300

0 6 12 18 30m
1:300

NOTES:

1. ELEVATIONS ARE TO GEODETIC DATUM.
2. ELEVATIONS OF VENDOR SUPPLIED MECHANICAL EQUIPMENT SHOWN ARE APPROXIMATE AND SUBJECT TO CHANGE ONCE EQUIPMENT IS ORDERED AND SHOP DRAWINGS PRODUCED.

BUILDING AREA AND STRUCTURE ELEVATIONS			
BUILDING NAME	FLOOR AREA (M^2)	STRUCTURE HEIGHT (M)	STRUCTURE ELEVATION (M)
CONTROL ROOM AND WASHROOM ENCLOSURE	43.29	3.5	9.0
FUEL LAB ENCLOSURE	21.65	3.5	9.0
FIRE PUMP ENCLOSURE 1	33.51	2.6	8.1
FIRE PUMP ENCLOSURE 2	33.51	2.6	8.1
FOAM STORAGE ENCLOSURE	28.01	2.6	8.1
ELECTRICAL ENCLOSURE	45.97	5.5	11.0
DOCK UNLOADING ARMS	N/A	33.0	37.8
DOCK GANGWAY TOWER	N/A	19.7	24.5
NOTE: THE MARINE UNLOADING ARMS ELEVATION ARE TO BE DETERMINED BY THE MANUFACTURER. APPROXIMATE ELEVATIONS OF THE STRUCTURE ARE LISTED ABOVE			
SITE AREA: 40,468 M^2 LOT COVERAGE AREA: 0.52%			



B CS-101 ELEVATION
1:150

0 3 6 9 15m
1:150

NOV 29 2017

ISSUED FOR DEVELOPMENT PERMIT REVIEW

ISSUE NO.	DRAWING REVISIONS	ISSUE DATE
2	ISSUED FOR DEVELOPMENT PERMIT REVIEW	05/05/2017
1	ELEVATIONS ADDED	04/27/2017
0	ISSUED FOR CONSTRUCTION	02/14/2017

Fuel Facilities Corporation

VANCOUVER AIRPORT FUEL DELIVERY PROJECT
MARINE RECEIVING AREA
MARINE DESIGN PACKAGE
VANCOUVER AIRPORT FUEL FACILITIES CORPORATION
RICHMOND, BRITISH COLUMBIA

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ARGUS CONSULTING, INC.
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Overland Park, Kansas 66211
816.228.7500 FAX 816.228.7535
www.argusconsulting.com

PROJECT NO:	15004.22C
DATE:	12/18/15
DESIGNED BY:	FS
DRAWN BY:	AVV
CHECKED BY:	RB
CAD FILE NAME	15004.22C-G031

ELEVATION

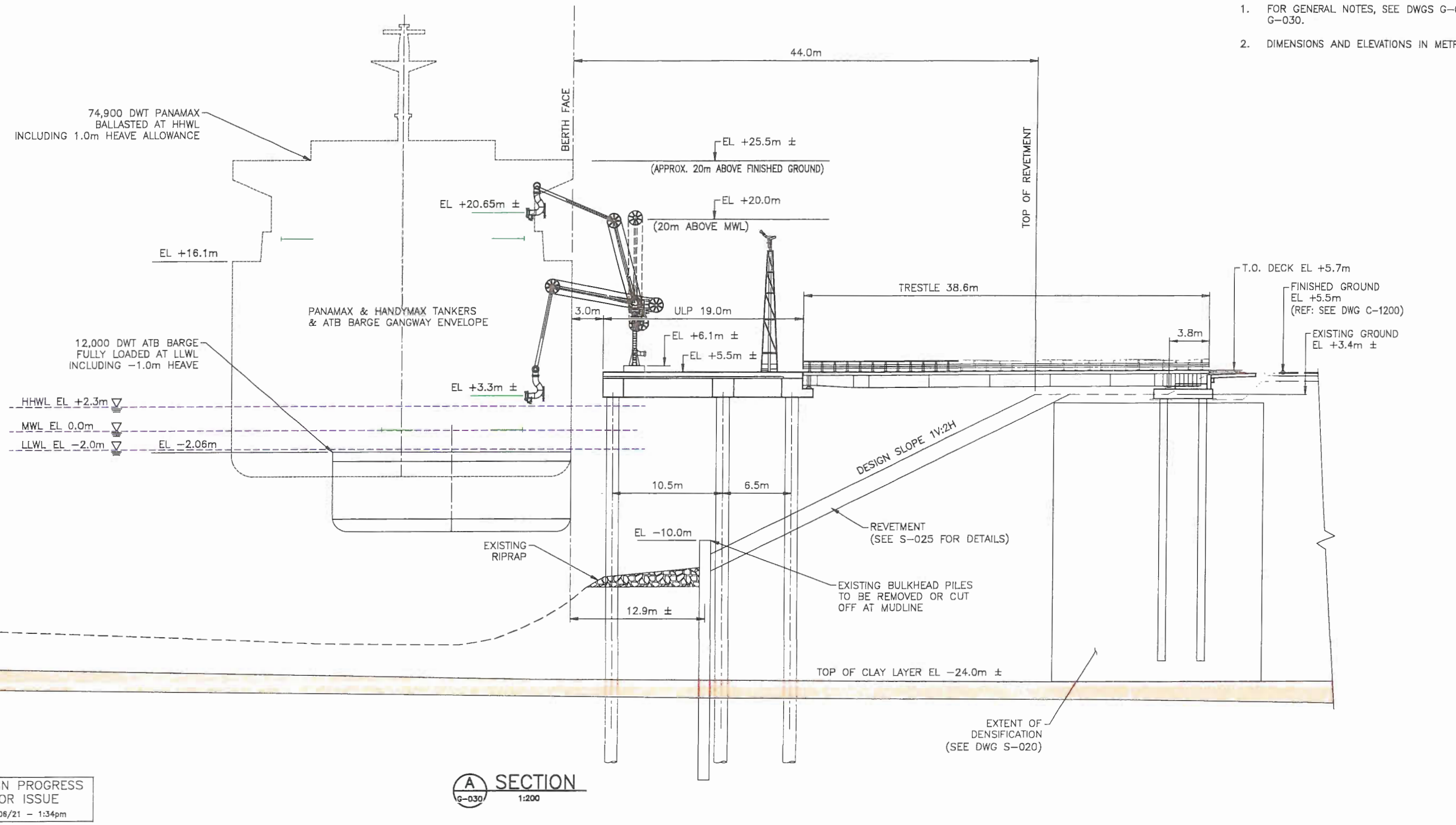
DRAWING NO.: G-031

Plotted: Y:\Comm\YVR - Vancouver\15004 VAFDP\Dwgs\22-Marine\22A - Permit\Ger\15004.22C-G031 ELEVATION 2017-05-01\15004.22C-G031.dwg on 05/5/17 at 8:13 AM by NPARK using acad.stb

Plan # 10

NOTES:

1. FOR GENERAL NOTES, SEE DWGS G–003 & G–030.
2. DIMENSIONS AND ELEVATIONS IN METRES (m).



A G–030 SECTION 1:200

REVISION IN PROGRESS
NOT FOR ISSUE
DATE: 2017/06/21 – 1:34pm

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

0 4 8 12 20m
1:200

NOV 29 2017

ISSUED FOR CONSTRUCTION

PLEASE RECYCLE

ISSUE NO.	DRAWING REVISIONS	ISSUE DATE

Fuel Facilities Corporation

PSM GROUP 106 12300 Horseshoe Way Richmond BC V7A 4Z1 604-271-7113 www.psmgroup.ca www.vancouverairportfuel.ca

VANCOUVER AIRPORT FUEL DELIVERY PROJECT
MARINE RECEIVING AREA
MARINE DESIGN PACKAGE
VANCOUVER AIRPORT FUEL FACILITIES CORPORATION
RICHMOND, BRITISH COLUMBIA

SEAL

LOGO
moffatt & nichol
777 WEST BROADWAY, STE 301
VANCOUVER, BC CANADA V5Z 4J7
604–707–9004

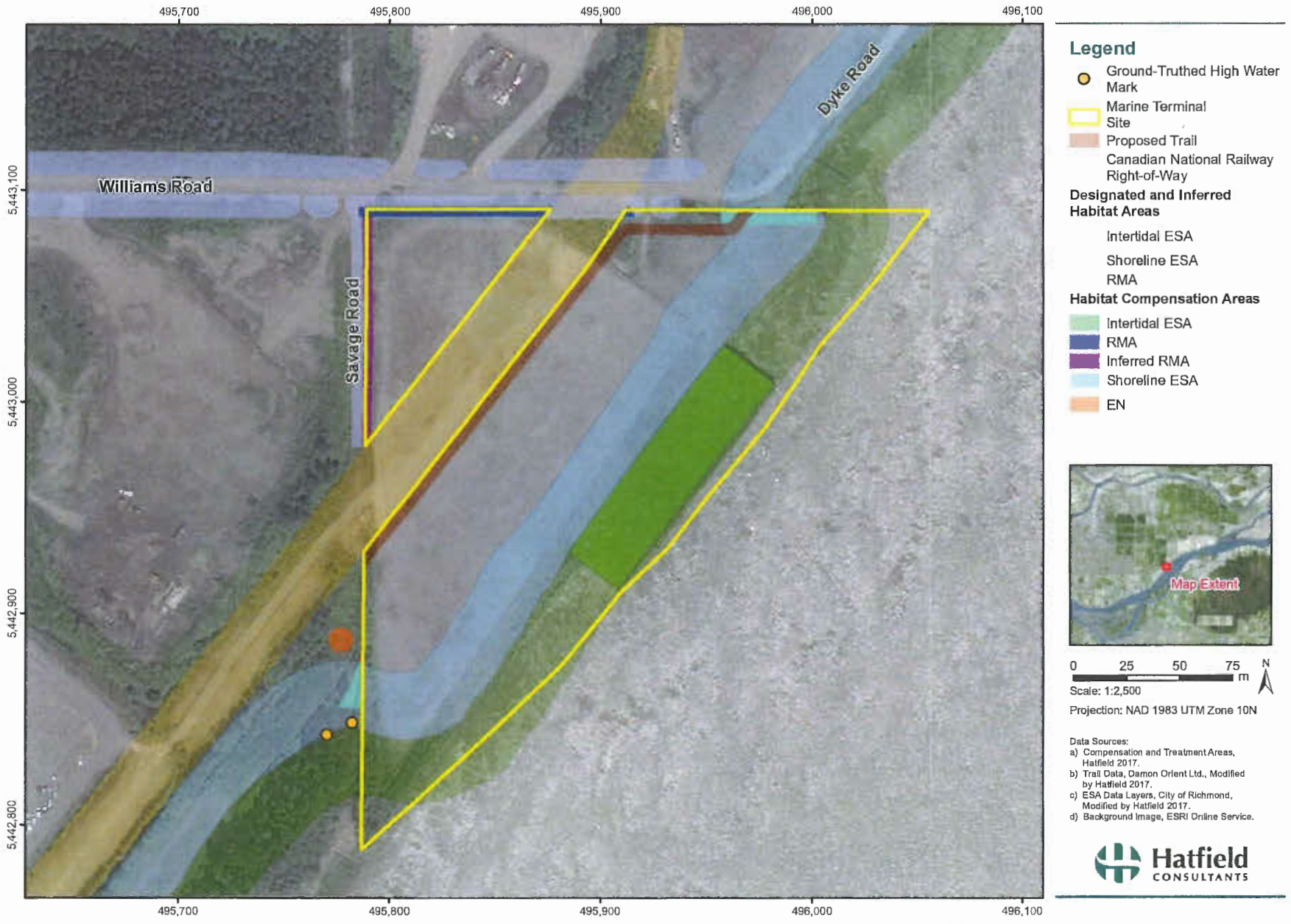
Argus
ENGINEERING | PLANNING | MANAGEMENT
ARGUS CONSULTING, INC.
8383 College Boulevard, Suite 600
Overland Park, Kansas 66211
816.228.7500 FAX 816.228.7535
www.argusconsulting.com

PROJECT NO: 15004.22C	UNLOADING PLATFORM SECTION
DATE: 10/20/15	
DESIGNED BY: SP	
DRAWN BY: AVM	
CHECKED BY: RB	DRAWING NO.: G-034
CAD FILE NAME: 15004.22C-G034	

Plotted: P:\8338 VC Vancouver Airport Fuel Delivery Project\CADD_Active\15004.22C-G034.dwg on 06/21/17 at 1:34 PM by AMANUZON using Argus.stb

Plan #11

Figure 1 Vancouver Airport Fuel Delivery Project – Marine terminal proposed habitat compensation areas



Legend

- Ground-Truthed High Water Mark
- Marine Terminal Site
- Proposed Trail
- Canadian National Railway Right-of-Way

Designated and Inferred Habitat Areas

- Intertidal ESA
- Shoreline ESA
- RMA

Habitat Compensation Areas

- Intertidal ESA
- RMA
- Inferred RMA
- Shoreline ESA
- EN

0 25 50 75 m N

Scale: 1:2,500

Projection: NAD 1983 UTM Zone 10N

Data Sources:
a) Compensation and Treatment Areas, Hatfield 2017.
b) Trail Data, Damon Orient Ltd., Modified by Hatfield 2017.
c) ESA Data Layers, City of Richmond, Modified by Hatfield 2017.
d) Background Image, ESRI Online Service.

Hatfield CONSULTANTS

K:\Data\Project\VAFFC6773\A_MXD\HabitatComp\MarineTerminal\VAFFC6773_Fig1_MT_HabitatComp_20170629_v1_13_SJ.mxd

This plan is reprinted from the
ESA and RMA Environmental Impacts Report
by
Hatfield Environmental Consultants

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landscape architects

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Vancouver, BC, Canada
V6R 2H9

t. 604-222-9200
e. dvo@telus.net
w. damonoriente.ca

Project
VAFFC MARINE TERMINAL FACILITY

15040 Williams Road, Richmond BC

Drawing
PROPOSED COMPENSATION AREAS

Issue:
31 Oct. 2017 Development Permit Application Resubmission - ADP Comments

Scale: nts

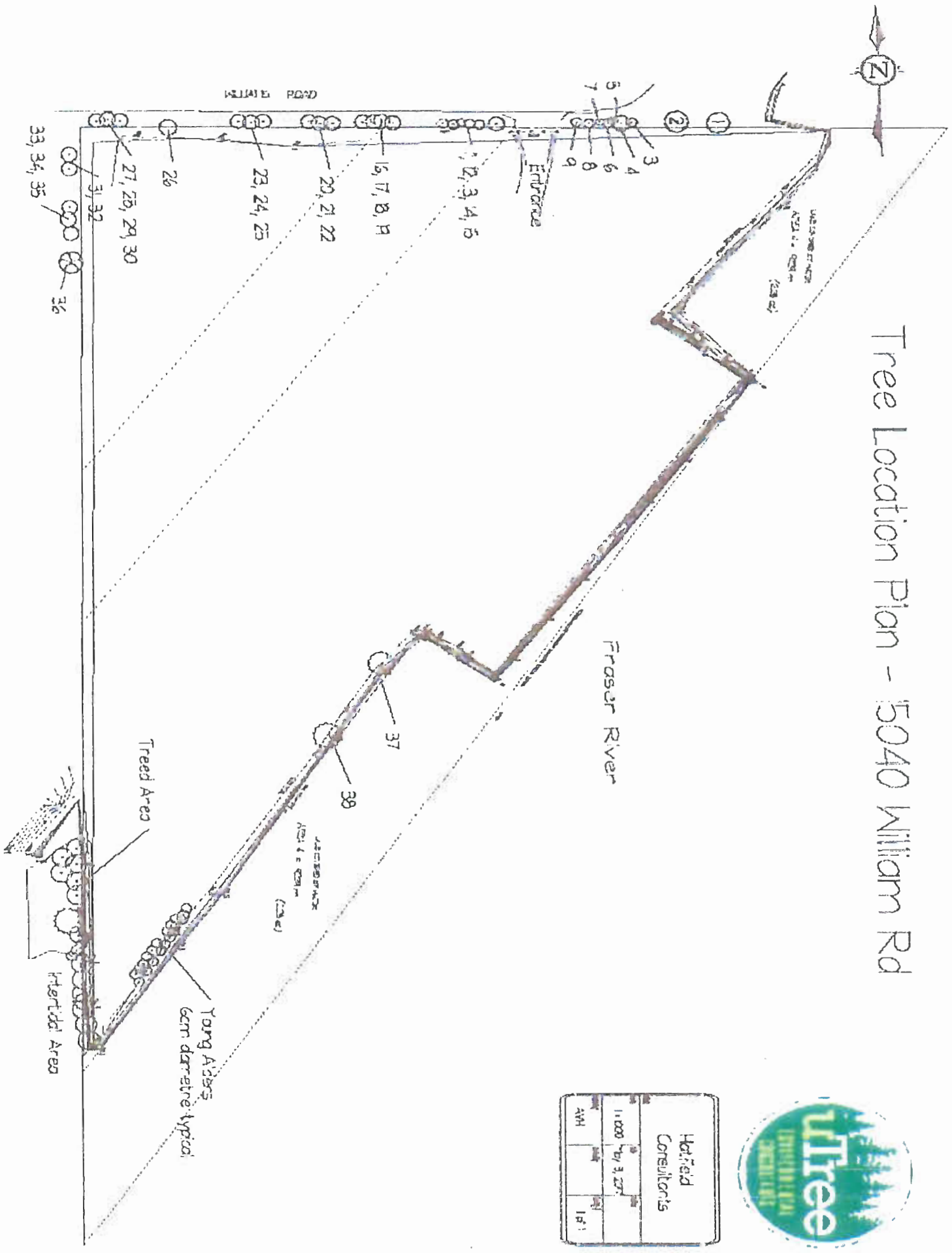
Date:

Project Number: 2014-280

Dwg
L0.03

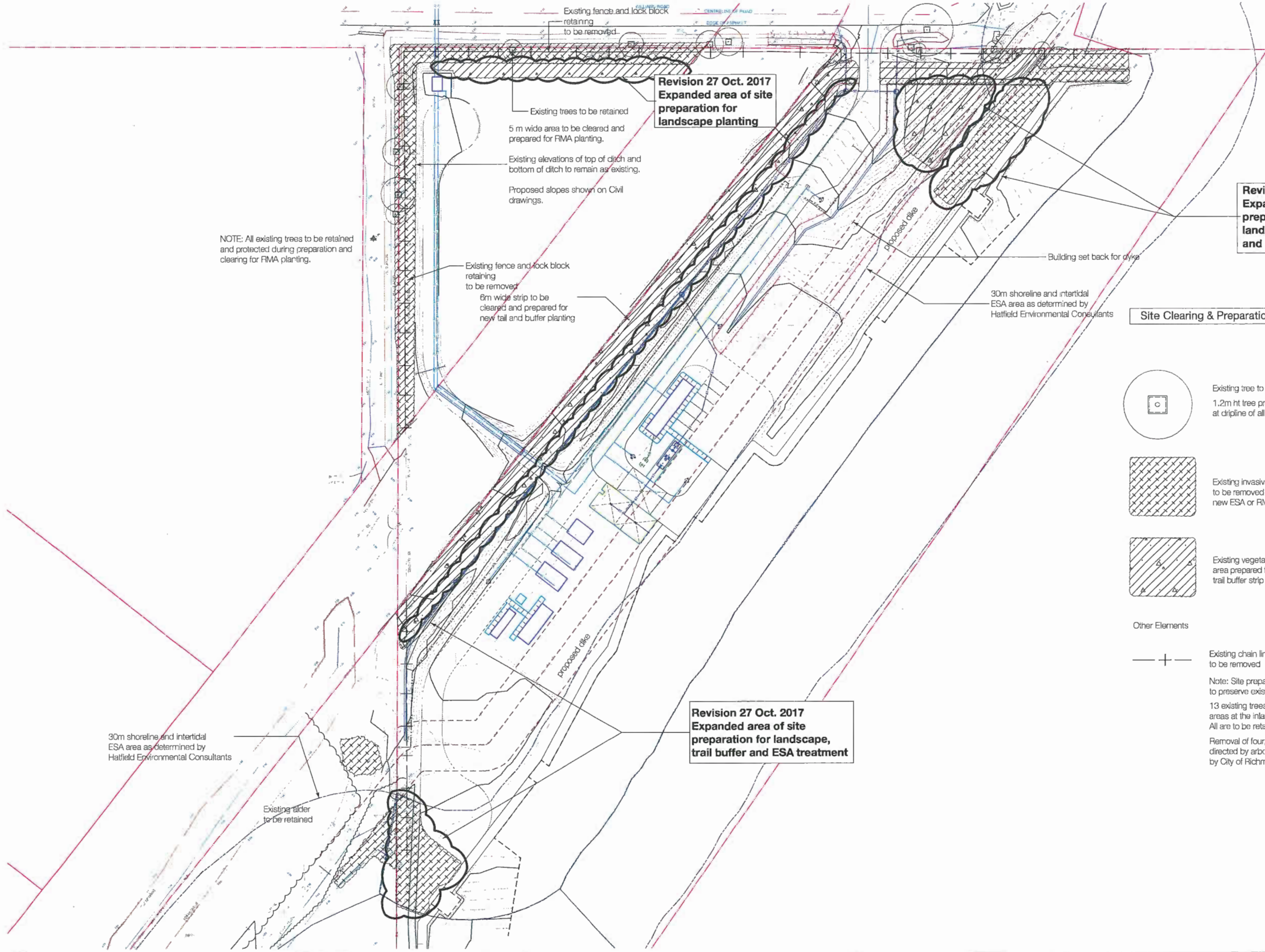
Plan # 12

Tree Location Plan - 5040 William Rd



uTree Environmental Consultants.
p 604-328-0614 e avanderhelm1@gmail.com w www.utree.com

Plan #13



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f. 604-222-9212
e. dvo@telus.net
w. damonoriente.ca

Project
VAFFC MARINE TERMINAL FACILITY
16040 Williams Road, Richmond BC

Drawing
SITE PREPARATION & CLEARING

Issue 19 May 2017 Development Permit Application
30 June 2017 Development Permit Application Resubmission
18 July 2017 Development Permit Application Resubmission
31 Oct. 2017 Development Permit Application Resubmission - ADP Comments

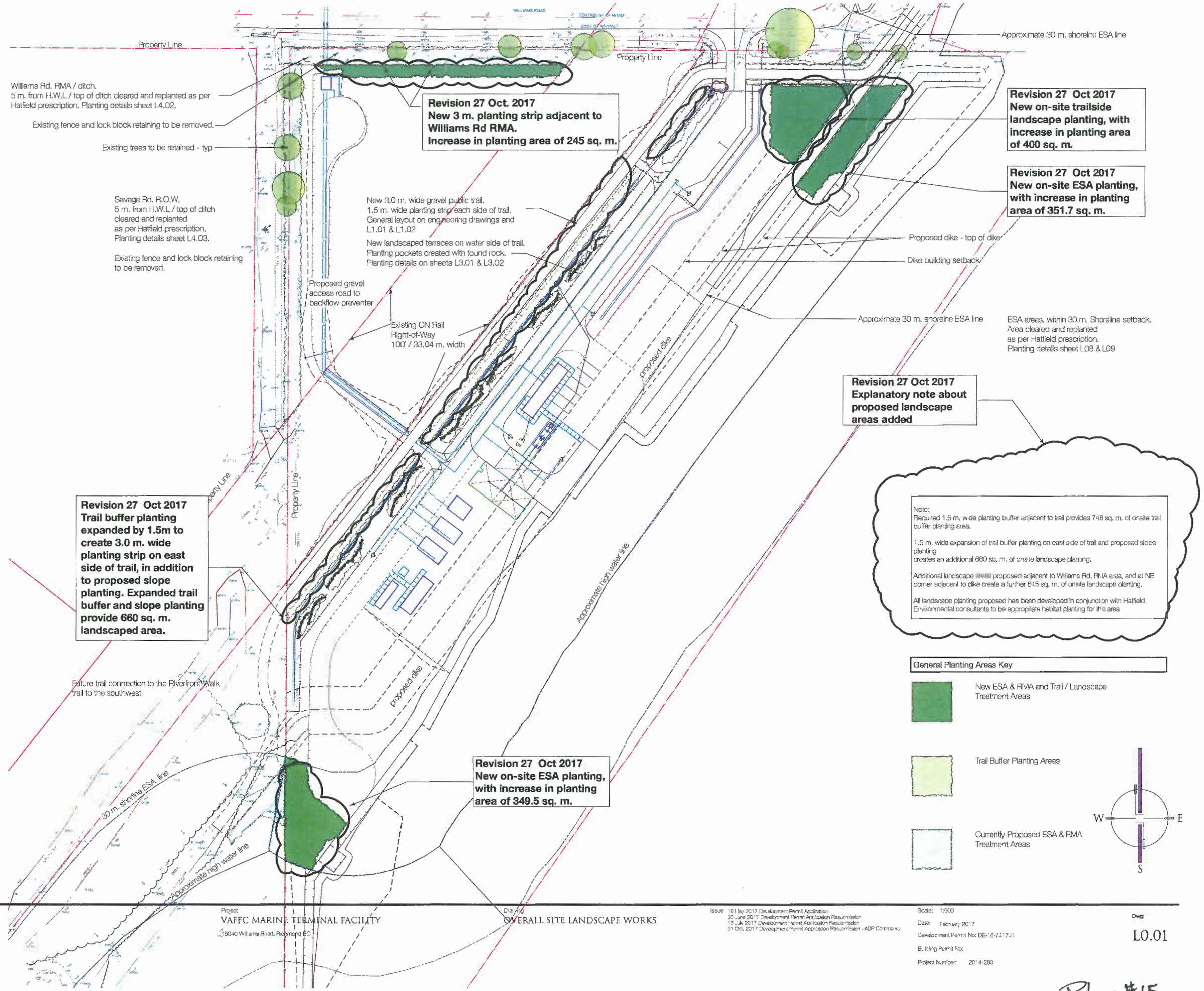
Scale 1:500
Date: February 2017
Development Permit No: DP-16-741741
Building Permit No:
Project Number: 2014-280

Dwg
L1.01

NOV 29 2017

DP 16-741741

Plan #14



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w. damonoriente.ca

Project
VAFFC MARINE TERMINAL FACILITY
5040 Williams Road, Richmond BC

Drawing
OVERALL SITE LANDSCAPE WORKS

Issue 18 May 2017 Development Permit Application
30 June 2017 Development Permit Application Resubmission
18 July 2017 Development Permit Application Resubmission
31 Oct. 2017 Development Permit Application Resubmission - ADP Comments

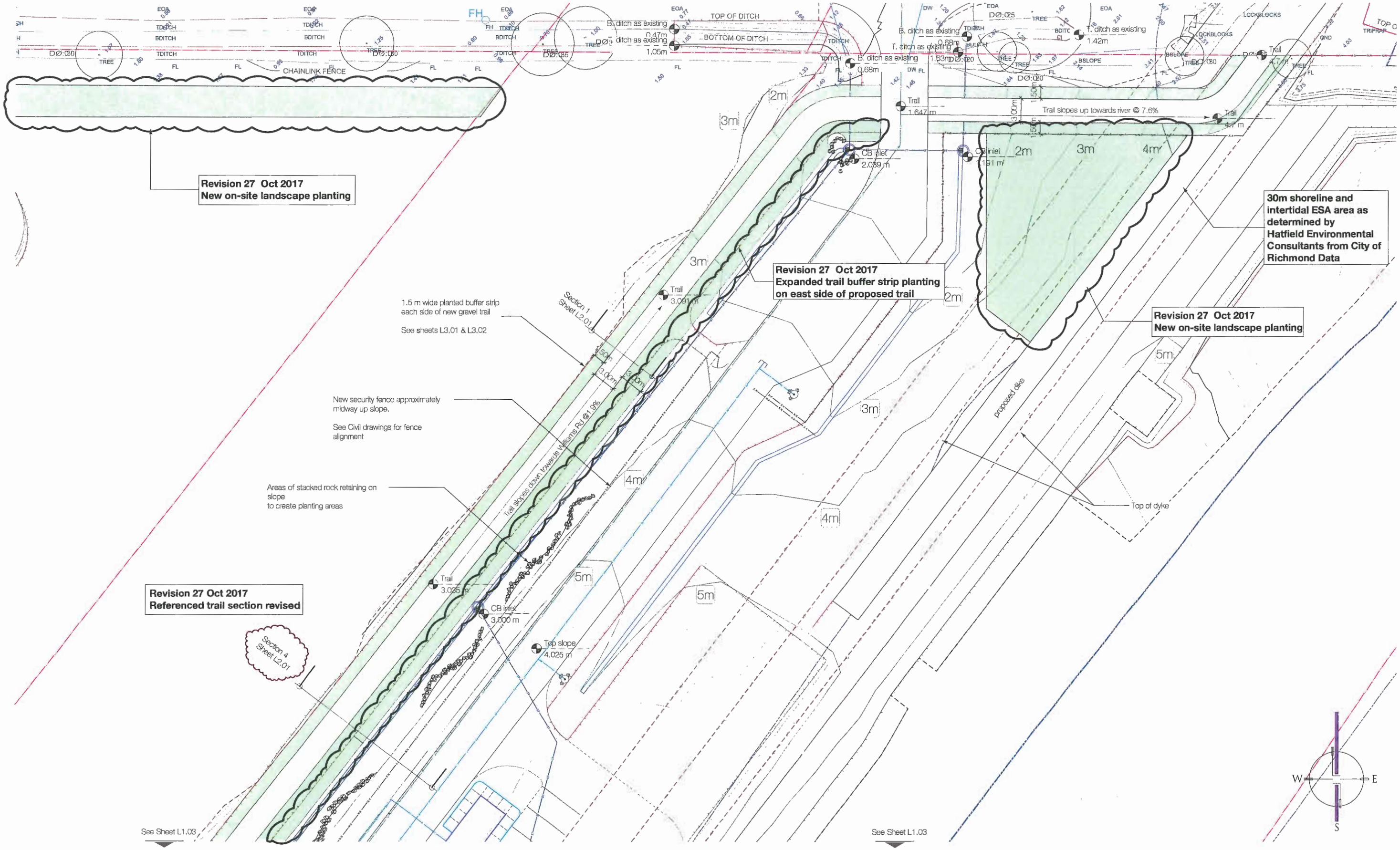
Scale: 1:500
Date: February 2017
Development Permit No: DP-16-741741
Building Permit No:
Project Number: 2014-280

Dwg
L0.01

Plan #15

NOV 29 2017

DP 16-741741



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landscape architects
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f. 604-222-9212
e. dvo@telus.net
w. damonoriente.ca

Project
VAFFC MARINE TERMINAL FACILITY
15040 Williams Road, Richmond BC

Drawing
TRAIL LAYOUT - NORTH

Issue: 9 May 2017 Development Permit Application
30 June 2017 Development Permit Application Resubmission
18 July 2017 Development Permit Application Resubmission
31 Oct. 2017 Development Permit Application Resubmission - ADP Comments

Scale: 1:200
Date: February 2017
Development Permit No: DP-16-741741
Building Permit No:
Project Number: 2014-280

Dwg
L1.02

Plan #16

See Sheet L1.02

See Sheet L1.02

Revision 27 Oct 2017
Expanded trail buffer strip planting on east side of proposed trail

B. ditch as existing
0.70 m

T. ditch as existing
2.70 m

BOTTOM OF SLOPE
DIRT PATH
BSLOPE
TDITCH
BDITCH
PATH CL
FL
METAL FENCE
2m
BOTTOM OF DITCH
TOP OF DITCH
CHAINLINK FENCE
GATE
GNP
CI

3m
4m
4m
3m
4m
5m

Trail
4.7

Trail section showing condition of greatest elevation difference between trail and adjacent facility grade.

Section 4
Sheet L2.01

Trail slopes down to SW @ 2%

New chain link security fence
See Detail 1 Sheet L2.01

New surface drainage ditch
See Civil drawings

CB (typ)
2.815 m

T. ditch as existing
2.82 m

T. ditch as existing
2.76 m

B. ditch as existing
0.78 m

Trail
2.683 m

Top slope
5.024 m

proposed dike

Top of dyke

30m shoreline and intertidal ESA area as determined by
Hatfield Environmental Consultants based on
City of Richmond Data

W E S

NOV 29 2017

DP 16-741741

DAMON ORIENTE LTD.
landscape architects
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Project
VAFFC MARINE TERMINAL FACILITY
15040 Williams Road, Richmond BC

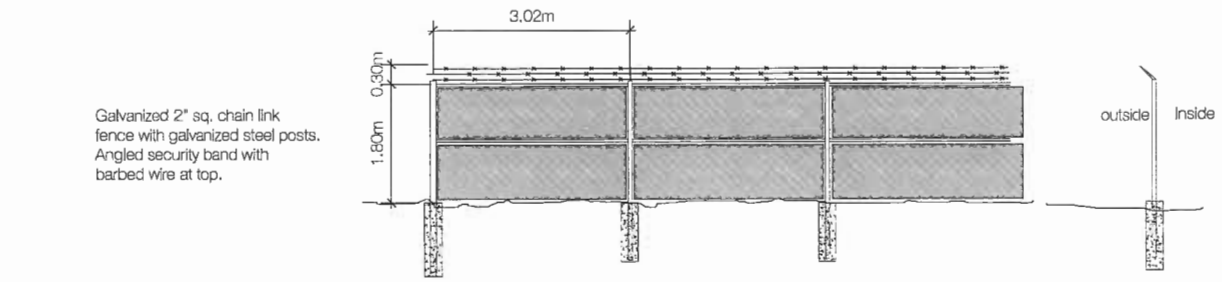
Drawing
TRAIL LAYOUT - SOUTH

Issue
19 Feb 2017 Development Permit Application
30 June 2017 Development Permit Application Resubmission
18 July 2017 Development Permit Application Resubmission
31 Oct, 2017 Development Permit Application Resubmission - ADP Comments

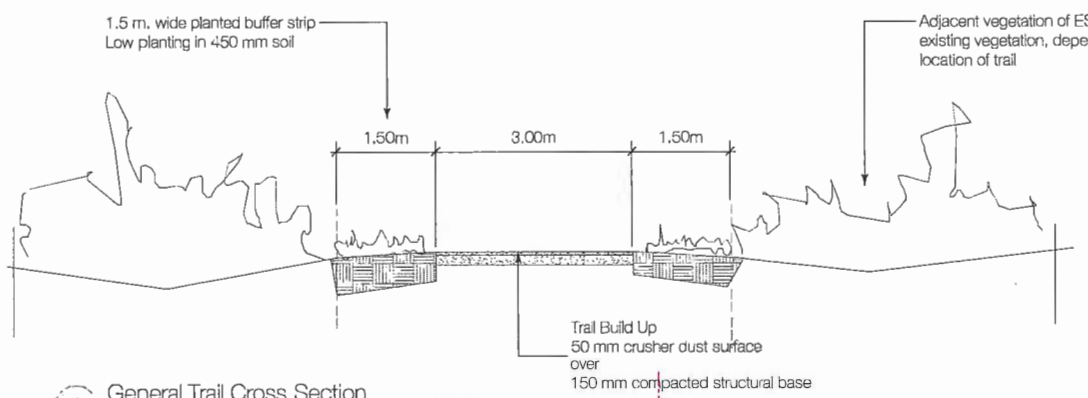
Scale: 1:200
Date: February 2017
Development Permit No: DP-16-741741
Building Permit No:
Project Number: 2014-250

Dwg
L1.03

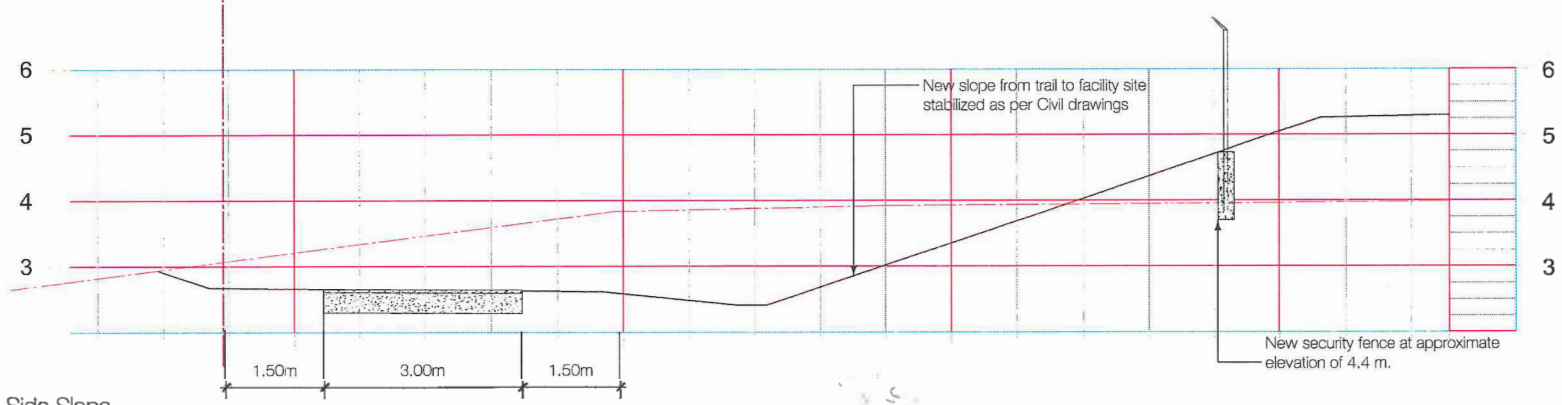
Plan #17



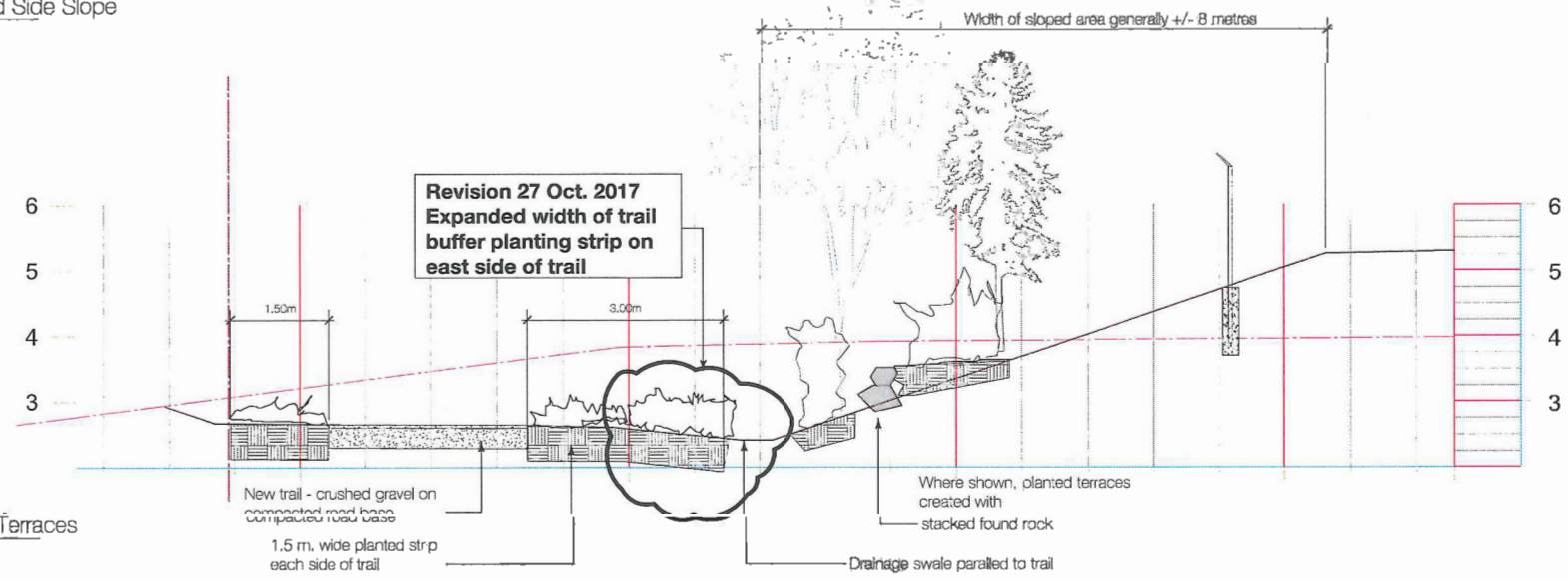
1 Security Fence - Typical



2 General Trail Cross Section



3 Trail Through Facility Site - Standard Side Slope



4 Trail Through Facility Site - Planted Terraces

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Project
VAFFC MARINE TERMINAL FACILITY
15040 Williams Road, Richmond BC

Drawing
TRAIL SECTIONS

Issue
19 May 2017 Development Permit Application
30 June 2017 Development Permit Application Resubmission
18 July 2017 Development Permit Application Resubmission
31 Oct. 2017 Development Permit Application Resubmission - ADP Comments

Scale 1:50
Date: February 2017
Development Permit No: DP-16-741741
Building Permit No:
Project Number: 2014-260

Dwg
L2.01

CENTRELINE OF ROAD

EDGE OF ASPHALT

TOP OF DITCH

BOTTOM OF DITCH

CHAIN LINK FENCE

Revision 27 Oct 2017
New on-site landscape planting adjacent to RMA planting

Revision 27 Oct 2017
Expanded trail buffer strip planting on east side of proposed trail

Revision 27 Oct 2017
New on-site landscape planting

Groundcover and Shrubs

Groundcover

30 m. shoreline ESA setback line

Groundcover and Grasses

Groundcover

proposed dike

Top of dyke

Building setback for dyke

Groundcover and Grasses

Groundcover and Shrubs

See Sheet L3.02

See Sheet L3.02

Trail Buffer Planting Areas Key

Trail Planting 1 - Groundcover

ac	Arctostaphyllos uva-ursi	Kinnikinnick	4 plants per sq. m.
fc	Fragraria chiloensis	Coastal strawberry	4 plants per sq. m.

Trail Planting 2 - Groundcover & Grasses

ac	Arctostaphyllos uva-ursi	Kinnikinnick	2 plants per sq. m.
Eg	ELymus glaucus	Blue lyme grass	3 plants per sq. m.
Lm	Leymus mollis	Dune grass	3 plants per sq. m.

Trail Planting 3 - Groundcover & Shrubs

Rosa	Rosa gymnocarpa	Baldhip rose	1 plant per sq. m.
Mn	Mahonia nervosa	Dull Oregon grape	1 plant per sq. m.
Ma	Mahonia aquafolium	Oregon grape	0.25 plants per sq. m.
ac	Arctostaphyllos uva-ursi	Kinnikinnick	2 plants per sq. m.

NOV 29 2017

DP 16-741741

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Project
VAFFC MARINE TERMINAL FACILITY
15040 Williams Road, Richmond BC

Drawing
TRAIL PLANTING AREA 1

Issue
19 May 2017 Development Permit Application
30 June 2017 Development Permit Application Resubmission
18 July 2017 Development Permit Application Resubmission
31 Oct. 2017 Development Permit Application Resubmission - ADP Comments

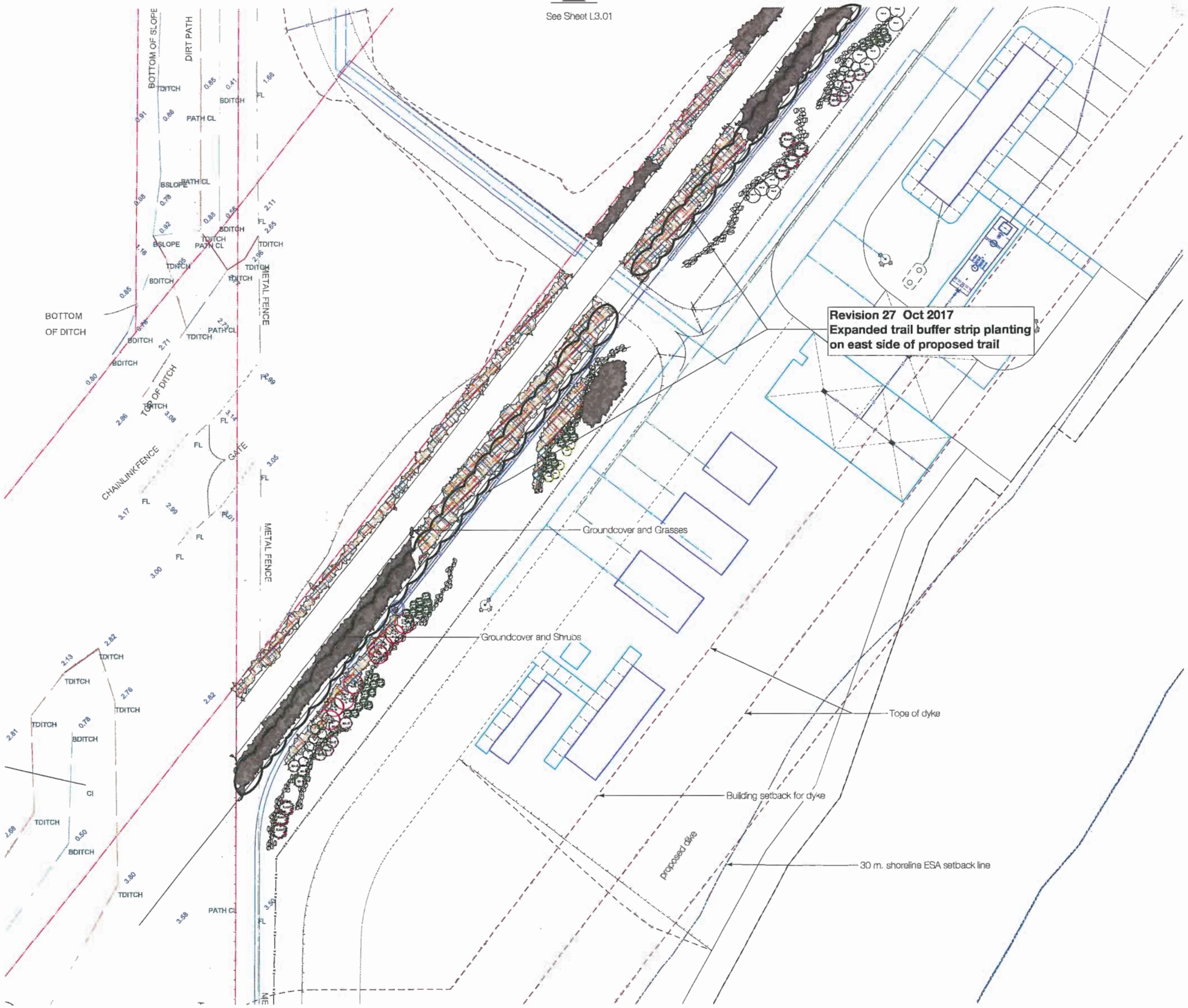
Scale: 1:200
Date: February 2017
Development Permit No: DP-16-741741
Building Permit No:
Project Number: 2014-280

Dwg
L3.01

Plan #19

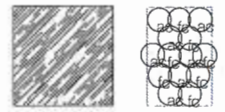
See Sheet L3.01

See Sheet L3.01



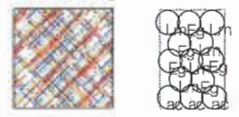
General Planting Areas Key

Trail Planting 1 - Groundcover



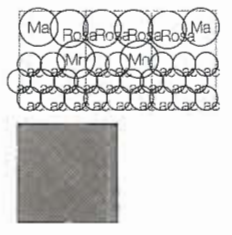
ac	Arctostaphyllos uva-ursi	Kinnikinnick
fc	Fragraria chiloensis	Coastal strawberry

Trail Planting 2 - Groundcover & Grasses

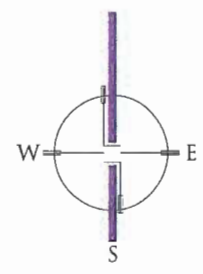


ac	Arctostaphyllos uva-ursi	Kinnikinnick
Eg	ELymus glaucus	Blue lyme grass
Lm	Leymus mollis	Dune grass

Trail Planting 3 - Groundcover & Shrubs



Rosa	Rosa gymnocarpa	Baldhip rose	1 plant per sq. m.
Mn	Mahonia nervosa	Dull Oregon grape	1 plant per sq. m.
Ma	Mahonia aquafolium	Oregon grape	0.25 plants per sq. m.
ac	Arctostaphyllos uva-ursi	Kinnikinnick	2 plants per so. m.



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Project
VAFFC MARINE TERMINAL FACILITY
15040 Williams Road, Richmond BC

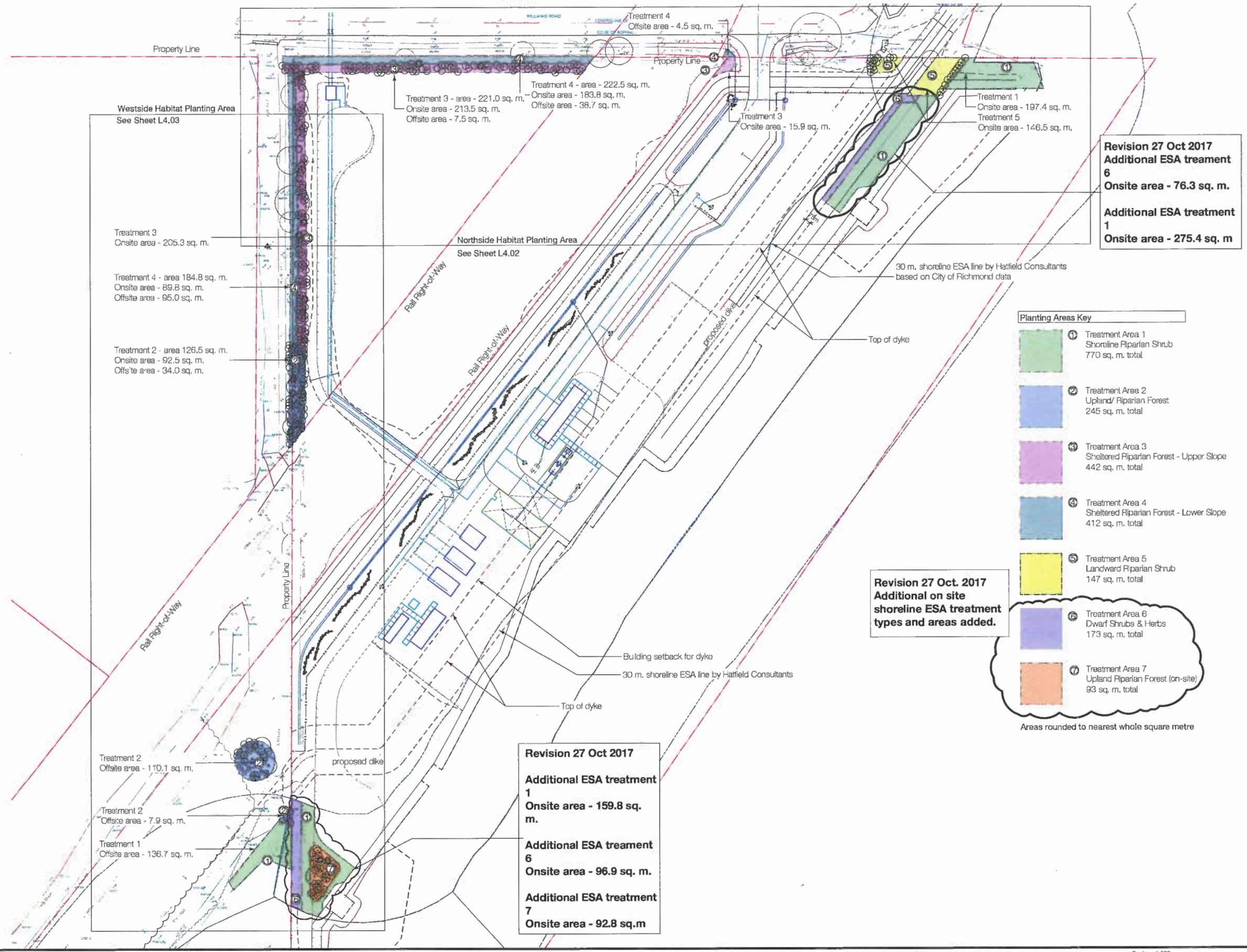
Drawing
TRAIL PLANTING AREA 2

Issue 19 May 2017 Development Permit Application
30 June 2017 Development Permit Application Resubmission
19 July 2017 Development Permit Application Resubmission
31 Oct. 2017 Development Permit Application Resubmission - ADP Comments

Scale: 1:200
Date: February 2017
Development Permit No: DE-16-741741
Building Permit No:
Project Number: 2014-280

Dwg
L3.02

Plan #20



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Project
VAFFC MARINE TERMINAL FACILITY
16040 Williams Road, Richmond BC

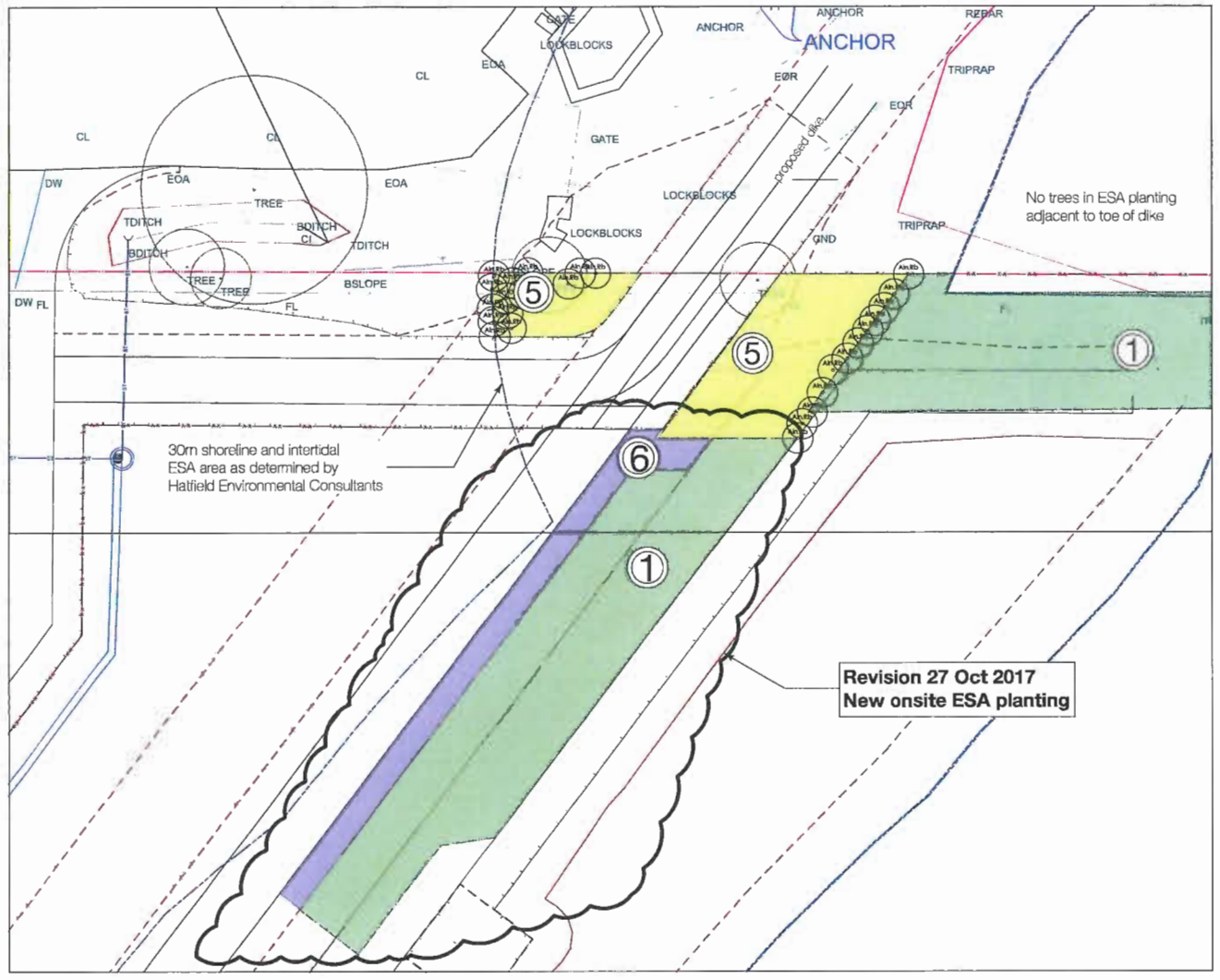
Drawing
ESA & RMA PLANTING OVERVIEW

Issue: 19 May 2017 Development Permit Application
30 June 2017 Development Permit Application Resubmission
18 July 2017 Development Permit Application Resubmission
31 Oct. 2017 Development Permit Application Resubmission - ADP Comments

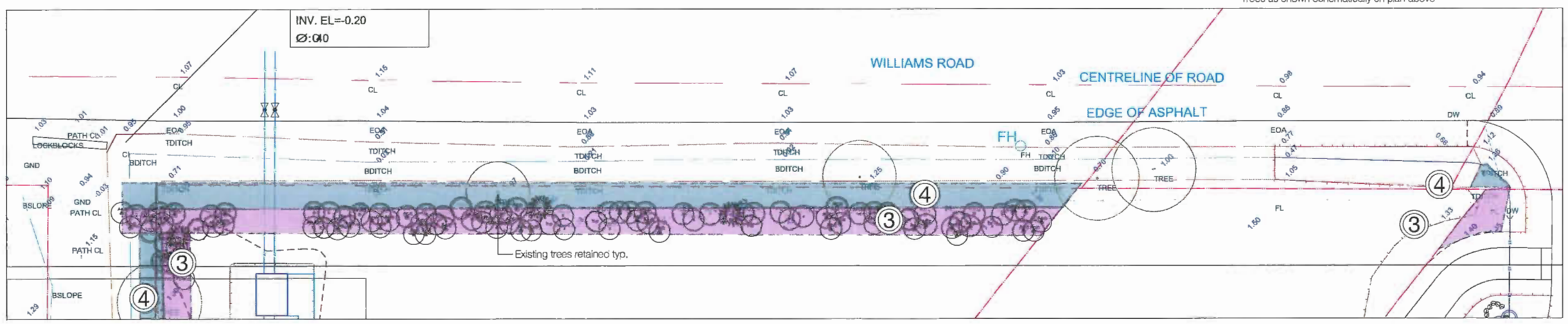
Scale: 1:500
Date: February 2017
Development Permit No: DP-16-741741
Building Permit No:
Project Number: 2014-280

Dwg
L4.01

Plan #21

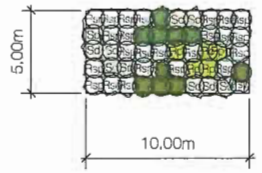


1 Northeast Shoreline ESA Areas



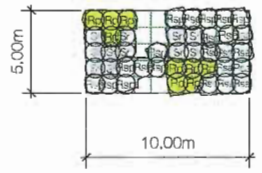
2 Williams Road RMA Areas

Treatment Area 1 - Shoreline Riparian Shrub



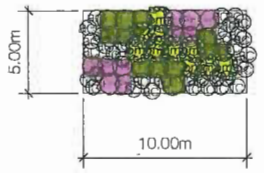
M	Mahonia nervosa	10% of area
Rp	Rubus parviflorus	10% of area
Rs	Rubus spectabilis	50% of area
Sd	Spirea douglasii	20% of area
Sa	Symphoricarpos albus	10% of area

Treatment Area 5 - Landward Riparian Shrub



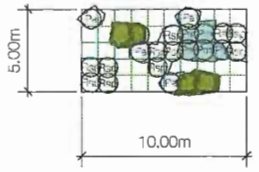
	Alnus rubra as shown on plan In blank areas on sample plan to left	18% of area
Rp	Rubus parviflorus	15% of area
Rs	Rubus spectabilis	30% of area
Rs	Ribes sanguineum	15% of area
Sr	Sambucus racemosa	22% of area

Treatment 6 - Dwarf Shrubs & Herbs



M	Mahonia nervosa	25% of area
Rn	Rosa nootkensis	20% of area
Pm	Polystichum munitum	20% of area
Ac	Arctostaphyllos uva-ursi	20% of area
fc	Fragraria chiloensis	15% of area

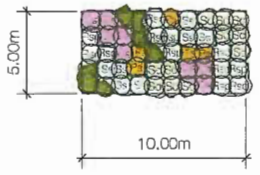
Treatment 3 Sheltered Riparian Forest - Upper Slope



Ps	Physocarpus albus	7% of area
Pm	Polystichum munitum	9% of area
Rs	Rubus spectabilis	23% of area
Sa	Symphoricarpos albus	8% of area
	Alnus rubra	10% of area
	Acer circinatum	18% of area
	Populus trichocarpa	10% of area
	Thuja plicata	8% of area
	Tsuga heterophyla	7% of area

Trees as shown schematically on plan above

Treatment 4 Sheltered Riparian Forest - Lower Slope



Cs	Cornus stolonifera	15% of area
Ps	Physocarpus albus	10% of area
Rs	Rubus spectabilis	25% of area
Sx	Salix sitchensis	15% of area
Sd	Soirea douglasii	20% of area
Sa	Symphoricarpos albus	15% of area

Note on Planting Layout

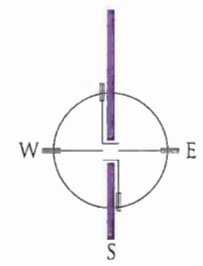
Planting detail area plans show the exent the applicable habitat planting treatment. The trees for each treatment area prescription are shown in a probable layout.

The shrub keys show a general arrangment for layout of shrubs and herbs. Where the sample area has white or open space, this space indicates the approximate area, based on percent coverage, that will be occupied by the trees proposed for that treatment area.

Colours shown in shrub key areas are intended to illustrate the general grouping of shrubs in each area.x

Note that habitat planing plans are guides. It is standard practice that final layout of trees and shrubs be done in the field at the time of planting.

IN-PROGRESS REVIEW
31 OCT. 2017
1:30 PM



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DP 16-741741

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Project
VAFFC MARINE TERMINAL FACILITY
15040 Williams Road, Richmond BC

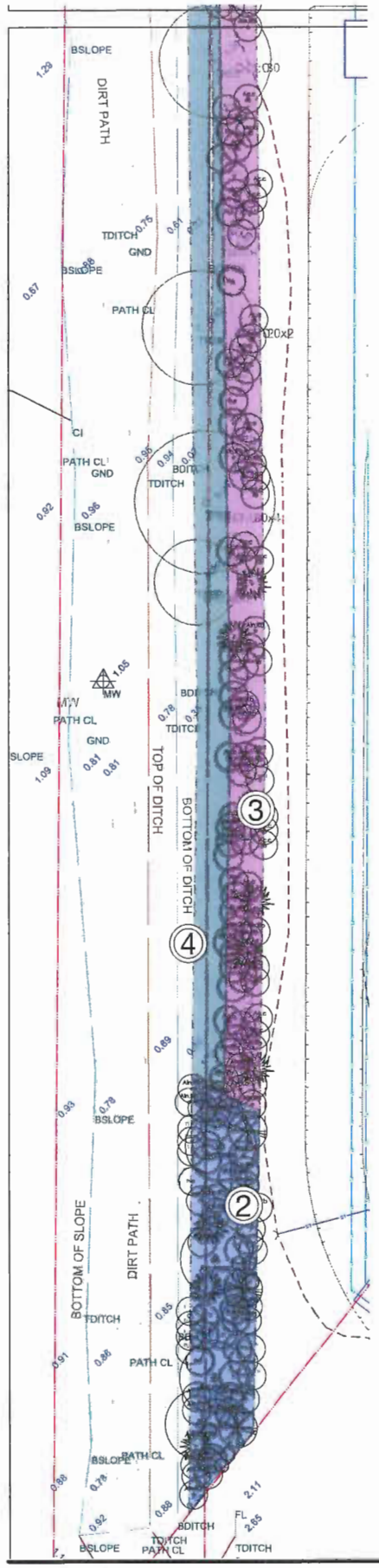
Drawing
NORTH SIDE ESA & RMA PLANTING

Issue 19 May 2017 Development Permit Application
30 June 2017 Development Permit Application Resubmission
19 July 2017 Development Permit Application Resubmission
31 Oct. 2017 Development Permit Application Resubmission - ADP Comments

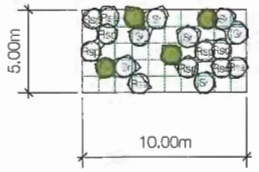
Scale: 1:200
Date: February 2017
Development Permit No: DP-16-741741
Building Permit No:
Project Number: 2014-230

Dwg
L4.02

Plan # 22

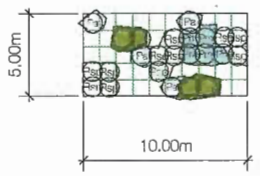


Treatment 2 - Upland/ Riparian Forest



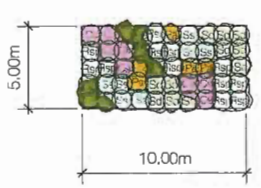
Rsp	Rubus spectabilis	14% of area	Acer macrophyllum 6% of area
Rse	Ribes sanguineum	5% of area	Alnus rubra 17% of area
Sr	Sambucus racemosa	15% of area	Corylus comuta var. Californica 7% of area
Sa	Symphoricarpos albus	7% of area	Populus trichocarpa 12% of area
			Pseudotsuga douglasii 6% of area
			Thuja plicata 6% of area
			Tsuga heterophyla 7% of area

Treatment 3 - Sheltered Riparian Forest - Upper Slope



Ps	Physocarpus albus	7% of area	Alnus rubra 10% of area
Pm	Polystichum munitum	9% of area	Acer circinatum 18% of area
Rsp	Rubus spectabilis	23% of area	Populus trichocarpa 10% of area
Sa	Symphoricarpos albus	8% of area	Thuja plicata 8% of area
			Tsuga heterophyla 7% of area

Treatment 4 - Sheltered Riparian Forest - Lower Slope



Cs	Cornus stolonifera	15% of area
Pa	Physocarpus albus	10% of area
Rsp	Rubus spectabilis	25% of area
Sx	Salix sitchensis	15% of area
Sd	Spirea douglasii	20% of area
Sa	Symphoricarpos albus	15% of area

Note on Planting Layout

Planting detail area plans show the extent the applicable habitat planting treatment. The trees for each treatment area prescription are shown in a probable layout.

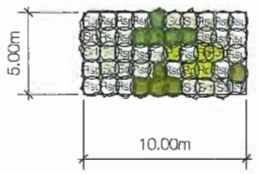
The shrub keys show a general arrangment for layout of shrubs and herbs. Where the sample area has white or open space, this space indicates the approximate area, based on percent coverage, that will be occupied by the trees proposed for that treatment area.

Colours shown in shrub key areas are intended to illustrate the general grouping of shrubs in each area.x

Note that habitat planing plans are guides. It is standard practice that final layout of trees and shrubs be done in the field at the time of planting.

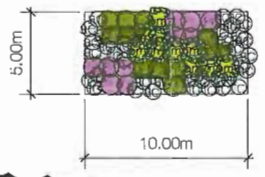
Revision 27 Oct 2017
Additional ESA plant prescriptions

Treatment Area 1 - Shoreline Riparian Shrub



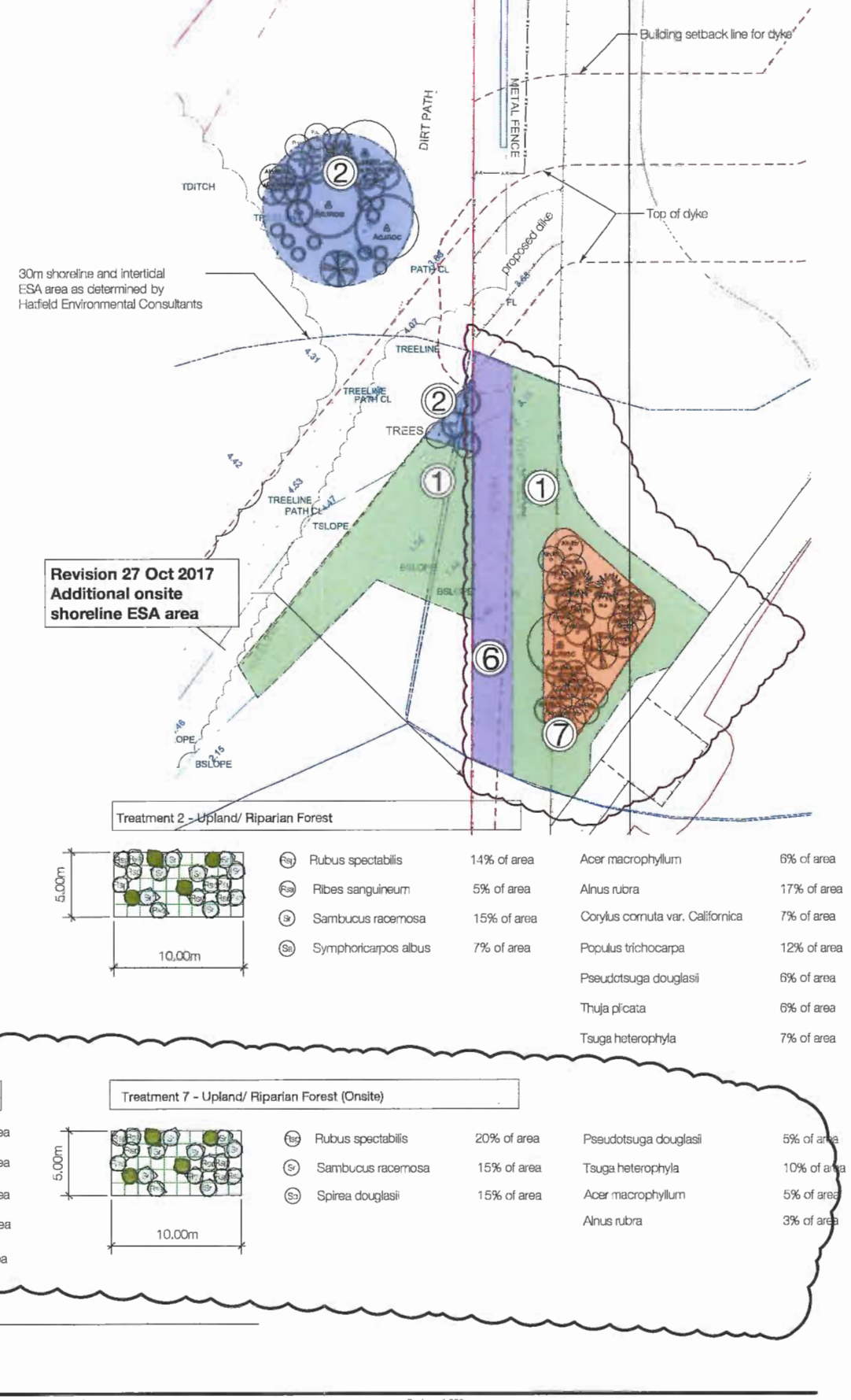
M	Mahonia nervosa	10% of area
Pv	Rubus parviflorus	10% of area
Rsp	Rubus spectabilis	50% of area
Sd	Spirea douglasii	20% of area
Sa	Symphoricarpos albus	10% of area

Treatment 6 - Dwarf Shrubs & Herbs



M	Mahonia nervosa	25% of area
Rn	Rosa nootkensis	20% of area
Pm	Polystichum munitum	20% of area
Au	Arctostaphyllos uva-ursi	20% of area
Fc	Fragraria chiloensis	15% of area

3 Savage Road R.O.W RMA Areas



Treatment 2 - Upland/ Riparian Forest

Rsp	Rubus spectabilis	14% of area	Acer macrophyllum 6% of area
Rse	Ribes sanguineum	5% of area	Alnus rubra 17% of area
Sr	Sambucus racemosa	15% of area	Corylus comuta var. Californica 7% of area
Sa	Symphoricarpos albus	7% of area	Populus trichocarpa 12% of area
			Pseudotsuga douglasii 6% of area
			Thuja plicata 6% of area
			Tsuga heterophyla 7% of area

Treatment 7 - Upland/ Riparian Forest (Onsite)

Rsp	Rubus spectabilis	20% of area	Pseudotsuga douglasii 5% of area
Sr	Sambucus racemosa	15% of area	Tsuga heterophyla 10% of area
Sd	Spirea douglasii	15% of area	Acer macrophyllum 5% of area
			Alnus rubra 3% of area

4 Southwest Corner ESA Area

NOV 2 9 2017

DP 16-741741

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Project
VAFFC MARINE TERMINAL FACILITY
*5040 Williams Road, Richmond BC

Drawing
WESTSIDE ESA & RMA PLANTING

Issue 19 May 2017 Development Permit Application
30 June 2017 Development Permit Application Resubmission
18 July 2017 Development Permit Application Resubmission
31 Oct. 2017 Development Permit Application Resubmission - ADP Comments

Scale: 1:200
Date: February 2017
Development Permit No: DP-16-741741
Building Permit No:
Project Number: 2014-280

Dwg
L4.03

Plan #23

Plant List for ESA, RMA Planting Areas

Revision 27 Oct 2017
Plant list updates to reflect additional ESA areas

Trees

ID	Quantity	Latin Name	Common Name	Scheduled Size	Notes
	0				
	80	Acer circinatum	Vine maple	#3 pot	
	8	Acer macrophyllum	Bigleaf maple	#5 pot	
	144	Alnus rubra	Red alder	#3 pot	
	17	Corylus cornuta var. 'Californica''	Beaked hazlenut	#2 pot	
	74	Populus trichocarpa	Black cottonwood	#3 pot	
	5	Pseudotsuga menziesii	Douglas fir	#15 pot	
	13	Thuja plicata	Western redcedar	#15 pot	
	14	Tsuga heterophylla	Western hemlock	#15 pot	

Shrubs & Herbs

ID	Quantity	Latin Name	Common Name	Scheduled Size	Notes
	0				
	62	Cornus stolonifera	Redosier dogwood	#2 pot	
	180	Mahonia nervosa	Dull Oregon grape	#2 pot	
	72	Physocarpus albus	Pacific ninebark	#2 pot	
	74	Polystichum munitum	Swordfern	#2 pot	
	69	Ribes sanguineum	Red flowering currant	#2 pot	
	96	Rubus parviflorus	Thimbleberry	#2 pot	
	696	Rubus spectabilis	Salmonberry	#2 pot	
	76	Sambuccus racemosa	Red elderberry	#2 pot	
	62	Salix sitchensis	Sitka willow	#2 pot	
	248	Spiraea douglasii	Steeplebush	#2 pot	
	179	Symphorocarpus albus	Snowberry	#2 pot	
	140	Arctostaphyllos uva-ursi	Kinnikinnick	#2 pot	
	104	Fragraria virginiana	Wild strawberry	#1 pot	

Plant List for Trail Buffer Planting Areas

Shrubs & Herbs

ID	Quantity	Latin Name	Common Name	Scheduled Size	Notes
	0				
	80	Mahonia aquafolium	Oregon grape	#2 pot	
	324	Mahonia nervosa	Dull Oregon grape	#2 pot	
	325	Rosa gymnocarpa	Baldhip rose	#2 pot	

Groundcover & Grasses

ID	Quantity	Latin Name	Common Name	Scheduled Size	Notes
	0				
	1252	Arctostaphylls uva-ursi	Kinnikinnick	10 cm pot	
	1252	Elymus glacus	Blue lyme grass	10 cm pot	
	115	Fragraria chiloensis	Coastal straberry	10 cm pot	
	980	Leymus mollis	Dune grass	10 cm pot	

Plant List for On-site Slope Areas and Additional Landscape Planting

Revision 27 Oct 2017
Plant list updates to reflect additional landscape planting areas

Trees

ID	Quantity	Latin Name	Common Name	Scheduled Size	Notes
A.l	15	Amelanchier laevis	Allegheny Serviceberry	5 cm. cal	
Be.pap	2	Betula papyrifera	Paper birch	2.5 m. ht.	
P.con	17	Pinus contorta	Shore pine	3 m. ht.	
P.doug	10	Pseudotsuga menziesii	Douglas fir	3 m. ht.	

Shrubs

ID	Quantity	Latin Name	Common Name	Scheduled Size	Notes
au	1411	Arctostaphylos uva-ursi 'Vancouver Jade'	Vancouver Jade Kinnikinick	#1 pot	
cs	37	Cornus sericea 'stolonifera'	Redosier Dogwood	#2 pot	
gs	109	Gaultheria shallon	Salal	#1 pot	
Hol.d	35	Holodiscus discolor	Oceanspray	#2 pot	
M.aq	38	Mahonia aquafolium	Oregon grape	#3 pot	
R.san	25	Ribes sanguineum 'King Edward VII'	King Edward Vii Flowering Currant	#2 pot	
sp.d	32	Spiraea douglasii	Hardhack spiraea	#2 pot	

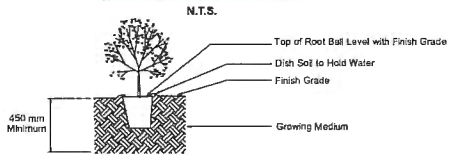
Groundcover & Grasses

ID	Quantity	Latin Name	Common Name	Scheduled Size	Notes
	0				
	1252	Arctostaphylls uva-ursi	Kinnikinnick	10 cm pot	
	1252	Elymus glacus	Blue lyme grass	10 cm pot	
	115	Fragraria chiloensis	Coastal straberry	10 cm pot	
	980	Leymus mollis	Dune grass	10 cm pot	

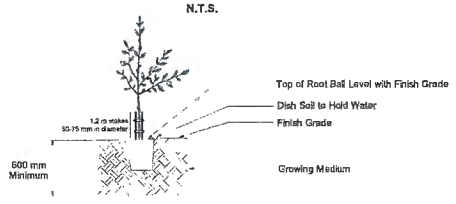
General Landscape Specifications

- Areas requiring topsoil shall be fine graded by raking out spoil material and debris such as rocks, asphalt and concrete over 50 mm in diameter, and scarified to a minimum depth of 150 mm immediately before placing topsoil.
- Topsoil and any amendments to the growing medium shall meet the criteria described in the British Columbia Landscape Standards for background (natural) areas (refer to adjacent table for particle size, acidity and drainage specifications).
- Topsoil shall be tested by an accredited soil testing laboratory, prior to delivery.
- Screened topsoil must be applied with a minimum thickness of 450 mm in shrub planting areas and 600 mm in treed areas. Topsoil must be free of subsoil, wood (including woody plant parts), toxic materials, stones over 30 mm, foreign objects, propagules of plant species designated as noxious under the BC Weed Control Act and Regulation, and other invasive or undesirable plant species.
- All plant material that has not been salvaged from the construction footprint shall be of guaranteed nursery stock, densely branched, well-established (minimum leaf density of 50%), free of invasive/noxious plant material and meet the criteria specified in City of Richmond Engineering and Public Works Department Supplementary Specifications and Detail Drawings, Version 3, 2016, Schedule G – Tree Planting on Sidewalks and Boulevards (they replace the specifications in Section 32 93 01 – Planting of Trees, Shrubs, and Ground Covers in the MMCD Platinum Edition).
- Plants in containers shall have a well-established root system, reaching the sides of the container but not being root bound. Soil must hold together when a plant is removed from its container.
- The City of Richmond's Engineering and Public Works department must be notified once nursery stock has arrived on site, for inspection prior to planting. Fall planting (following the last drought period in September or October), or spring planting (March or April) is recommended.
- Native trees, shrubs and herbs must be set plumb and fully immersed in growing medium, such that the top of the rootball is set at or slightly above the finished grade. Planting wells will be established to increase the capture and retention of water. The soil around each new plant will be tamped and watered in layers. Trees will be securely staked on both sides.
- The soil must be raked once the revegetation work is complete. A fall rye should be spread in the enhancement areas to prevent erosion and provide some shelter for new plants until they become fully established.
- Habitat enhancement works should be supervised by a certified landscape architect (or horticulturalist) to ensure compliance with the BC Landscape Standards and City and Richmond specifications for the planting of trees, shrubs, and ground cover.
- The contractor shall provide maintenance including, watering, removal of invasive species and replacement of dead stock for a period of three (3) years following planting.

Typical Container Shrub Planting Detail
N.T.S.



Typical Container Tree Planting Detail
N.T.S.



Topsoil (growing medium) specifications.

Soil Attribute	Criteria
Gravel 2 - 30 mm	< 10% of dry weight
Sand 0.05 – 2 mm	30 – 70% of dry weight
Silt and clay combined	Max of 60% of dry weight
Organic content	10 – 20% of dry weight
Hydraulic conductivity	2 cm/hour
pH	4.5 – 7.0

Hatfield	Vancouver Airport Fuel Delivery Project – Habitat Enhancement On/By Marine Terminal		
DESIGN: LD	DRAWN: TK	PROFESSIONAL SEAL	DRAWING NUMBER: 6773-01
REVISION: 0	DATE: Feb 2, 2017		

Treatment 1 (Shoreline Riparian Shrub)

Common name	Botanical Name	% of Area	Stock Size	Planting Density
Salmonberry	Rubus spectabilis	50	No. 3 pot	1 plant per 1 m2
Thimbleberry	Rubus parviflorus	10	No. 2 pot	1 plant per 1 m2
Steeplebush	Spirea douglasii	20	No. 2 pot	1 plant per 1 m2
Snowberry	Symphoricarpos albus	10	No. 2 pot	1 plant per 1 m2
Dull Oregon Grape	Mahonia nervosa	10	No. 2 pot	1 plant per 1 m2

Treatment 2 (Upland/Riparian Forest)

Common name	Botanical Name	% of Area	Stock Size	Planting Density
Coastal Douglas-fir	Pseudotsuga douglasii	6	No. 15 pot	1 plant per 4 m2
Western redcedar	Thuja plicata	6	No. 15 pot	1 plant per 4 m2
Western hemlock	Tsuga heterophylla	7	No. 15 pot	1 plant per 4 m2
Bigleaf maple	Acer macrophyllum	6	No. 5 pot	1 plant per 2 m2
Red alder	Alnus Rubra	17	No. 3 pot	1 plant per 1 m2
Black cottonwood	Populus trichocarpa	12	No. 3 pot	1 plant per 1 m2
Salmonberry	Rubus spectabilis	14	No. 3 pot	1 plant per 1 m2
Beaked hazelnut	Corylus cornuta var. Californica	7	No. 2 pot	1 plant per 1 m2
Red elderberry	Sambucus racemosa	15	No. 3 pot	1 plant per 1 m2
Red-flowering currant	Ribes sanguineum	5	No. 2 pot	1 plant per 1 m2
Snowberry	Symphoricarpos albus	7	No. 2 pot	1 plant per 1 m2

Treatment 3 (Sheltered Riparian Forest – Upper Slope)

Common name	Botanical Name	% of Area	Stock Size	Planting Density
Western redcedar	Thuja plicata	8	No. 15 pot	1 plant per 4 m2
Western hemlock	Tsuga heterophylla	7	No. 15 pot	1 plant per 4 m2
Red alder	Alnus Rubra Populus	10	No. 3 pot	1 plant per 1 m2
Black cottonwood	trichocarpa Rubus	10	No. 3 pot	1 plant per 1 m2
Salmonberry	spectabilis	23	No. 3 pot	1 plant per 1 m2
Pacific ninebark	Physocarpus albus	7	No. 2 pot	1 plant per 1 m2
Vine maple	Acer circinatum	18	No. 3 pot	1 plant per 1 m2
Snowberry	Symphoricarpos albus	8	No. 2 pot	1 plant per 1 m2
Sword fern	Polystichum munitum	9	No. 2 pot	1 plant per 1 m2

Treatment 4 (Sheltered Riparian Forest – Lower Slope)

Common name	Botanical Name	% of Area	Stock Size	Planting Density
Redosier dogwood	Cornus stolonifera	15	No. 2 pot	1 plant per 1 m2
Sitka willow	Salix sitchensis	15	No. 2 pot	1 plant per 1 m2
Salmonberry	Rubus spectabilis	25	No. 2 pot	1 plant per 1 m2
Pacific ninebark	Physocarpus albus	10	No. 2 pot	1 plant per 1 m2
Snowberry	Symphoricarpos albus	15	No. 2 pot	1 plant per 1 m2
Steeplebush	Spirea douglasii	20	No. 2 pot	1 plant per 1 m2

Treatment 5 (Landward Riparian Shrub)

Common name	Botanical Name	% of Area	Stock Size	Planting Density
Red alder	Alnus rubra	18	No. 2 pot	1 plant per 1 m2
Red elderberry	Sambucus racemosa	22	No. 3 pot	1 plant per 1 m2
Salmonberry	Rubus spectabilis	30	No. 2 pot	1 plant per 1 m2
Thimbleberry	Rubus parviflorus	15	No. 2 pot	1 plant per 1 m2
Red-flowering currant	Ribes sanguineum	15	No. 2 pot	1 plant per 1 m2

Treatment 6 (Dwarf Shrubs and Herbs)

Common name	Botanical Name	% of Area	Stock Size	Planting Density
Nootka rose	*Rosa nootkana*	0.2	No. 2 pot	1 plant per 1 m2
Dwarf oregon-grape	*Mahonia nervosa*	0.25	No. 2 pot	1 plant per 1 m2
Kinnikinnick	*Arctostaphylos uva-ursi*	0.2	No. 2 pot	1 plant per 0.25 m2
Wild strawberry	*Fragaria virginiana*	0.15	No. 1 pot	1 plant per 0.25 m2
Sword fern	*Polystichum munitum*	0.2	No. 1 pot	1 plant per 1 m2

Treatment 7 (On-Site Upland/Riparian Forest)

Common name	Botanical Name	% of Area	Stock Size	Planting Density
Douglas-fir	*Pseudotsuga douglasii*	0.05	No. 15 pot	1 plant per 4 m2
Western hemlock	*Tsuga heterophylla*	0.1	No. 15 pot	1 plant per 4 m2
Bigleaf maple	*Acer macrophyllum*	0.05	No. 10 pot	1 plant per 4 m2
Red alder	*Alnus rubra*	0.3	No. 3 pot	1 plant per 1 m2
Salmonberry	*Rubus spectabilitis*	0.2	No. 2 pot	1 plant per 1 m2
Red elderberry	*Sambucus racemosa*	0.15	No. 2 pot	1 plant per 1 m2
Steeplebush	*Spirea douglasii*	0.15	No. 2 pot	1 plant per 1 m2

Revision 27 Oct 2017
Plant list updates to reflect additional ESA areas

Hatfield	Vancouver Airport Fuel Delivery Project – Habitat Enhancement On/By Marine Terminal		
DESIGN: LD	DRAWN: TK	PROFESSIONAL SEAL	DRAWING NUMBER: 6773-01
REVISION:	DATE: Oct. 30, 2017		

RECEIVED NOV 29 2017

DP 16-717741

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Project
VAFFC MARINE TERMINAL FACILITY
15040 Williams Road, Richmond BC

Drawing
SPECIFICATION NOTES AND PLANT LISTS

Issue
19 May 2017 Development Permit Application
30 June 2017 Development Permit Application Resubmission
18 July 2017 Development Permit Application Resubmission
31 Oct. 2017 Development Permit Application Resubmission - ADP Comments

Scale: 1:500
Date: February 2017
Development Permit No: DP-16-717741
Building Permit No.
Project Number: 2014-280

Dwg
L0.05

Plan #24

Habitat Balance Sheet for the Marine Terminal Site Development.

Location	Habitat (m^2)				Comments
Habitat Impact Summary					
Marine Terminal Property	**Existing**	**Post-construction**	**Net Change**	**Enhancement Area**	
Shoreline ESA	208.0	1046	+837	+1046	Existing ESA is an area of fill and gravel, and largely barren. Two young trees and one small marginal habitat patch containing native red alder and black cottonwood saplings with an understory of invasive shrubs and herbs will be lost to development. A 5.1:1 compensation for this loss will be achieved by enhancing Shoreline ESA in the SW (350 m^2) and NE corner (696 m^2) of the property and adjacent to the property (see below). Overall, 88% of ESA enhancement works would be onsite.
Intertidal ESA	Refer to comments				Green-coded low productivity habitat. Replacing the existing 3,256 m^2 wharf structure with clean, stable erosion bank protection (armour) that will restore approximately 36,000 m^3 of open river flow environment and provide approximately 3,800 m^3 of new, artificial 'reef' habitat aimed to provide micro-refugia for aquatic flora and fauna. Upgrading concrete rubble rip-rap on either side of the existing wharf footprint will improve stability and quality of substrate refugia over 4,400 m^3 (total of 8,000 m^3 at base of slope along marine terminal property). Refer to Hatfield memo dated October 31, 2017 for additional information.
Williams Road RMA	176.3	413.2	+236.9	+413.2	These RMAs are degraded by invasive species and dust generated by the high volume of Ecowaste truck traffic. Only the trees are native and these will not be eliminated by the development. Although there is no defensible ecological rationale for it, 2.2:1 habitat compensation is proposed, by removing the existing fences to restore the full 5 m width of each RMA, and by regrading the sites and replacing invasive shrubs and herbs with native vegetation. Overall, 82% of RMA enhancement works would be onsite.
Savage Road RMA (inferred)	95.0	387.6	+292.6	+387.6	
Proposed Habitat Compensation					
Adjacent to Property					
Shoreline ESA	N/A	N/A	N/A	+144.6	To further compensate for marginal habitat loss from the marine terminal property Shoreline ESA, invasive plants southwest of the property, by some red-coded intertidal habitat, would be replaced with native plants.
Williams Road RMA	50.7	50.7	0	50.7	A portion of the RMAs are beyond the property boundary, which would thus involve limited offsite enhancement work (11% for Williams Road RMA; 25% for Savage Road RMA).
Savage Road RMA (inferred)	129.0	129.0	0	129.0	
Upland Habitat	N/A	N/A	N/A	+110.1	A portion of the CN ROW in the Williams Road RMA would be compensated for by replacing invasive species with native ones between the Savage Road RMA and Shoreline ESA, as a contribution to the local Ecological Network (the remaining 72 m^2 of the ROW compensation area was shifted to the onsite Shoreline ESA).
Gains and Losses					
Terrestrial Habitat				+2,281 m^2	5.7:1 habitat enhancement in Shoreline ESAs for a 208 m^2 onsite shoreline disturbance and a portion of the Williams RMA overlapping with the CN ROW (53% on site). Approximately 2:1 habitat compensation and enhancement to RMAs (54% on site).
Aquatic Habitat				+3,800.0 m^3	Improvements to Intertidal ESA by replacing vertical steel-pile wharf with clean, stable erosion protection of Fraser River shoreline and secondary artificial reef for brackish environments.

Revision 27 Oct 2017
Table updated with latest Hatfield information

This schedule is reprinted from the
ESA and RMA Environmental Impacts Report
by
Hatfield Environmental Consultants

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Project
VAFFC MARINE TERMINAL FACILITY
15040 Williams Road, Richmond BC

Drawing
HABITAT BALANCE

Issue:
31 Oct. 2017 Development Permit Application Resubmission - ADP Comments

Scale: nts
Date:
Project Number: 2014-280

Dwg
L0.04

Plan # 25

City of Richmond

Development Permit

No. DP 16-741741

To the Holder:	VANCOUVER AIRPORT FUEL FACILITIES CORPORATION
Property Address:	15040 WILLIAMS ROAD
Address:	C/O FSM MANAGEMENT GROUP INC. 108 – 12300 HORSESHOE WAY RICHMOND, BC V7A 4Z1

1. This Development Permit is issued subject to compliance with all of the Bylaws of the City applicable thereto, except as specifically varied or supplemented by this Permit.
2. This Development Permit applies to and only to those lands shown cross-hatched on the attached Schedule "A" and any and all buildings, structures and other development thereon.
3. Subject to Section 692 of the Local Government Act, R.S.B.C.: buildings and structures; off-street parking and loading facilities; roads and parking areas; and landscaping and screening shall be constructed generally in accordance with Plans #1 to #25 attached hereto.
4. Sanitary sewers, water, drainage, highways, street lighting, underground wiring, and sidewalks, shall be provided as required.
5. As a condition of the issuance of this Permit, the City is holding the security in the amount of $361,248.80 (including, on-site ESA/RMA $86,673.00, on-site Trail and Buffer Strip $95,414.00, On-site Trail Slope landscaping $56,681.00, 3 years of maintenance $81,720.00, 3 years of monitoring $7,920.00 and a 10% contingency $32,840.80) to ensure that development is carried out in accordance with the terms and conditions of this Permit. Should any interest be earned upon the security, it shall accrue to the Holder if the security is returned. The condition of the posting of the security is that should the Holder fail to carry out the development hereby authorized, according to the terms and conditions of this Permit within the time provided, the City may use the security to carry out the work by its servants, agents or contractors, and any surplus shall be paid over to the Holder. Should the Holder carry out the development permitted by this permit within the time set out herein, the security shall be returned to the Holder. The City may retain the security for up to three years after inspection of the completed landscaping in order to ensure that plant material has survived.
6. If the Holder does not commence the construction permitted by this Permit within 24 months of the date of this Permit, this Permit shall lapse and the security shall be returned in full.

NOV 29 2017

Development Permit
No. DP 16-741741

To the Holder:	VANCOUVER AIRPORT FUEL FACILITIES CORPORATION
Property Address:	15040 WILLIAMS ROAD
Address:	C/O FSM MANAGEMENT GROUP INC. 108 - 12300 HORSESHOE WAY RICHMOND, BC V7A 4Z1

7. The land described herein shall be developed generally in accordance with the terms and conditions and provisions of this Permit and any plans and specifications attached to this Permit which shall form a part hereof.

   This Permit is not a Building Permit.

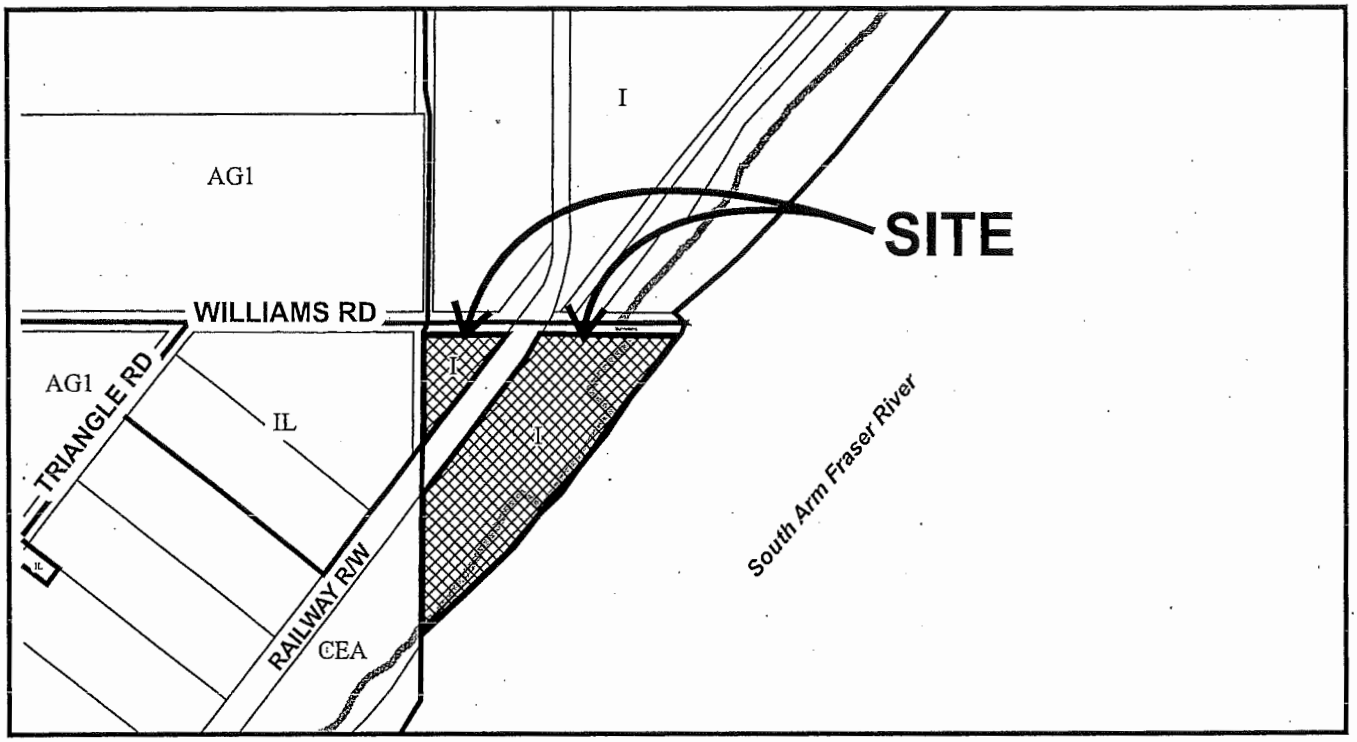
AUTHORIZING RESOLUTION NO. ISSUED BY THE COUNCIL THE DAY OF , .

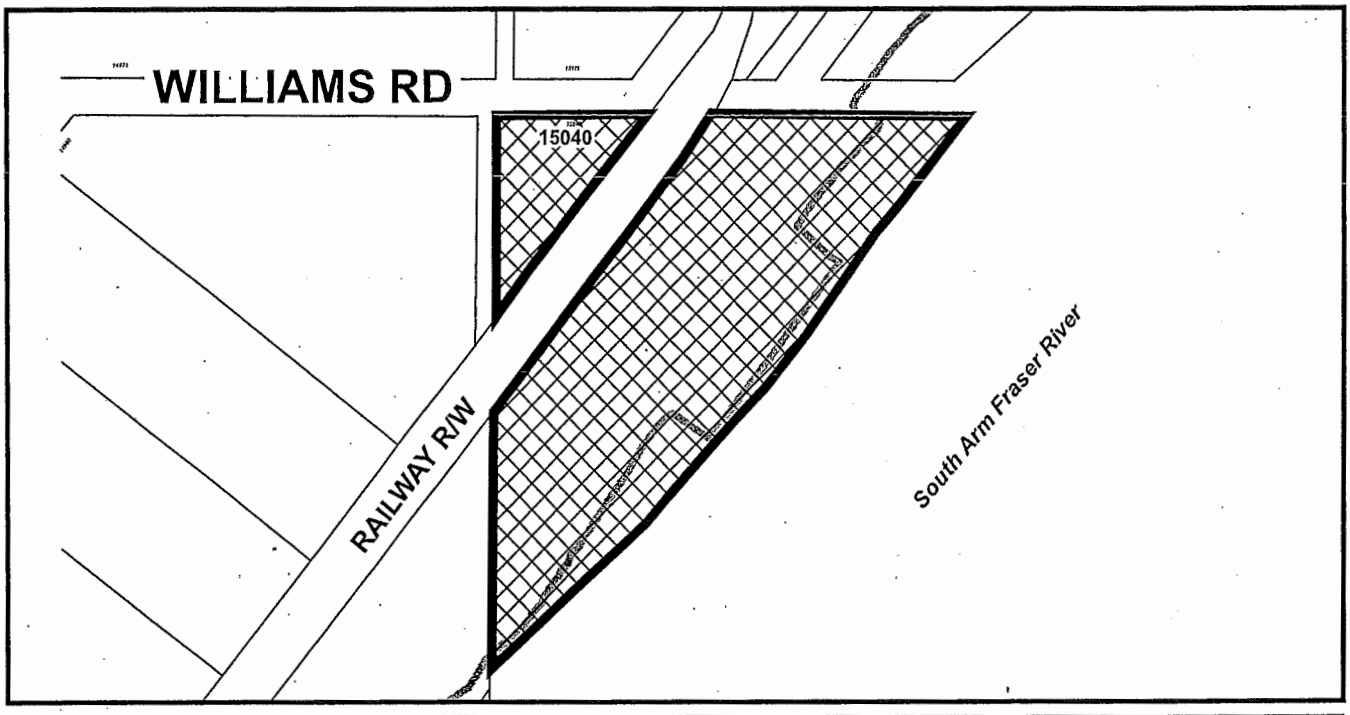
DELIVERED THIS DAY OF , .

_____

MAYOR

City of
Richmond





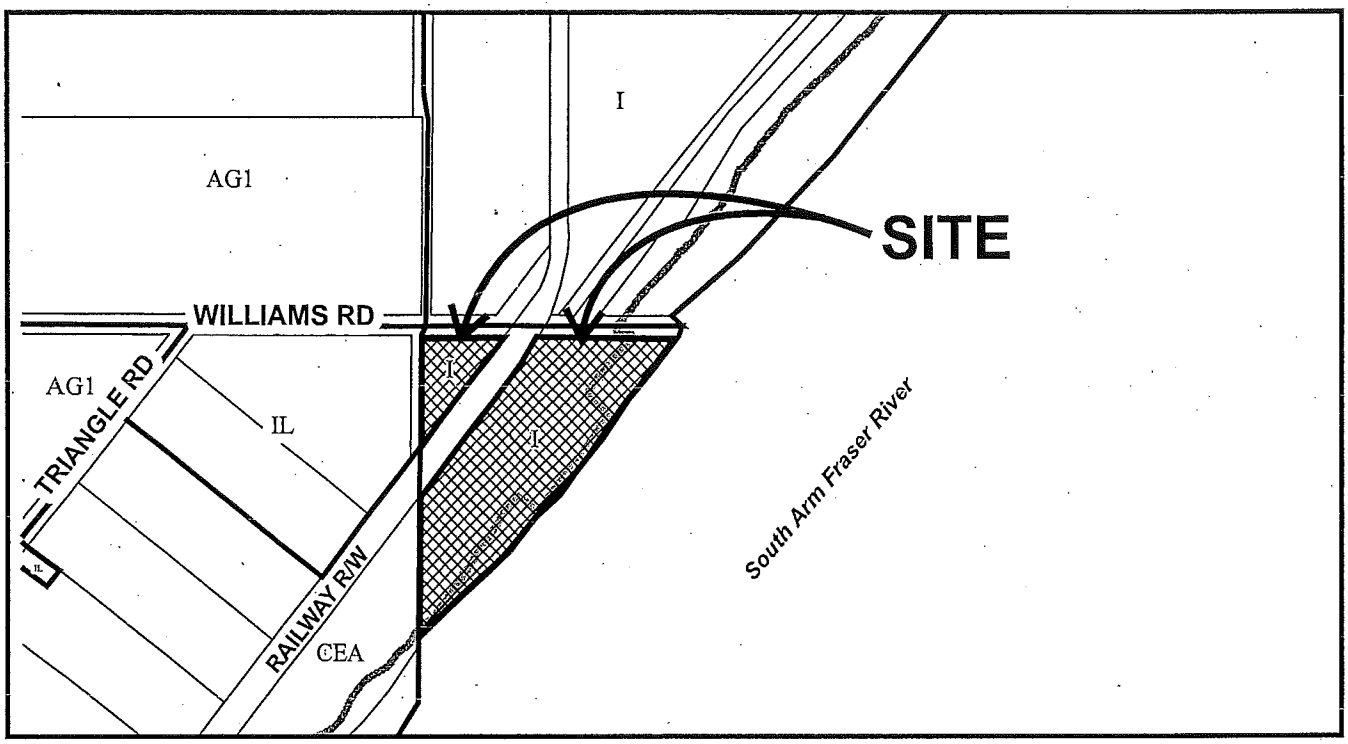
DP 16-741741
SCHEDULE "A"

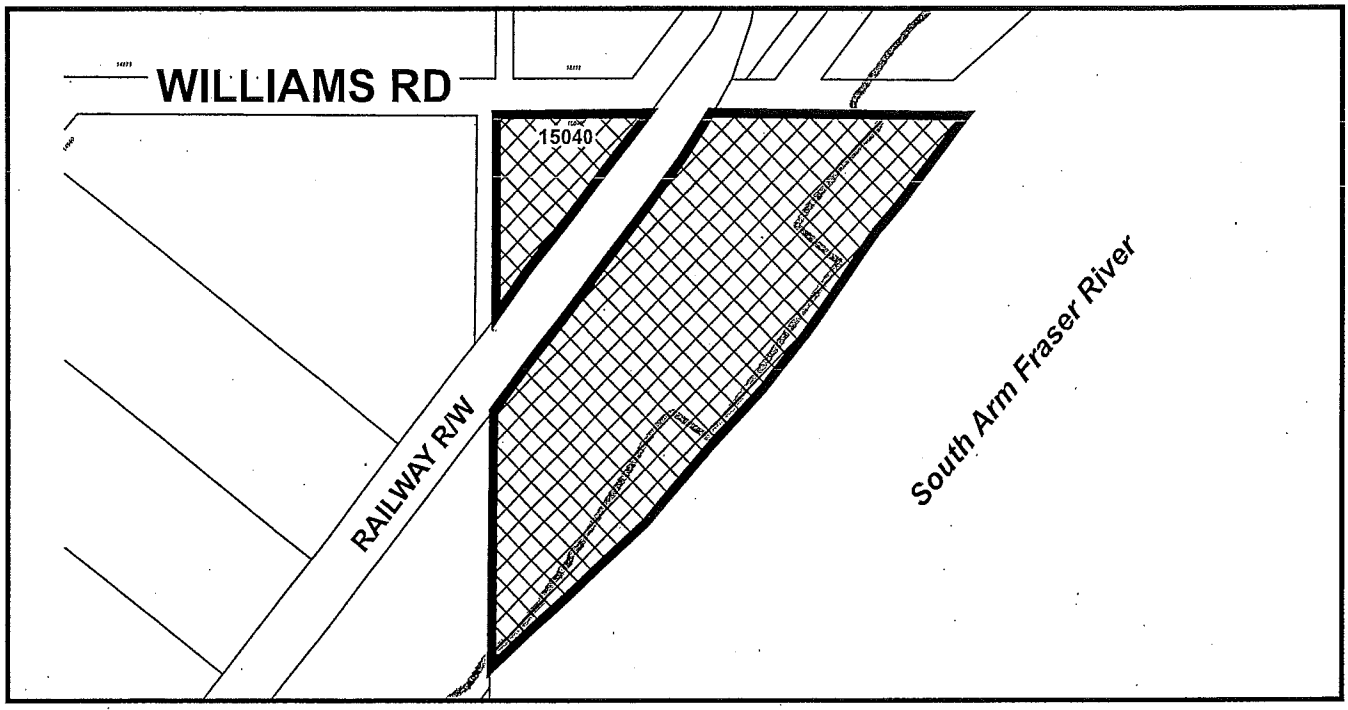
Original Date: 08/22/16

Revision Date:

Note: Dimensions are in METRES

City of
Richmond





DP 16-741741

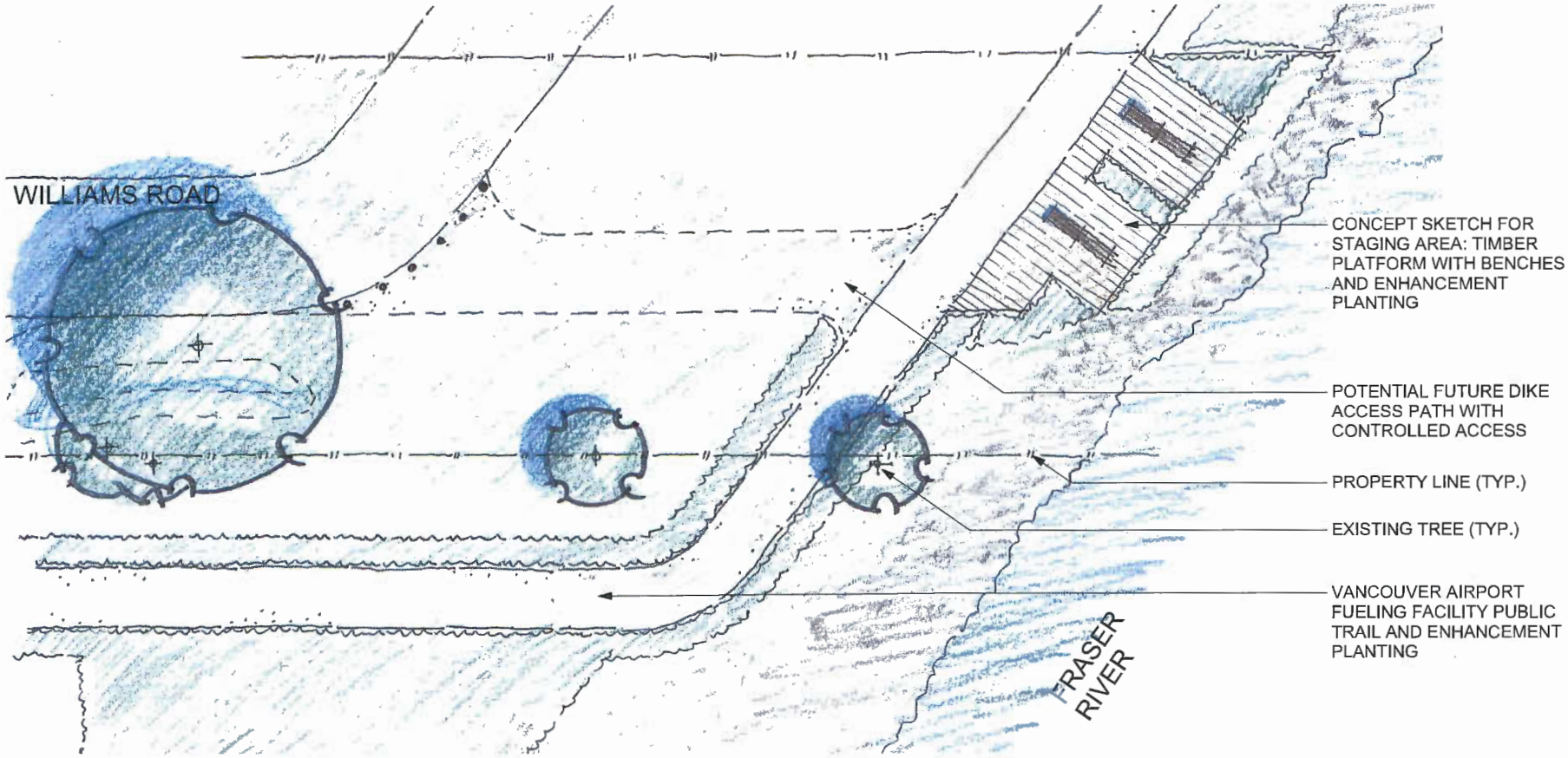
Original Date: 08/22/16

Revision Date:

Note: Dimensions are in METRES

Attachment BB

Revised Offsite Staging Area and
Trail Enhancement Cost Estimate



VANCOUVER AIRPORT FUELING FACILITY: WILLIAMS ROAD STAGING AREA CONCEPT SKETCH | DATE: JAN 23, 2018 | SCALE 1:200 | N

City of Richmond Interactive Map

Legend

- Parks Names
- Major Street Names
- Minor Street Names
- Parks
- Strata
- Property
- Aerial Photo 2013

169.0 0 84.52 169.0 Meters

This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.

THIS MAP IS NOT TO BE USED FOR NAVIGATION

VAFFC

Estimate of Probable Costs

Last updated: January 8, 2018

Williams Road Staging Area

#	Item	Units	Unit Cost	Quantity	Total
	Site Preparation				
1	Excavation and Earth Works	cu m	$50.00	50	$2,500.00
	Paving and Hardscape				
2	Timber Decking	sq m	$300.00	75	$22,500.00
	Furnishings				
3	Benches	ea	$1,500.00	4	$6,000.00
	Planting				
4	Mixed Shrubs and Perennials	sq m	$75.00	55	$4,125.00
5	Growing Medium	cu m	$60.00	25	$1,500.00
	Miscellaneous				
6	Site Survey	lump	$7,500.00	1	$7,500.00
7	Engineering + Design	lump	$15,000.00	1	$15,000.00
				Subtotal	**$59,125.00**

Trail and Planting Upgrades to South

#	Item	Units	Unit Cost	Quantity	Total
	Site Preparation				
1	Excavation and Earth Works	cu m	$50.00	325	$16,250.00
	Paving and Hardscape				
2	Increase existing width of crushed granular trail along the river by 1m (from 2m to 3m)	sq m	$40.00	420	$16,800.00
	Planting				
3	Mixed Shrubs and Perennials	sq m	$75.00	840	$63,000.00
4	Growing Medium	cu m	$60.00	250	$15,000.00
				Subtotal	**$111,050.00**

Combined Subtotal	**$170,175.00**
20%Contingency	**$34,035.00**
TOTAL	**$204,210.00**

Legend: cu m = cubic meter // lump = lump sum // sq m = square meter // ea = each

Attachment CC
Revised Landscape Cost Estimates

DAMON ORIENTE LTD.
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18 December 2017

RE: Marine Terminal Fuel Facility Site
REVISED Estimate of Landscape Construction Costs for On-Site Landscape Areas Adjacent to Trail Buffer and Expanded Landscape Areas On-Site.

This letter provides a summary of our estimate of probable landscape construction costs for the above named area. It has been prepared to cover the onsite planting areas on the slope adjacent to the on-site area of the trail. This estimate is based on the revised landscape drawings dated 18 December 2017.

We have divided the work into general categories typical for landscape construction. Each category cost is developed using material costs which have integrated allocations for delivery, installation and machine time factored in to the total item cost.

This estimate assumes that grading and necessary excavation will be performed as part of the overall site construction work, undertaken by the facility and civil works contractors. Site access is direct, with gentle slopes and direct delivery to the installation locations anticipated.

The estimated total increases from $99,177.10 to $109,074.35

On Site Trail Slope Planting			
	Planting soil	652 cu. m.	$35,887.50
	Plants, installed	5330	$29,791.00
	Estimated Construction Cost		$65,678.50
	Maintenance for three years		$33,480.00
Subtotal			$99,158.50
Contingency at 10%			$9,915.85
Estimated Total Cost			$109,074.35

Maintenance includes watering once per week, three months per year, for three years, and weeding once per month, eight months per year, for three years.

end

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18 December 2017

RE: Marine Terminal Fuel Facility Site
REVISED Estimate of Landscape Construction Costs for Development Permit Areas

This letter provides a revised summary of our estimate of probable landscape construction costs for the above named project. It includes the onsite and offsite RMA and ESA habitat planting areas as well as the onsite trail and landscape buffer planting.

This estimate is based on the landscape drawings submitted as part of the development permit application, revised 18 December 2017. Tree sizes have been increased as have pot sizes for some specified shrubs and ground covers. The estimate total increases from $283,167.50 to $345,426.40.

We have divided the work into general categories typical for landscape construction. Each category cost is developed using material costs which have integrated allocations for delivery, installation and machine time factored in to the total item cost.

These estimates assume that the site grading and necessary excavation will be performed as part of the overall site construction work, undertaken by the facility and civil works contractors. Site access appears to be direct, with gentle slopes and direct delivery to the installation locations anticipated.

Summary Table of Area Cost Estimates		
	On Site ESA & RMA Planting	$87,329.00
	Off Site ESA & RMA Planting	$23,861.00
	On Site Trail and Buffer Strip Planting	$146,674.00
Subtotal		**$257,864.00**
	Maintenance for Three Years	$48,240.00
	Monitoring for Three Years	$7,920.00
Subtotal		**$314,024.00**
Contingency at 10%		$31,402.40
Estimated Total Cost		**$345,426.40**

The area breakdowns are on the following page.

Maintenance includes watering once per week, three months per year, for three years, and weeding once per month, eight months per year, for three years. Monitoring will be once per year by a QEP and includes an annual report.

Damon Oriente Ltd.

On Site ESA & RMA planting area		2,282 sq. m.	UPDATED
	Planting soil	925 cu. m.	$50,831.00
	Plants, installed	1876 asst'd sizes	$36,498.00
	Estimated Item Total		**$87,329.00**

Off Site ESA & RMA Planting			UPDATED
	Planting soil	142 cu. m.	$7,837.00
	Plants, installed	537 asst'd sizes	$16,024.00
	Estimated Item Total		**$23,861.00**

On Site Trail and Buffer Strip Planting			UPDATED
	Planting soil	390 cu. m.	$21,450.00
	Plants, installed	5389 asst'd sizes	$86,224.00
	Trail, gravel on compacted base	780 sq. m. (260 lin. m. x 3 m width)	$39,000.00
	Estimated Item Total		**$146,674.00**

end

DAMON ORIENTE LTD.
LANDSCAPE ARCHITECTS

#306 – 4464 West 10th Avenue
Vancouver, BC, V6R 2H9
Canada

Tel: 604-222-9200
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W: http://www.damonoriente.ca

25 January 2018

RE: Marine Terminal Fuel Facility Site
Estimate of Landscape Construction Costs for Inland/ Triangle Portion of the Development Permit Areas

This letter provides a preliminary estimate of probable landscape construction costs for the inland triangle area of the proposed Marine Terminal project. It includes the onsite area west of the rail R.O.W, excluding RMA and ESA habitat planting areas which are costed in previous estimates.

This estimate is based on the landscape drawing dated 18 December 2017 prepared for City review. The treatment area on this portion of the site is calculated at 1210 sq. metres.

We have divided the work into general categories typical for landscape construction. Each category cost is developed using material costs which have integrated allocations for delivery, installation and machine time factored in to the total item cost. The plant list for this area is on the following page.

Maintenance includes watering once per week, three months per year, for three years, and weeding once per month, eight months per year, for three years.

Summary Table of Inland Triangle Area Cost Estimate			
	Planting soil	605 cu. m.	$33,275.00
	Plants installed	3193 asst'd sizes	$86,964.00
Subtotal			**$120,239.00**
	Maintenance for Three Years		$33,480.00
Subtotal			**$153,719.00**
Contingency at 10%			$15,371.90
Estimated Total Cost			**$169,090.90**

.../2

Triangle Site Plant List

ID	Quantity	Latin Name	Common Name	Scheduled Size	Notes
TREES					
Ac.c	61	Acer circinatum	Vine maple	3.0 m ht.	
Ac.mac	38	Acer macrophyllum	Big leaf maple	#5 pot	
Aln.Rb	152	Alnus rubra	Red alder	#3 pot	
P.doug	38	Pseudotsuga menziesii	Douglas fir	3.0 m. ht.	
Tsu.ht	61	Tsuga heterphylla	Western hemlock	3.0 m. ht.	
SHRUBS					
Cyc	61	Corylus cornuta	Beaked hazelnut	1.5m. ht.	
Pa	23	Physocarpus albus	Pacific ninebark	#2 pot	
Rp	114	Rubus parviflorus	Thimbleberry	#2 pot	
Rsp	190	Rubus spectabilis	Salmonberry	#2 pot	
Sa	36	Symphorocarpus albus	Snowberry	#2 pot	
GROUNDCOVERS AND GRASSES					
	888	Arctostaphylls uva-ursi	Kinnikinnick	10 cm pot	
	608	Elymus glacus	Blue lyme grass	10 cm pot	
	608	Leymus mollis	Dune grass	10 cm pot	
	35	Mahonia aquafolium	Oregon grape	#2 pot	
	140	Mahonia nervosa	Dull Oregon grape	#2 pot	
	140	Rosa gynmocarpa	Baldhip rose	#2 pot	
	3193	Plant total for triangle site			

Damon Oriente Ltd.

end

Hatfield
CONSULTANTS

MEMO

Date: February 8, 2018

From: Tim Poulton

To: Mark McCaskill

Subject: Vancouver Airport Fuel Facilities Corporation – Cost Proposal to Monitor Intertidal Habitat Bench

The following memorandum provides a scope of work and fee estimate to monitor the proposed intertidal marsh bench located at the Vancouver Airport Fuel Facilities Corporation's Marine Terminal in the City of Richmond.

The monitoring will occur over a 5-year post-construction period. The intention of the monitoring program is to evaluate the success of the intertidal marsh bench by assessing plant species survivorship, and physical stability of the bench. It is estimated that two site inspections will occur each year of the monitoring program and include liaison with stakeholders to review adaptive management as required.

A brief report summarizing results of the site inspections and recommendations will be provided annually. It should be noted that a formal monitoring plan has not been developed or approved at this time. Estimated costs to complete the monitoring activities are summarized in Table 1.

Table 1 Estimated cost to complete monitoring of the Marine Terminal Facility Intertidal Marsh Bench.

Year 1 Task Description	Professional Fees
Field Inspections	$2,880
Adaptive Management and Liaison	$1,440
Annual Report	$2,880
Year 1 Total	**$7,200**
[1]Year 2 Total	$7,416
[1]Year 3 Total	$7,638
[1]Year 4 Total	$7,867
[1]Year 5 Total	$8,103
5 Year Monitoring Plan Total	**$38,224**

Note: All costs are exclusive of GST.

[1]Includes a 3% annual increase in Fees

Please contact me should you have any questions regarding this memorandum.

Sincerely

Tim Poulton

Tim Poulton, RPBio, PBiol
Manager, Environmental Monitoring and Assessment
HATFIELD CONSULTANTS

Attachment DD

Peer Review Summary Letter
(Pottinger Gaherty and Northwest Hydraulics)

PGL ENVIRONMENTAL CONSULTANTS
1200 – 1185 West Georgia Street
Vancouver BC V6E 4E6
604 682 3707
pggroup.com

February 8, 2018
PGL File: 0831-11.01

Via E-mail: **dbrownlee@richmond.ca**

City of Richmond
6911 No. 3 Road
Richmond, BC
V6Y 2C1

Attention: **David Brownlee**
Planner 2

RE: PEER REVIEW ASSESSMENT – VANCOUVER AIPORT FUEL FACILITIES CORPORATION, INTERTIDAL ENHANCEMENT – 15040 WILLIAMS ROAD, RICHMOND, BC

PGL Environmental Consultants (PGL) is pleased to provide the City of Richmond (City) with the following letter summarizing our peer review assessment of the proposed intertidal habitat enhancement works associated with Vancouver Airport Fuel Facilities Corporation's (VAFFC's) Marine Terminal Facility at 10540 Williams Road in Richmond, BC.

BACKGROUND

The VAFFC has applied to the City for a Development Permit (DP) to construct a Marine Terminal Facility for aviation/jet fuel delivery at 15040 Williams Road (the Site). The Site is situated along the north shoreline of the South Arm of the Fraser River and a portion of this Site has been designated by the City as an Environmentally Sensitive Area (ESA).

Given the location and nature of the proposed project, the ESA will be impacted. As such, the City has requested that the VAFFC explore opportunities to enhance habitat conditions within the ESA and along the Fraser River intertidal waterfront to offset the proposed impacts. In addition to backshore terrestrial restoration, the proponent's offset plan includes a 200m x 2m wide marsh bench within the intertidal zone of the Fraser River.

The City has requested that PGL review the intertidal habitat bench to ensure that the proposed offset is viable from both a technical and a functional habitat perspective. To provide this review, PGL collaborated with Northwest Hydraulic Consultants (NHC) to provide a review from both a biological and geomorphological/engineering perspective.

The objective of the review will be to provide the City with our opinion and recommendations related to the design and monitoring of the intertidal bench feature, as well as indicate whether any additional approvals might be required (e.g., referral to Fisheries and Oceans Canada).

Methodology

PGL and NHC reviewed background documents, as provided by the City. These included a series of memos and reports prepared by Hatfield Consultants (Hatfield) and various design plans prepared by VAFFC's consulting team. City-prepared guidance documents including the Official Community Plan sections related to the Ecological Network Approach and the intertidal ESA DP Guidelines were also reviewed.

In addition to reviewing background documents, PGL and NHC participated in a site meeting and reconnaissance on February 2, 2018. Representatives from both the City and VAFFC's consulting team were present to provide additional background, and answer questions.

FINDINGS

The proposed intertidal bench is positioned within a fast-flowing portion of the Fraser River and is located on the scour-side. As such, there are inherent challenges in creation of intertidal habitat features without careful consideration of geomorphologic processes. It is our opinion that the projects ability to design and engineer around the geomorphic process will have the greatest influence on the success of the intertidal bench feature. This is in line with notions expressed in Hatfield's memo dated October 31, 2017. NHC provides further assessment, comments, and recommendations regarding this aspect of the design will be provided under separate cover.

From a biological perspective, we provide the following comments regarding general approach, species selection, substrate, geese grazing, and adaptive management/success monitoring.

General Approach

We agree with VAFFC's consultants in that the proposed project will ultimately provide an improvement to overall foreshore habitat in this area. Demolition of the existing bulkhead wall, removal of fill, and stabilization of the shoreline with a new riprap slope will improve connectivity between moderately productive habitat upstream of the Site, to highly productive habitat downstream.

As noted, creation of a planted intertidal feature with the shoreline improvements will be met with inherent challenges. Careful engineering designs and implementation of an adaptive management approach (discussed below) should provide the best possible means to reduce/address these challenges. With even limited vegetation success, the additional complexity and new intertidal area at this location will represent a significant improvement in foreshore habitat.

The current placement of the intertidal bench is situated at mean sea level (i.e., 0.0m geodetic). This position could potentially subject the intertidal bench to maximum inundation depths of up to 2.3m under higher high water large tide events. Other than salinity, environmental factors such as soil texture and elevation can influence composition and richness in brackish intertidal marshes. Studies have shown notable decreases in these plant community characteristics, as time and depth of inundation increase.[i] For this reason, we would recommend adjusting the position of the intertidal bench so that it is closer to, or just below the mean annual high tide level.

Plant Species Selection

The proponent is proposing the use of three plant species to be installed at a density of 3 plants per square meter in the intertidal bench. The density proposed falls within the typical approach of 3-4 plants per square meter density observed/experienced in similar restoration initiatives.

Baltic rush (*Juncus balticus*) is the dominant species proposed for planting. This species seems suitable for the expected conditions (brackish water, frequent inundation) and proposed planting substrate (coarse). Under ideal conditions, a new stand could be established within one growing season planted at the proposed density. The Baltic rush plant guide provided by the United States Department of Agriculture's (USDAs) Natural Resources Conservation Service (NRCS) suggests that new plants can tolerate between 2.5 and 8cm of inundation.[ii] This would further support our recommendation to move the proposed intertidal bench to a higher position on the riprap slope.

The other two plant species proposed, Lyngbye's sedge (*Carex lyngbyei*) and hard-stemmed bulrush (*Schoenoplectus acutus*), are proposed at lesser amounts (i.e., 20% total composition each). According to growth requirements listed by the USDA's NRCS, Lyngbye's sedge has a

moderate tolerance to salinity, but is intolerant to shade.[iii] The latter may have a greater influence on the success of this species given the north-east exposure of the intertidal bench. In addition to this, studies have shown that Lyngbye's sedge grows most often in clay soils.[i] The coarser substrate proposed in the intertidal bench may also be a hindrance to the success of this species.

Hard-stemmed bulrush is noted to be less tolerant of saline conditions relative to Baltic rush and Lyngbye's sedge; however, it can tolerate greater depths of inundation.[iv] Although hard-stemmed bulrush is believed to be intolerant of shade, it can grow in a range of soils including coarser substrate.[v]

Although the two lesser plant species are not as suitable for the expected growing environment relative to Baltic rush, there is a reasonable chance that they might succeed. As such, it is our opinion that including these species as a "trial" attempt to diversify the plant community within the proposed intertidal bench is worth the effort, providing an adaptive management strategy is in place.

Substrate

As noted above, the coarse substrate proposed may not present ideal growing conditions for some of the plant species (e.g., Lyngbye's sedge). However, given the position on the Fraser River and expected geomorphic influences, it is our opinion that the substrate proposed is needed in order to reduce loss. Finer sediment accumulation may occur with time, as deposition occurs, which may, over time, create a more favourable habitat for other plant species.

Based on the cross-section reviewed, it appears that the proposed substrate depth of 0.5m will only be achieved in the middle of the bench. Substrate depth will lessen towards the edges of the bench. Presumably, the substrate depth will reach a point where it is too shallow to support plants (i.e., <0.3-0.2m). As such, it is reasonable to expect that vegetation will occur in a somewhat narrower band closer to the centre of the bench.

We note that the January 5, 2018 memo indicates that the bench will be "lined with geotextile;" this is not included on the cross-section detail. Lining the bench with geotextile material will help to retain the substrate within the bench and reduce the amount of material that could potentially wash into the spaces of the large riprap below. Therefore, it is our recommendation that the proponent ensure the intertidal bench includes a geotextile liner.

Geese Grazing

Based on past experience and expectations discussed during the site reconnaissance, we strongly recommend that some level of goose deterrent be implemented to restrict access to the planted intertidal bench. Canada geese (*Branta canadensis*) are known to be a nuisance species when trying to establish wetland or intertidal plant species because they are known to devour any and all newly-planted nursery stock.

To avoid these losses, one possible option might be to install a temporary fence around the perimeter of the intertidal planting area. The fencing should be securely anchored (i.e., wooden posts firmly pounded into substrate), and rope should be strung across the opening to prevent geese from flying into the enclosure. The fencing must also be inspected and maintained on a regular basis to repair damage caused by floating debris or river flows, and ropes must be restrung across the opening, as needed.

Although the fencing may not be aesthetically pleasing and require some level of effort to maintain, it will only be required as a temporary measure (i.e., two-three growing seasons). This will allow for the plants to establish and develop sufficient biomass to withstand future grazing.

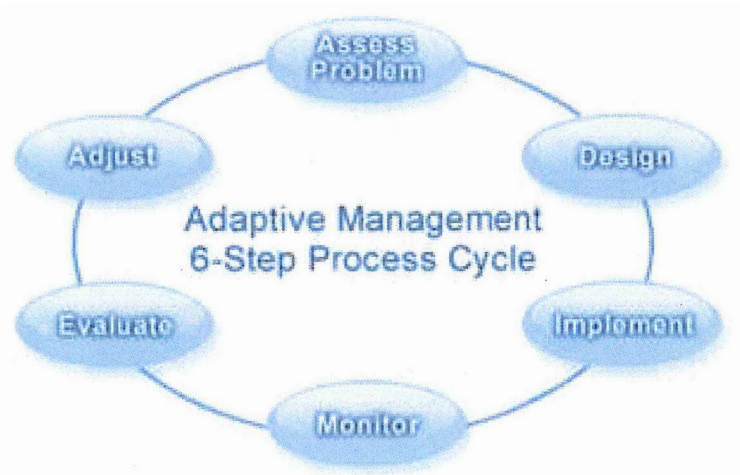
Adaptive Management and Success Monitoring

As noted, it should be anticipated that challenges will be experienced during the establishment of plant communities on the proposed intertidal bench. The proponent and City should recognize that the proposed intertidal bench is an attempt to create an unique habitat feature relative to adjacent and/or nearby shorelines, which are characterized by little to no intertidal plant growth.

Successful plant establishment will be influenced by ambient site conditions, species selection, invasive species occurrences, and potentially other unanticipated factors (e.g., storm events, human or animal disturbances, etc.). It is recommended that the proposed success monitoring program be implemented as part of an adaptive management strategy. Monitoring data should be used to modify and adapt the planting plan, if required, and improve plant establishment success.

Adaptive management is not simply an "on-the-fly" management strategy but is based on incorporating appropriate science and experience, along with monitoring data to reach a successful outcome. A simple adaptive management framework includes six primary steps, including assessment, design/planning, implementation, monitoring, evaluation, and adjustment (Figure 1).

Figure 1: Adaptive Management 6-Step Process Cycle[1]



We understand that the proponent has proposed a three-year success monitoring program. Given the expected challenges and uncertainty around intertidal plant success, we recommend that the success monitoring program for the intertidal habitat bench be extended to a minimum of five years. At the very least, there should be established thresholds or triggers in the proposed three-year success monitoring plan that would require the program to be extended (i.e., if any adaptation is required). It is our opinion that a three-year program would not provide for sufficient time to assess the success of adaptive measures, should they be required.

We recommend that the proponent propose a detailed success monitoring plan for the City to review and agree to. The plan should outline monitoring methodology, reporting expectations, and success criteria. It is also recommended that the proponent consider implementing a success criterion that assesses coverage versus survival. An agreed upon threshold should be established

[1] BC Ministry of Forests and Range, accessed March 24, 2015. https://www.for.gov.bc.ca/hfp/amhome/Admin/index.htm

where efforts are to be abandoned if it becomes apparent that plant success cannot be reasonably achieved.

Previous restoration projects requiring assessment of success of similar intertidal habitats have established five coverage classes. The coverage classes are defined as follows:

- Class 5 = 76-100% coverage;
- Class 4 = 51-75% coverage;
- Class 3 = 26-50% coverage;
- Class 2 = 5-25% coverage; and
- Class 1 = <5% coverage.

Standards outlined in the BC Ministry of Forests and Range/Ministry of Environment's Field Manual for Describing Terrestrial Ecosystems (2nd edition, 2010) could be adapted to estimate of percent vegetation cover on the intertidal bench. Achievement of Class 4 or 5 after five years of monitoring should be considered good success, Class 3 should be considered moderate success, and Classes 1 and 2 should be considered poor.

CONCLUSIONS

PGL was tasked with determining if the habitat enhancement project proposed by VAFFC was viable. We recommend that the bench elevation be altered to improve likelihood of success and note that conditions may not be ideal for long-term survival of marsh grasses in high densities. Nevertheless, even low vegetative coverage on a periodically exposed bench characterized by coarse substrate has ecological benefit and represents a meaningful improvement in riparian habitat quality in the lower reaches of the Fraser River. We are therefore of the opinion that the project is viable from an ecological and technical perspective.

LIMITATIONS

PGL prepared this report for our client and its agents exclusively. PGL accepts no responsibility for any damages that may be suffered by third parties as a result of decisions or actions based on this report.

PGL relied on the documents provided by the City for site information to prepare this opinion and as such, the limitations of our review are at least as great as those documents. The documents reviewed were last uploaded to the City's ownCloud application on February 2, 2018.

The findings and conclusions are site-specific and were developed in a manner consistent with that level of care and skill normally exercised by environmental professionals currently practising under similar conditions in the area. Changing assessment techniques, regulations, and site conditions means that environmental investigations and their conclusions can quickly become dated. The recommendations contained within this report are considered valid for one year. The report should not be used after that without PGL review/approval.

The project has been conducted according to our instructions and work program. Additional conditions, and limitations on our liability are set forth in our work program/contract. No warranty, expressed or implied, is made.

CLOSING

We trust that this meets your needs. If you have any questions or require clarification, please contact Keven Goodearle or Leslie Beckmann at 604-895-7646 and 604-895-7629, respectively.

PGL ENVIRONMENTAL CONSULTANTS

Per:

Original signed by

Keven Goodearle, B.Sc., R.P.Bio.
Senior Environmental Consultant

Original signed by

Leslie M. Beckmann, M.A.
Senior Environmental Consultant

[i] Erwing, K. 1982. *Environmental controls in Pacific Northwest intertidal marsh plant communities.* Canadian Journal of Botany, Volume 61: 1105-1116.

[ii] Stevens, M. and C. Hoag. Plant guide for Baltic rush (*Juncus balticus*). USDA-Natural Resources Conservation Service, Idaho Plant Materials Centre. Aberdeen, ID. https://plants.usda.gov/plantguide/pdf/cs_juba.pdf . Accessed 7 February 2018.

[iii]PLANTS Database. Characteristics: *Carex lyngbyei.* USDA-Natural Resources Conservation Service. https://plants.usda.gov/java/charProfile?symbol=CALY3 . Accessed 7 February 2018.

[iv] Tiley, D. 2012. Plant guide for hardstem bulrush (*Schoenoplectus acutus*). USDA-Natural Resources Conservation Service, Idaho Plant Materials Centre. Aberdeen, ID. 83210. https://plants.usda.gov/plantguide/pdf/pg_scac3.pdf . Accessed 7 February 2018.

[v] PLANTS Database. Characteristics: *Schoenoplectus acutus.* USDA-Natural Resources Conservation Service. https://plants.usda.gov/java/charProfile?symbol=SCACA . Accessed 7 February 2018.

Attachment EE
Revised Development Permit Considerations

City of Richmond

Development Permit Considerations
Development Applications Department
6911 No. 3 Road, Richmond, BC V6Y 2C1

Address: 15040 Williams Road **File No.:** DP 16-741741

Prior to approval of the Development Permit, the developer is required to complete the following:

1. Receipt of a Letter of Credit/security for $597,344.55 inclusive of the following:
   - On-site ESA and RMA landscaping in the amount of $87,329.00.
   - On-site Trail and Buffer Strip in the amount of $146,674.00.
   - On-site Trail landscaping in the amount of $65,678.50.
   - On-site landscaping for the Triangle Area north of CN Rail in the amount of $120,239.00.
   - Three years of maintenance (ESA/RMA/Trail/Trail Slope/Triangle area) in the amount of, $115,200.00.
   - Three years of monitoring (ESA/RMA/Trail/Triangle area) in the amount of $7,920.00.
   - 10% contingency in the amount of $54,304.05.

   (The above amounts being based on the costs estimate provided by Damon Oriente Ltd. Landscape Architects – letters dated December 18, 2017. The figures include a 10% contingency).

   Off-site ESA/RMA securities (estimated at $23,861.00 plus $2,386.10 contingency**) will be addressed through a Servicing Agreement. ** Note that off-site security amounts may be adjusted via the terms of the standard Servicing Agreement.
2. Receipt of a Letter of Credit/security in the amount of $38,224.00 for five years of adaptive management/detailed success monitoring plan implementation with annual reporting by a Qualified Environmental Professional (QEP).
3. Submission of a five-year adaptive management strategy/detailed success monitoring plan to the satisfaction of the Director of Development prior to the Development Permit application being forwarded to Council.

4. Submission of a contract entered into between the applicant and a Qualified Environmental Professional (QEP) to monitor all ESA, RMA and trail vegetation installations (on and off-site) plus the on-site trailside landscaping (400 m^2), the expanded trail buffer and slope planting (660 m^2) the planting strip adjacent to the Williams Road RMA (245 m^2), the new intertidal bench marsh (200 m^2) and the new triangle area planting (1,210 m^2). The contract will also include provision for three years of post-installation monitoring for all areas, with the exception of the intertidal bench marsh which will be monitored for five years. Annual reporting is to be provided for these installations. The Contract should include the scope of work to be undertaken, including: the proposed number of site monitoring inspections, and a provision any remedial works during the monitoring period. Planting within RMA areas is to comply with Provincial RAR re-vegetation guidelines.
5. Submission of a contract to ensure that pruning and limb removal of retained trees is under supervision of a certified arborist, invasive vegetation removal within the tree protection area by hand only and activity within the drip line of retained trees to be done under the supervision of a Qualified Environmental Professional (QEP) or a certified arborist as outlined in the Arborist's Report.
6. Installation of appropriate tree protection fencing around all trees identified for retention by the Arborist (uTree Environmental Consultants Report, June, 2017). Fencing is to be installed to the City's standards as part of the development prior to any construction activities occurring on-site.
7. Submission of payment in the amount of $204,210 to the City of Richmond, as a voluntary cash-in-lieu contribution for the design and future construction of a recreational staging area located to the east of Williams Road and off-site trail enhancements to the east of the subject property at the City's discretion. Timing of the staging area construction may be affected by future dike improvements.
8. Submission of payment in the amount of $6,480.00 to the City of Richmond, as a voluntary contribution for the design and future installation of an interpretive signage package for the pedestrian trail system through the subject site. The detailed design and installation has been included in the Servicing Agreement requirements for the pedestrian trail and will be to the satisfaction of the Senior Manager of Parks Department.
9. Registration of a 6 m wide statutory right-of-way (ROW) with public right-of-passage (PROP) through 15040 Williams Road to accommodate a public trail in an alignment generally along the southern side of the CN Rail right-of-way as indicated in the Development Permit application and to the satisfaction of the Senior Manager of Parks Department. After completion of the Servicing Agreement maintenance period, the City will be responsible for maintenance and liability associated with the SRW.

10. Registration of a 7.5 m wide statutory right-of-way (ROW) for dike through 15040 Williams Road in an alignment generally near the property's foreshore with the Fraser River as indicated in the Development Permit application and to the satisfaction of the General Manager of Engineering Department. After completion of the Servicing Agreement maintenance period, the City will be responsible for maintenance and liability associated with the SRW. The SRW will provide the City with rights for access and the ability to maintain the works. The agreement should include a minimum building setback from the SRW of 7.0 m.
11. Registration of a flood plain covenant on Title, identifying a minimum habitable elevation of 3.0 / 4.35 m GSC split approximately at the alignment of the southern edge of the CN Rail right-of-way.
12. Registration of a legal agreement on Title to ensure that landscaping planted as part of the on-site ESA, the on-site RMA, the intertidal bench marsh and the triangle site are maintained and will not be abandoned or removed without City approval. Registration of a statutory right-of-way, and/or other legal agreements or measures, as determined to the satisfaction of the Director of Development.
13. Discharge of the existing foreshore covenant (BG 285960).
14. Registration of a legal agreement on Title to require the owner to design and construct bank protection along the river to the satisfaction of the General Manager, Engineering and the Inspector of Dikes and to provide the City with access to the land to inspect and maintain the works should the owner fail to do so. The owner will be responsible for the ongoing maintenance and liability of the works. The intent of the covenant is to ensure that the area outside of the 7.5 m right-of-way (ROW) will be constructed and maintained in a manner that protects the dike and cannot be modified without consent of the City of Richmond and the Provincial Inspector of Dikes.

Prior to Building Permit Issuance, the developer must complete the following requirements:

1. Enter into a Servicing Agreement* for the design and construction of a dike across 15040 Williams Road within the 7.5 m wide right-of-way (ROW) and integration with existing dikes on adjacent properties acceptable to the General Manager, Engineering. The foreshore riprap armourment is to include a bench marsh of approximately 100 m length by 2 m width, lined with an appropriate geotextile fabric and suitable growing substrate materials as outlined in the Development Permit application (DP 16-741741) and to the satisfaction of the General Manager, Engineering and the Director of Development. The intertidal bench marsh is to be located on the riprap slope generally as described in the report by PGL Environmental Consultants dated February 8, 2019 and is to include a temporary protective fence or similar alternative acceptable to the City.
2. Enter into a Servicing Agreement* for the design and construction of a 6 m wide park trail across 15040 Williams Road and integration with existing trails on adjacent properties acceptable to the Senior Manager of Parks Department. Works include, but may not be limited to, a 3 m wide aggregate trail surface with vegetation strips on both sides, design and installation of an interpretive signage package for the pedestrian trail, to the satisfaction of the Senior Manager of Parks Department.

3. Enter into a Servicing Agreement* for the design and construction of utility and frontage works and the off-site ESA/RMA landscaping enhancement areas identified as per the landscaping plans submitted under DP 16-741741. Off-site ESA/RMA securities (estimated at $23,861.00 plus $2,386.10 contingency**) will be addressed through the Servicing Agreement. ** Note that off-site security amounts may be adjusted via the terms of the standard Servicing Agreement.
4. Servicing Agreement works include, but may not be limited to the following:

Water Works:

a. Using the OCP Model, there is 583 L/s of water available at a 20 psi residual at the Williams Road frontage. Based on your proposed development, your site requires a minimum fire flow of 250 L/s.
b. The Developer is required to:
   - Submit Fire Underwriter Survey (FUS) or International Organization for Standardization (ISO) fire flow calculations to confirm development has adequate fire flow for on-site fire protection. Calculations must be signed and sealed by a Professional Engineer and be based on Building Permit Stage Building designs.
   - Install a single water service connection to serve the development site. The service connection can be split at the property line, and 2 m installed (one for fire, one for domestic use) inside meter chamber(s).
   - Install backflow prevention device at property line.
   - Provide statutory right-of-way (ROW) for meter and meter chamber.
c. At Developer's cost, the City is to:
   - Complete all tie-ins for the proposed works to existing City infrastructure.

Storm Sewer Works:

a. The Developer is required to:
   - Design and construct a storm sewer outfall into the RMA ditch utilizing appropriate sediment and erosion control methods, such as deltalok bags, and provide a functional plan within the first Servicing Agreement submission for review and approval by the City.
   - Install an oil and grit separator upstream of the proposed outfall, and provide the City with a separator maintenance plan within the first Servicing Agreement submission for review and approval.

Sanitary Sewer Works:

a. The Developer is required to:
   - N/A.

Frontage Improvements:

a. The Developer is required to:

- Coordinate with BC Hydro, Telus and other private communication service providers:
- When relocating/modifying any of the existing power poles and/or guy wires within the property frontages.
- To locate all above ground utility cabinets and kiosks required to service the proposed development within the developments site (see list below for examples). A functional plan showing conceptual locations for such infrastructure shall be included in the development process design review. Please coordinate with the respective private utility companies and the project's lighting and traffic signal consultants to confirm the requirements (e.g., statutory right-of-way dimensions) and the locations for the aboveground structures. If a private utility company does not require an aboveground structure, that company shall confirm this via a letter to be submitted to the City. The following are examples of statutory right-of-ways that shall be shown in the functional plan and registered prior to Servicing Agreement design approval:
- BC Hydro PMT – 4 mW x 5 m (deep).
- BC Hydro LPT – 3.5 mW x 3.5 m (deep).
- Street light kiosk – 1.5 mW x 1.5 m (deep).
- Traffic signal kiosk – 2 mW x 1.5 m (deep).
- Traffic signal UPS – 1 mW x 1 m (deep).
- Shaw cable kiosk – 1 mW x 1 m (deep) – show possible location in functional plan.
- Telus FDH cabinet-1.1 m W x 1 m (deep – show possible location in functional plan.
- Implement a riparian enhancement planting plan in the 5.0 m RMA watercourse along the Williams Road frontage.

Dike Improvements:

a. The developer is required to satisfy the following for the dike:
   - The dike shall be designed by a Professional Geotechnical Engineer.
   - The elevation of the dike crest shall be raised to minimum 4.7 m geodetic, and designed to accommodate a future elevation of 5.5 m. On the waterside of the dike, the slope shall be maximum 2:1. On the landside of the dike, the slope shall be maximum 3:1.
   - The crest of the dike shall be minimum 4.0 m wide.
   - Provide a 7.5 m statutory right-of-way for the dike.
   - There shall be a minimum building setback of 7.0 m from the dike right-of-way.
   - The drip line of any trees shall be set back at least 8.0 m from the future toe of the dike.
   - Above ground pipes crossing the dike right-of-way shall be removable to allow for dike inspection and maintenance.

- Design the dike and operations in a manner that allows for vehicular and man access along the dike upon the City's request.
- The dike along the frontage of the development site shall be tied in to the adjacent dikes to the north and south at a maximum slope of 3:1. Developer to be responsible to locate the dike to the north and south for a smooth transition. No retaining walls within the dike crest or slope area are allowed.
- All dike construction, including materials, shall be in conformance with City standard drawing MB-98 or MB-99, Dike Design and Construction Guide – Best Management Practices for British Columbia (2003), and Environmental Guidelines for Vegetation Management on Flood Protection Works to Protect Public Safety and the Environment (1999).
- The design and construction of the dike shall be done to the satisfaction of the General Manager, Engineering and Public Works, and any other relevant dike approving authorities.
- Discharge existing foreshore covenant and register a new foreshore covenant to ensure that the area outside of the 7.5 m right-of-way will be constructed and maintained in a manner that protects the dike and cannot be modified without consent of the City of Richmond and Inspector of Dikes.

General Items:

a. The Developer is required to:
   - Develop a sediment and erosion control and protection fencing plan for the proposed works to minimize impact to the 5.0 m RMA along Williams Road during construction, to the satisfaction of the City. A functional plan must be reviewed and approved by the City prior to Development Permit issuance.
   - Provide, within the first Servicing Agreement submission, a geotechnical assessment of preload and soil preparation impacts on the existing utilities fronting the development site and provide mitigation recommendations.
   - Enter into, if required, additional legal agreements, as determined via the subject development's Servicing Agreement(s) and/or Development Permit(s), and/or Building Permit(s) to the satisfaction of the Director of Engineering, including, but not limited to, site investigation, testing, monitoring, site preparation, de-watering, drilling, underpinning, anchoring, shoring, piling, pre-loading, ground densification or other activities that may result in settlement, displacement, subsidence, damage or nuisance to City and private utility infrastructure.

b. Plan and undertake the off-site ESA and RMA landscaping as per the landscaping plans submitted under DP 16-741741. A Qualified Environmental Professional (QEP) to monitor all planting ESA, RMA and trail vegetation installations and to provide three years of post-installation monitoring with annual reporting for the on-site and the off-site ESA, the RMA enhancement areas and the pedestrian trail vegetation installation. Planting within RMA areas is to comply with Provincial RAR re-vegetation guidelines.

c. Ensure that all pruning and limb removal of retained trees is to be under supervision of a certified arborist, invasive vegetation removal within the tree protection area is by hand only and activity within the drip line of retained trees to be done under the supervision of a Qualified Environmental Professional (QEP) or a certified arborist as outlined in the Arborist's Report.

5. City Arborist (Conor Sheridan: 604-244-1208, CSheridan@richmond.ca) to be notified prior to commencement of works within the drip line of existing retained off-site trees. Provide three business days minimum notice.
6. City Parks to review all off-site planting after it is in place (contact Steve Priest, Supervisor of Horticulture: 604-244-1208, and Miriam Plishka, Park Planner: 604-233-3310). Once plant material and placement have been accepted by the City, the maintenance period will commence.
7. Submission of a final sign-off letter of from CN Railway, to the satisfaction of the City's Director of Transportation and the Director of Engineering, for the VAFFC Marine Terminal project at 15040 Williams Road. If CN Railway's approval includes conditions or requirements, the proponent must provide means to meet those conditions/requirements to the satisfaction of the City's Director of Transportation.
8. Submission of a Construction Parking and Traffic Management Plan to the Transportation Department. Management Plan shall include location for parking for services, deliveries, workers, loading, application for any lane closures, and proper construction traffic controls as per Traffic Control Manual for works on Roadways (by Ministry of Transportation) and MMCD Traffic Regulation Section 01570.
9. Obtain a Building Permit for any construction hoarding. If construction hoarding is required to temporarily occupy a public street, the air space above a public street, or any part thereof, additional City approvals and associated fees may be required as part of the Building Permit. For additional information, contact the Building Approvals Department at 604-276-4285.

Notes:

* This requires a separate application and approval.

- Where the Director of Development deems appropriate, the preceding agreements are to be drawn not only as personal covenants of the property owner but also as covenants pursuant to Section 219 of the Land Title Act.

  All agreements to be registered in the Land Title Office shall have priority over all such liens, charges and encumbrances as is considered advisable by the Director of Development. All agreements to be registered in the Land Title Office shall, unless the Director of Development determines otherwise, be fully registered in the Land Title Office prior to enactment of the appropriate bylaw.

  The preceding agreements shall provide security to the City including indemnities, warranties, equitable/rent charges, letters of credit and withholding permits, as deemed necessary or advisable by the Director of Development. All agreements shall be in a form and content satisfactory to the Director of Development.

- Additional legal agreements, as determined via the subject development's Servicing Agreement(s) and/or Development Permit(s), and/or Building Permit(s) to the satisfaction of the Director of Engineering may be required including, but not limited to, site investigation, testing, monitoring, site preparation, de-watering, drilling, underpinning, anchoring, shoring, piling, pre-loading, ground densification or other activities that may result in settlement, displacement, subsidence, damage or nuisance to City and private utility infrastructure.
- Applicants for all City Permits are required to comply at all times with the conditions of the Provincial *Wildlife Act* and Federal *Migratory Birds Convention Act*, which contains prohibitions on the removal or disturbance of both birds and their nests. Issuance of Municipal permits does not give an individual authority to contravene these legislations. The City of Richmond recommends that where significant trees or vegetation exists on site, the services of a Qualified Environmental Professional (QEP) be secured to perform a survey and ensure that development activities are in compliance with all relevant legislation.

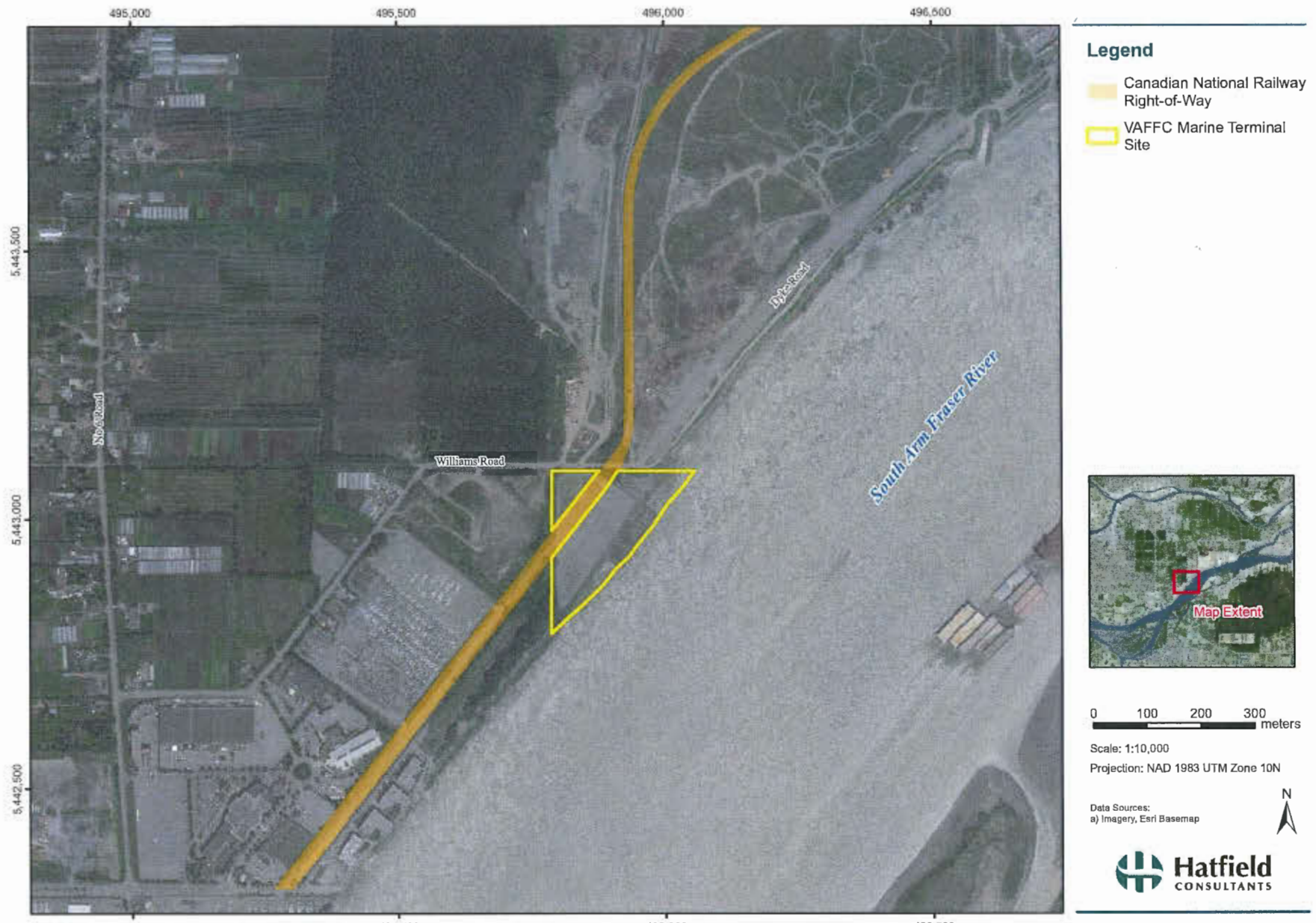
_____ _____

Signed Date

Revised Plan Submission

(For Development Permit Panel Review Feb. 28, 2018)

Figure 1 Vancouver Airport Fuel Delivery Project – Marine Terminal site location.



This plan is reprinted from the
ESA and RMA Environmental Report
by
Hatfield Environmental Consultants

18 Dec. 2017 Development Permit Application Resubmission - DPP Comments
31 Oct. 2017 Development Permit Application Resubmission - ADP Comments

DAMON ORIENTE LTD.
landscape architects

#306 - 4464 West 10th Avenue
Vancouver, BC, Canada
V6R 2H9

t. 604-222-9200
e. dvo@telus.net
w. damonoriente.ca

Project
VAFFC MARINE TERMINAL FACILITY

15040 Williams Road, Richmond BC

Drawing
MARINE TERMINAL SITE LOCATION

Issue:

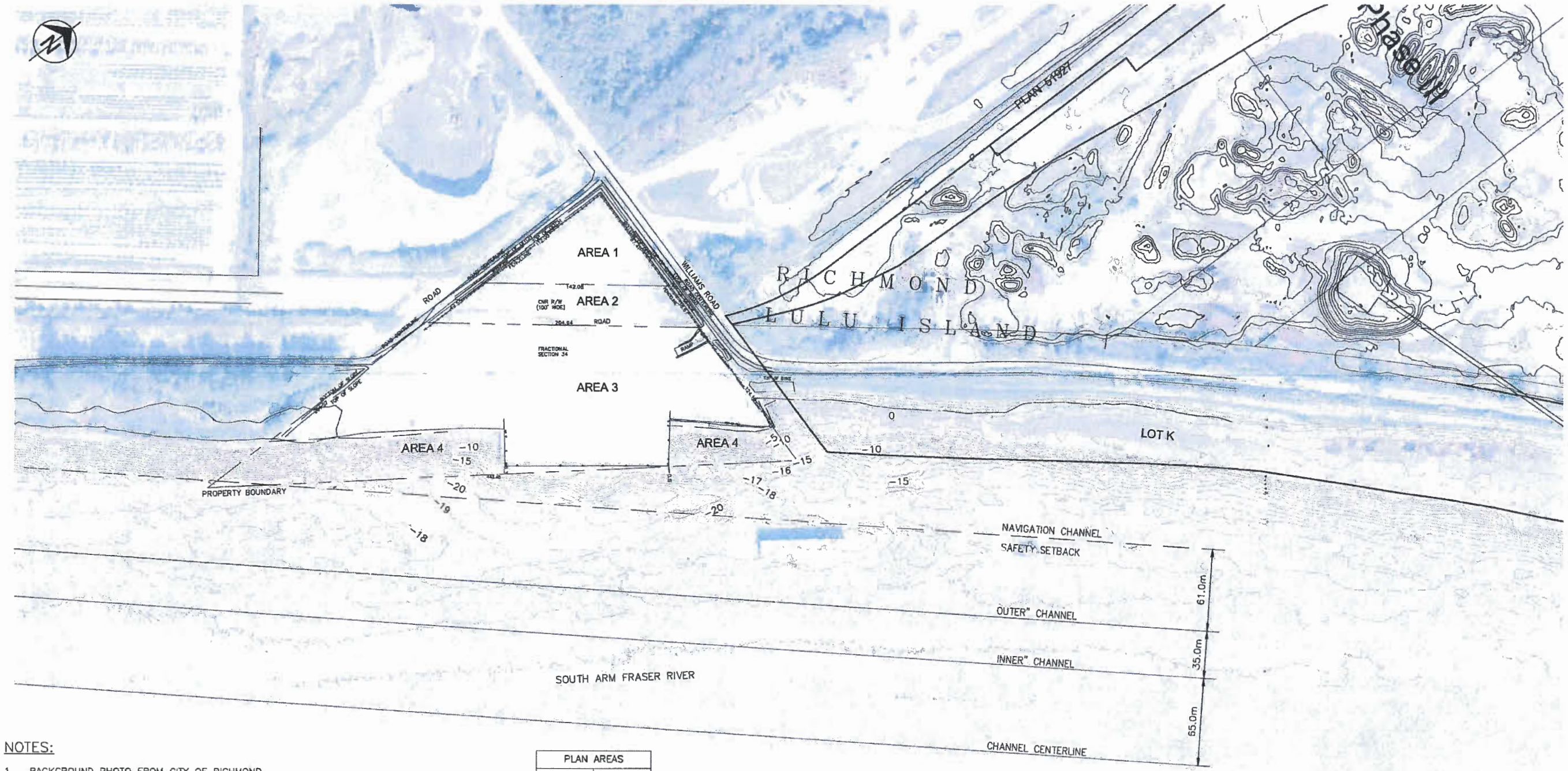
Scale: nts

Date:

Project Number: 2014-280

Dwg
L0.02

Refrence



NOTES:

1. BACKGROUND PHOTO FROM CITY OF RICHMOND.
2. TOPOGRAPHIC SURVEY PREPARED BY MATSON, PEAK AND TOPLISS. DRAWING REFERENCE V-06-15234-TPG. SURVEY DONE BY SEPTEMBER 12-14, 2006.
3. ALL ELEVATIONS ARE REFERENCED TO GEODETIC DATUM.

PLAN AREAS	
LOCATION	AREA (m^2)
AREA 1	4985
AREA 2	5298
AREA 3	26388
AREA 4	9229
TOTAL	45810

1 EXISTING SITE PLAN
1:1500

0 30 50 90 150m
1:1500

ISSUE NO.	DRAWING REVISIONS	ISSUE DATE
0	ISSUED FOR CONSTRUCTION	02/14/2017

YVR Fuel Facilities Corporation
106-12300 Horseshoe Way
Richmond BC V7A 4Z1
604-271-7113
www.fmgroup.ca
www.vancouverairportfuel.ca

VANCOUVER AIRPORT FUEL DELIVERY PROJECT
MARINE RECEIVING AREA
MARINE DESIGN PACKAGE
VANCOUVER AIRPORT FUEL FACILITIES CORPORATION
RICHMOND, BRITISH COLUMBIA

SEAL: PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA F.S. SHUSHTARIAN

LOGO: moffatt & nichol
777 WEST BROADWAY, STE 301
VANCOUVER, BC CANADA V5Z 4J7
604-707-9004

Argus
ENGINEERING | PLANNING | MANAGEMENT
ARGUS CONSULTING, INC.
6363 College Boulevard, Suite 600
Overland Park, Kansas 66211
816.228.7500 FAX 816.228.7535
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PROJECT NO:	15004.22C
DATE:	12/21/15
DESIGNED BY:	FS
DRAWN BY:	AVM
CHECKED BY:	RB
CAD FILE NAME:	15004.22C-G009

EXISTING SITE PLAN

DRAWING NO.: G-009

Plotted: P:\8338 VC Vancouver Airport Fuel Delivery Project\CADD_Active\15004.22C-G009.dwg on 03/7/17 at 1:17 PM by AMANUZON using Argus 2013.stb

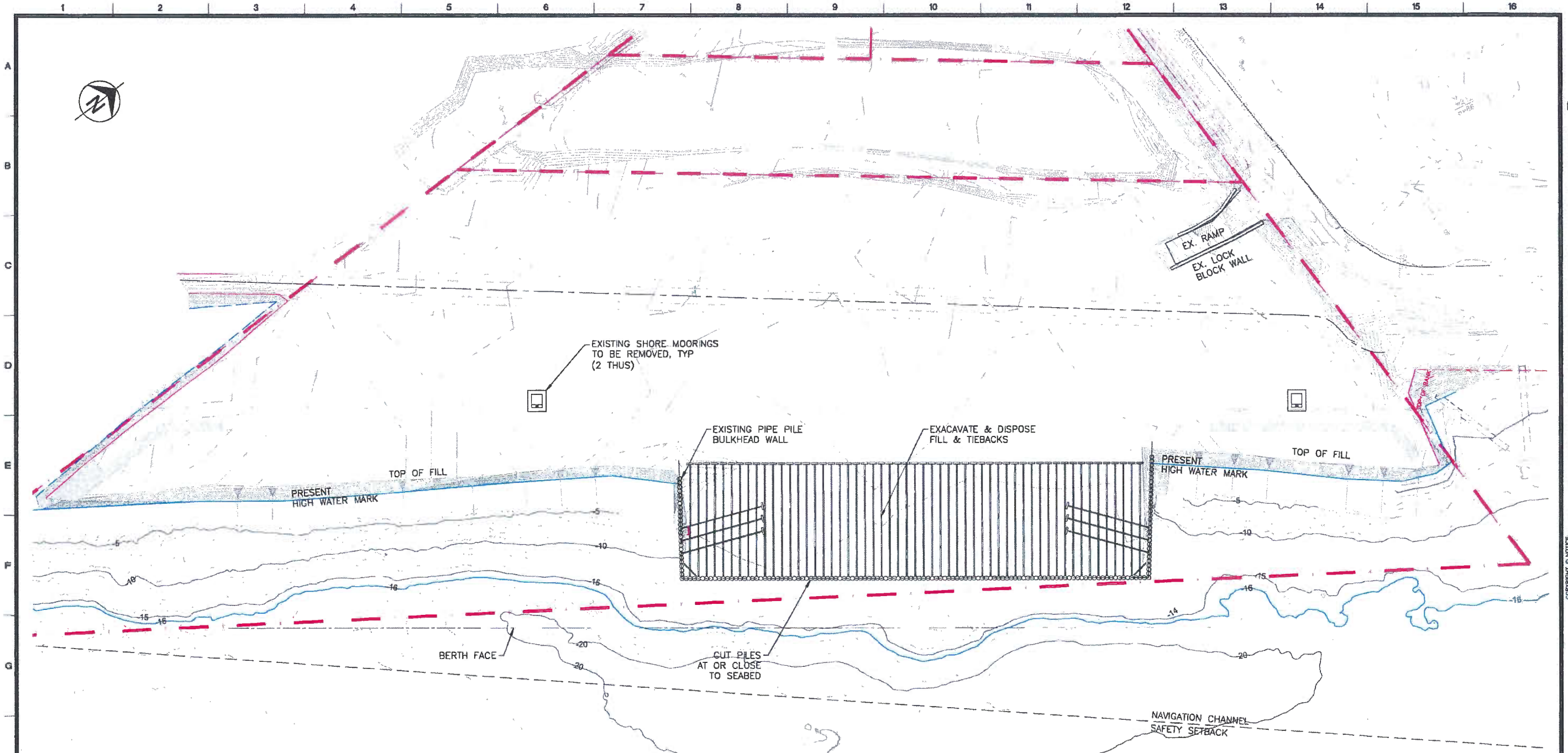
PLEASE RECYCLE

FEB 28 2018

ISSUED FOR CONSTRUCTION

DP 16-741741

Plan #1



1 DEMOLITION PLAN
1:500

LEGEND:

PROPERTY BOUNDARY

NOTES:

1. CONTOURS ARE BASED ON GEODETIC DATUM.

0 10 20 30 50m
1:500

ISSUE NO.	DRAWING REVISIONS	ISSUE DATE
0	ISSUED FOR CONSTRUCTION	02/14/2017

VAFFC / Fuel Facilities Corporation
1GB - 12300 Horseshoe Way
Richmond, BC, V7A 4Z1
604-271-7113
www.fsmgroup.ca
www.vancouverairportfuel.ca

VANCOUVER AIRPORT FUEL DELIVERY PROJECT
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VANCOUVER AIRPORT FUEL FACILITIES CORPORATION
RICHMOND, BRITISH COLUMBIA

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PROJECT NO:	15004.22C
DATE:	12/16/16
DESIGNED BY:	RB
DRAWN BY:	AVM
CHECKED BY:	RB
CAD FILE NAME:	15004.22C-G020

MARINE TERMINAL DEMOLITION PLAN

DRAWING NO.: G-020

PLEASE RECYCLE

FEB 28 2018

ISSUED FOR CONSTRUCTION

DP 16-741741

Plotted: P:\8338 VC Vancouver Airport Fuel Delivery Project\CADD_Active\15004.22C-G020.dwg on 03/7/17 at 1:18 PM by AMANUZON using Argus 2013.stb

Plan #2

BUILDING AREA AND STRUCTURE ELEVATIONS			
BUILDING NAME	FLOOR AREA (M^2)	STRUCTURE HEIGHT (M)	STRUCTURE ELEVATION (M)
CONTROL ROOM AND WASHROOM ENCLOSURE	43.29	3.5	9.0
FUEL LAB ENCLOSURE	21.65	3.5	9.0
FIRE PUMP ENCLOSURE 1	33.51	2.6	8.1
FIRE PUMP ENCLOSURE 2	33.51	2.6	8.1
FOAM STORAGE ENCLOSURE	28.01	2.6	8.1
ELECTRICAL ENCLOSURE	45.97	5.5	11.0
DOCK UNLOADING ARMS	N/A	33.0	37.8
DOCK GANGWAY TOWER	N/A	19.7	24.5
NOTE: THE MARINE UNLOADING ARMS ELEVATION ARE TO BE DETERMINED BY THE MANUFACTURER. APPROXIMATE ELEVATIONS OF THE STRUCTURE ARE LISTED ABOVE.			
SITE AREA: 40,468 M^2 LOT COVERAGE AREA: 0.52%			

BACKFLOW PREVENTOR AND WATER SHUTOFF BUILDING

VEHICLE PARKING
4– SPACES @ 3.2m
1–HANDICAP SPACE @ 3.2m
5 SPACES TOTAL

ACCESS ROAD TO BACKFLOW PREVENTOR BUILDING

DYKE NATURE TRAIL

OIL WATER SEPARATOR

ABOVEGROUND WASTE TANK

CN RAIL ROW

FOAM STORAGE ENCLOSURE

DIESEL POWERED FIRE PUMP ENCLOSURE

TRANSFORMER

GENERATOR

ELECTRICAL ENCLOSURE (SEE A–1401)

7.0 M DYKE SETBACK

PROPOSED DYKE ROW

NEW MOORING STRUCTURE WITH QUICK RELEASE MOORING HOOK (TYP.)

MOORING DOLPHIN 1

MOORING DOLPHIN 2

UNLOADING ARMS WITH SPILL CONTAINMENT (DRAINS TO OIL WATER SEPARATOR)

EQUIPMENT PAD WITH CONTAINMENT

UTILITY VESSEL LAUNCH

CONTAINMENT WALL

BERTHING DOLPHIN 1

BERTHING DOLPHIN 2

BERTHING DOLPHIN 3

BERTHING DOLPHIN 4

EXISTING BULKHEAD WALL TO BE REMOVED

CONTAINMENT BOOM DEPLOYED WHEN SHIP AT BERTH

MOORING DOLPHIN 4

MOORING DOLPHIN 3

EXISTING PARCEL A WATER LOT AREA = 3,550 SQ.M.

PROPOSED PARCEL A WATER LOT AREA = 7,977 SQ.M.

CONTAINMENT WALL

LAND COVERED BY WATER

WILLIAMS ROAD

6.0m ENTRANCE/EXIT FIRE CRASH GATE

OVERHEAD POWER POLE TRANSITION TO BELOWGROUND ELECTRICAL DUCT BANK

UTILITIES TO/FROM MARINE FACILITY (WORK OUTSIDE PROPERTY BOUNDARY NOT INCLUDED IN CITY OF RICHMOND PROJECT PERMIT)

NEW ELECTRICAL SERVICE CONNECTION TO EXISTING POWER POLE

7.0 M DYKE SETBACK

DYKE ROAD

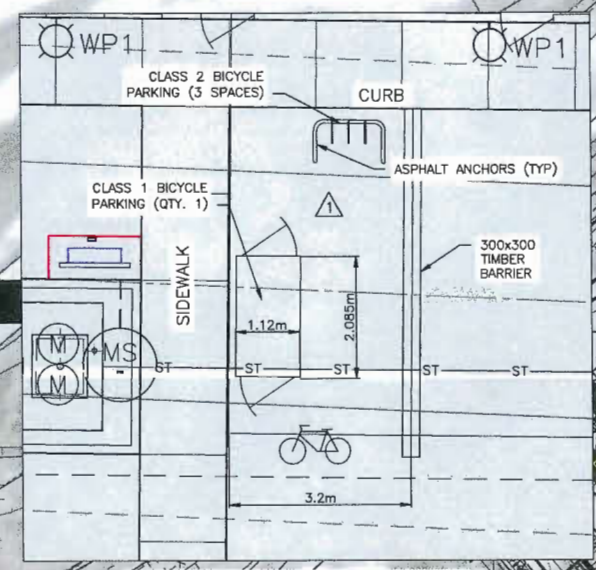
TRASH AND RECYCLE RECEPTICLE

CONTROL ROOM AND WASHROOM ENCLOSURE (SEE A–1402)

SECURITY FENCE AND PROPERTY BOUNDARY

CLASS 1 enclosure:
"Urban Bike Locker" or equivalent
http://www.urbanracks.com/bikelockers.html#image–3
Based in Surrey, BC

CLASS 2 Rack:
"Urban Hanger Rack" Model UB2000 or equivalent
http://www.urbanracks.com/hangerrack.html
Based in Surrey, BC



0 15 30 45 75m
1:750

ISSUE NO.	DRAWING REVISIONS	ISSUE DATE
2	REVISED LOCATION OF UNLOADING ARMS INTO WATER LOT	08/18/2017
1	ADDED BICYCLE PARKING DETAIL	07/24/2017
0	ISSUED FOR DEVELOPMENT PERMIT REVIEW	12/02/2016

VAFFC / Vancouver Airport Fuel Facilities Corporation
A FIRM GROUP MANAGED CORPORATION
FIRM MANAGEMENT GROUP
108 - 12300 Horseshoe Way
Richmond, BC. V7A 4Z1
604-271-7113
www.firmgroup.ca
www.vancouverairportfuel.ca

VANCOUVER AIRPORT FUEL DELIVERY PROJECT
MARINE RECEIVING AREA
PERMIT PACKAGE
VANCOUVER AIRPORT FUEL FACILITIES CORPORATION
RICHMOND, BRITISH COLUMBIA

SEAL

D. V. FRANIC
100109
PROFESSIONAL ENGINEER

LOGO

Argus
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6363 College Boulevard, Suite 600
Overland Park, Kansas 66211
816.228.7500 FAX 816.228.7535
www.argusconsulting.com

PROJECT NO:	15004.22
DATE:	05/22/2015
DESIGNED BY:	DWF
DRAWN BY:	DWF
CHECKED BY:	DWF
CAD FILE NAME:	CS1.01

OVERALL SITE PLAN

DRAWING NO.: CS-101

PLEASE RECYCLE

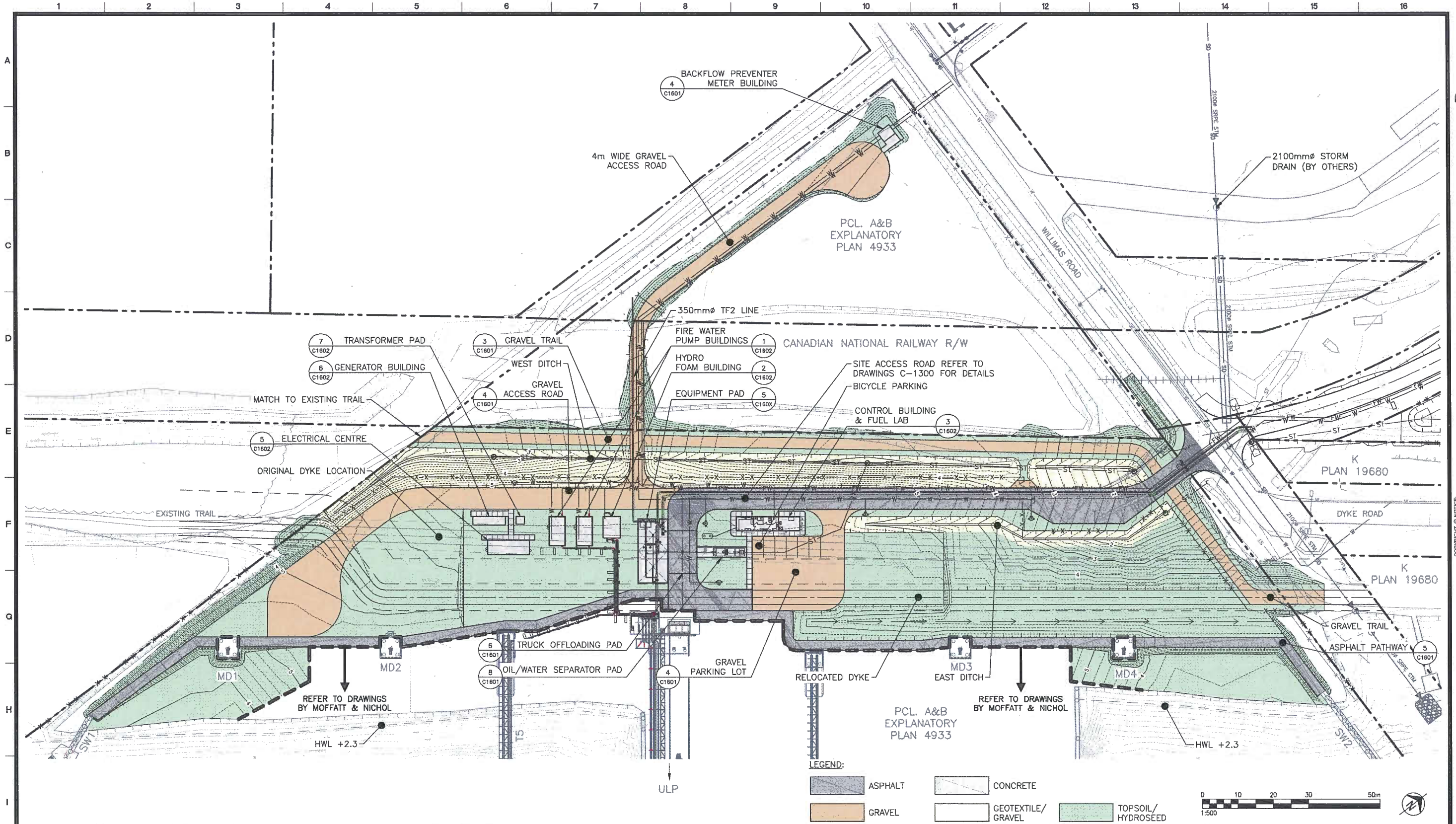
FEB 28 2018

ISSUED FOR DEVELOPMENT PERMIT REVIEW

DP 16-741741

Plotted: Y:\Comm\YVR – Vancouver\15004 VAFDP\Dwgs\22–Marine\22A – Permit\Civil\CS1.01.dwg on 08/18/17 at 5:51 PM by SNEWBOLD using acad.stb

Plan #3



ISSUE NO.	DRAWING REVISIONS	ISSUE DATE
	ISSUED FOR DEVELOPMENT PERMIT REVIEW	05/05/2017

VAFFC / Vancouver Airport Fuel Facilities Corporation
An FSM Group Managed Corporation
108-12300 Harseshoe Way, Richmond, BC. V7A 4Z1
604-271-7113
www.fsmgroup.ca
www.vancouverairportfuel.co

VANCOUVER AIRPORT FUEL DELIVERY PROJECT
MARINE RECEIVING AREA
MARINE DESIGN PACKAGE
VANCOUVER AIRPORT FUEL FACILITIES CORPORATION
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6363 College Boulevard, Suite 600 Overland Park, Kansas 66211
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www.argusconsulting.com

PROJECT NO:	15004.22C
DATE:	10/10/16
DESIGNED BY:	TJ
DRAWN BY:	TJ
CHECKED BY:	RK
CAD FILE NAME:	15004.22C-C1112

SURFACING PLAN (COLOUR)

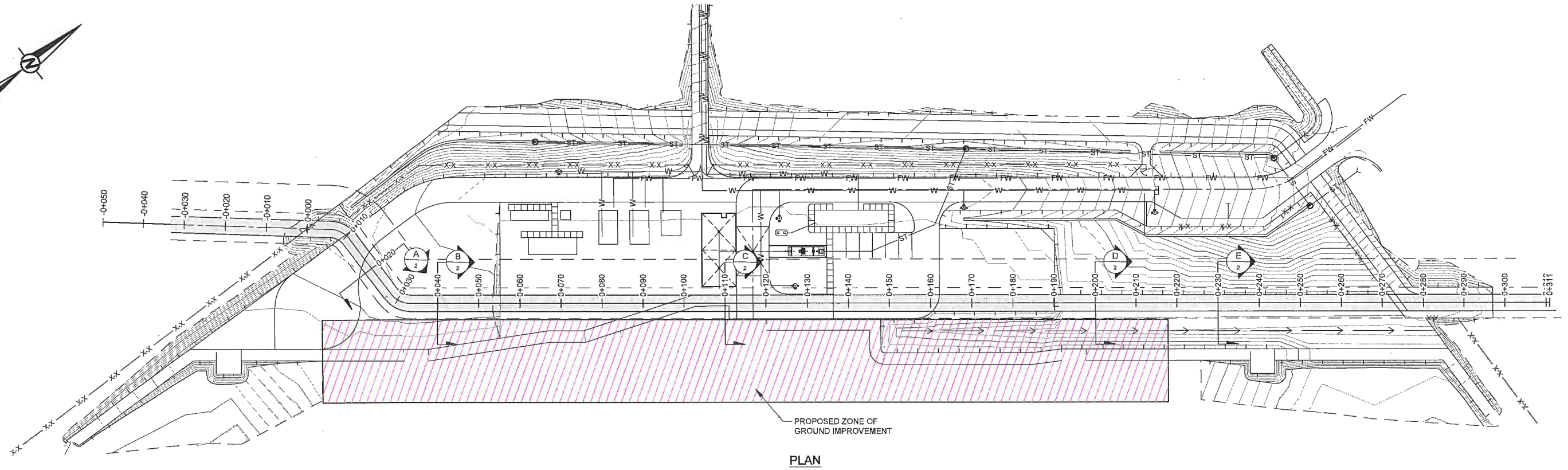
DRAWING NO.: C-1112

PLEASE RECYCLE

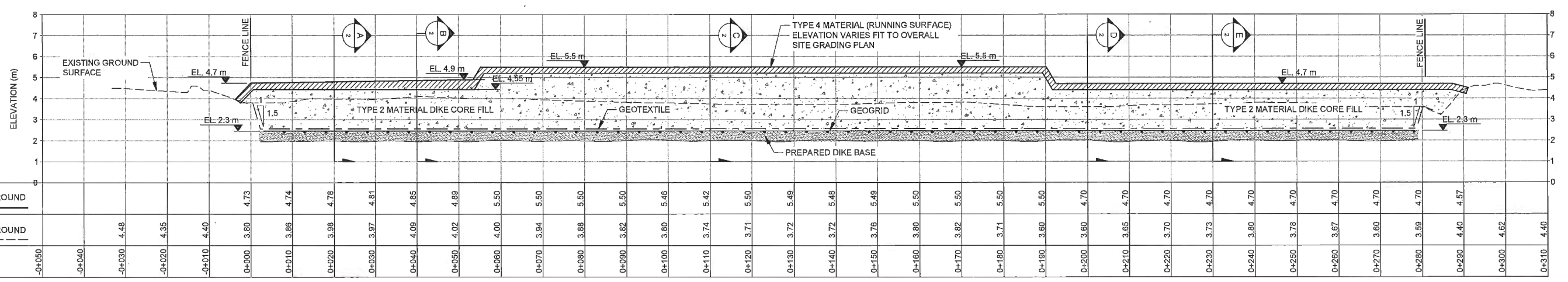
ISSUED FOR DEVELOPMENT PERMIT REVIEW
FEB 28 2018
DP 16-741741

Plotted: G:\C311\C31103509-01\15004.22C\CADD\DWGS\SHTS\15004.22C-C1112.dwg on 05/4/17 at 9:03 AM by TANNER.JOHNSON using Argus.stb

Plan #4



PLAN



CHAINAGE	0+050	0+040	0+030	0+020	0+010	0+000	0+010	0+020	0+030	0+040	0+050	0+060	0+070	0+080	0+090	0+100	0+110	0+120	0+130	0+140	0+150	0+160	0+170	0+180	0+190	0+200	0+210	0+220	0+230	0+240	0+250	0+260	0+270	0+280	0+290	0+300	0+310
FINISHED GROUND						4.73	4.74	4.78	4.81	4.85	4.89	5.50	5.50	5.50	5.50	5.46	5.42	5.50	5.49	5.48	5.49	5.50	5.50	5.50	5.50	4.70	4.70	4.70	4.70	4.70	4.70	4.70	4.70	4.70	4.57	
EXISTING GROUND			4.48	4.35	4.40	3.80	3.86	3.98	3.97	4.09	4.02	4.00	3.94	3.88	3.82	3.80	3.74	3.71	3.72	3.72	3.78	3.80	3.80	3.82	3.71	3.60	3.60	3.65	3.70	3.73	3.80	3.78	3.67	3.60	3.59	4.40	4.62	4.40

ELEVATION PROFILE

NOTE(S)

1. BASE DRAWING PROVIDED BY ARGUS CONSULTING
   CAD FILE: L2.01.DWG. DATED RECEIVED MAY 10, 2017.
2. ELEVATION SHOWN ARE IN GEODETIC DATUM
3. DATUM NAD 83, PROJECTION ZONE 10
4. ALL MATERIALS AND CONSTRUCTION SHALL CONFORM TO THE FOLLOWING:

5 A) CURRENT EDITION OF THE CITY OF RICHMOND SUPPLEMENTARY SPECIFICATIONS AND DETAIL DRAWINGS AND ASSOCIATED EDITION OF THE MASTER MUNICIPAL CONSTRUCTION DOCUMENTS.

5 B) PROVINCE OF BRITISH COLUMBIA MINISTRY OF ENVIRONMENT, LANDS AND PARKS "ENVIRONMENTAL GUIDELINES FOR VEGETATION MANAGEMENT ON FLOOD PROTECTION WORKS TO PROTECT PUBLIC SAFETY AND THE ENVIRONMENT" AND "RIPRAP DESIGN AND CONSTRUCTION GUIDE" AND "DIKE DESIGN AND CONSTRUCTION GUIDE: BEST MANAGEMENT PRACTICES FOR BRITISH COLUMBIA".

6. COMPATIBILITY OF THE MATERIAL SHOULD BE CHECKED BEFORE AND DURING CONSTRUCTION TO CONFIRM WHETHER GEOTEXTILE FABRIC IS NEEDED.

DRAFT

0 20 40
1:500 METRES
HORIZONTAL SCALE

0 5 10
1:100 METRES
VERTICAL SCALE

CLIENT
FSM MANAGEMENT GROUP

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-06-19
DESIGNED	M. MIAO / J. JI
PREPARED	GB
REVIEWED	M. MIAO
APPROVED	J. JI

PROJECT
VANCOUVER AIRPORT FUEL DELIVERY PROJECT
NEW FLOOD PROTECTION DIKE
15040 WILLIAMS ROAD, RICHMOND, B.C.

TITLE
PLAN AND ELEVATION PROFILE

PROJECT NO.	PHASE	REV.	FIGURE
1406834	9442	B	1

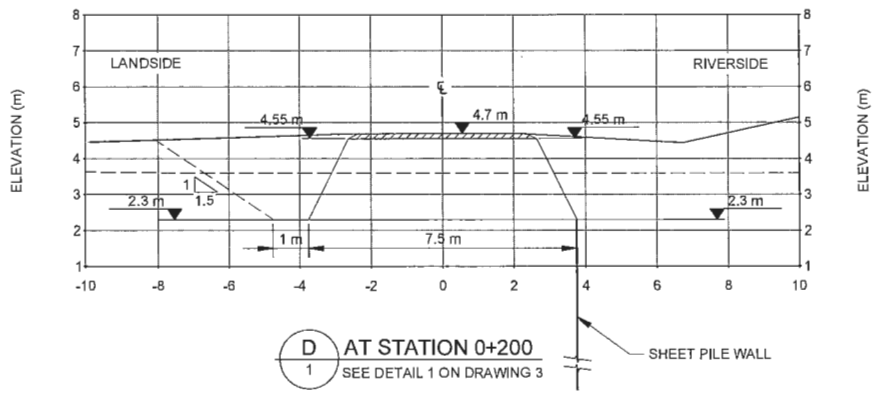
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D
25 mm
0

FEB 28 2018

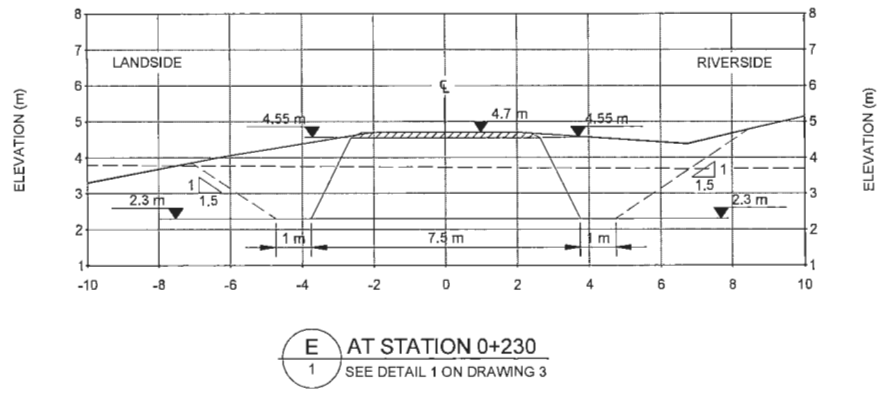
DP 16-741741

Plan #5

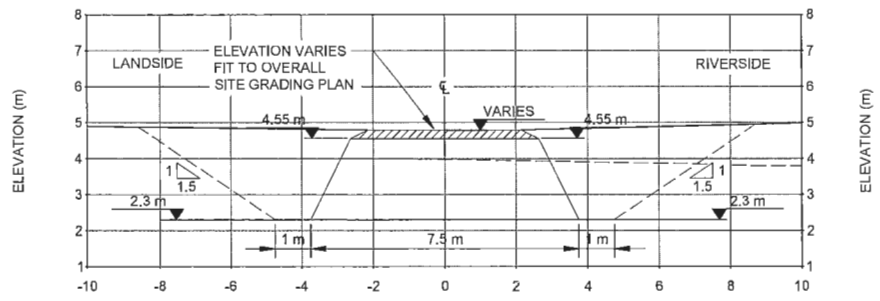
Path: \\golder.gds.golder.com\burnaby\CAD-GIS\Client\FSM\Richmond\99_PROJECT\911406834_VAFPD\02_PRODUCTION\9442\ | File Name: 1406834-9442-001.dwg



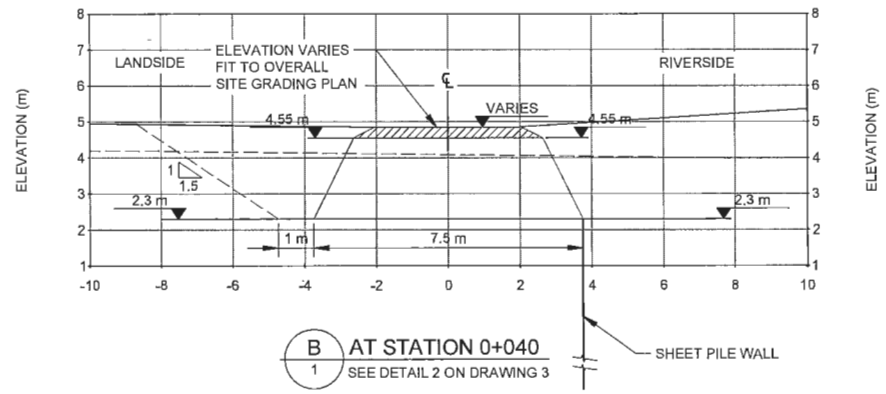
D / 1 AT STATION 0+200
SEE DETAIL 1 ON DRAWING 3



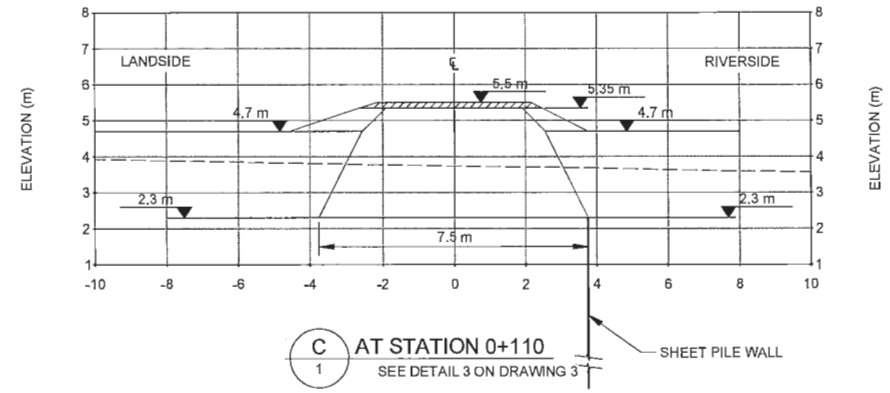
E / 1 AT STATION 0+230
SEE DETAIL 1 ON DRAWING 3



A / 1 AT STATION 0+020
SEE DETAIL 1 ON DRAWING 3



B / 1 AT STATION 0+040
SEE DETAIL 2 ON DRAWING 3



C / 1 AT STATION 0+110
SEE DETAIL 3 ON DRAWING 3

NOTE(S)

1. BASE DRAWING PROVIDED BY ARGUS CONSULTING CAD FILE: L2.01.DWG. DATED RECEIVED MAY 10, 2017.
2. ELEVATION SHOWN ARE IN GEODETIC DATUM
3. DATUM NAD 83, PROJECTION ZONE 10

DRAFT

0 5 10
1:100 METRES

CLIENT
FSM MANAGEMENT GROUP

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-06-19
DESIGNED	M. MIAO / J. JI
PREPARED	GB
REVIEWED	M. MIAO
APPROVED	J. JI

PROJECT
VANCOUVER AIRPORT FUEL DELIVERY PROJECT
NEW FLOOD PROTECTION DIKE
15040 WILLIAMS ROAD, RICHMOND, B.C.

TITLE
CROSS SECTIONS

PROJECT NO.	PHASE	REV.	FIGURE
1406834	9442	B	2

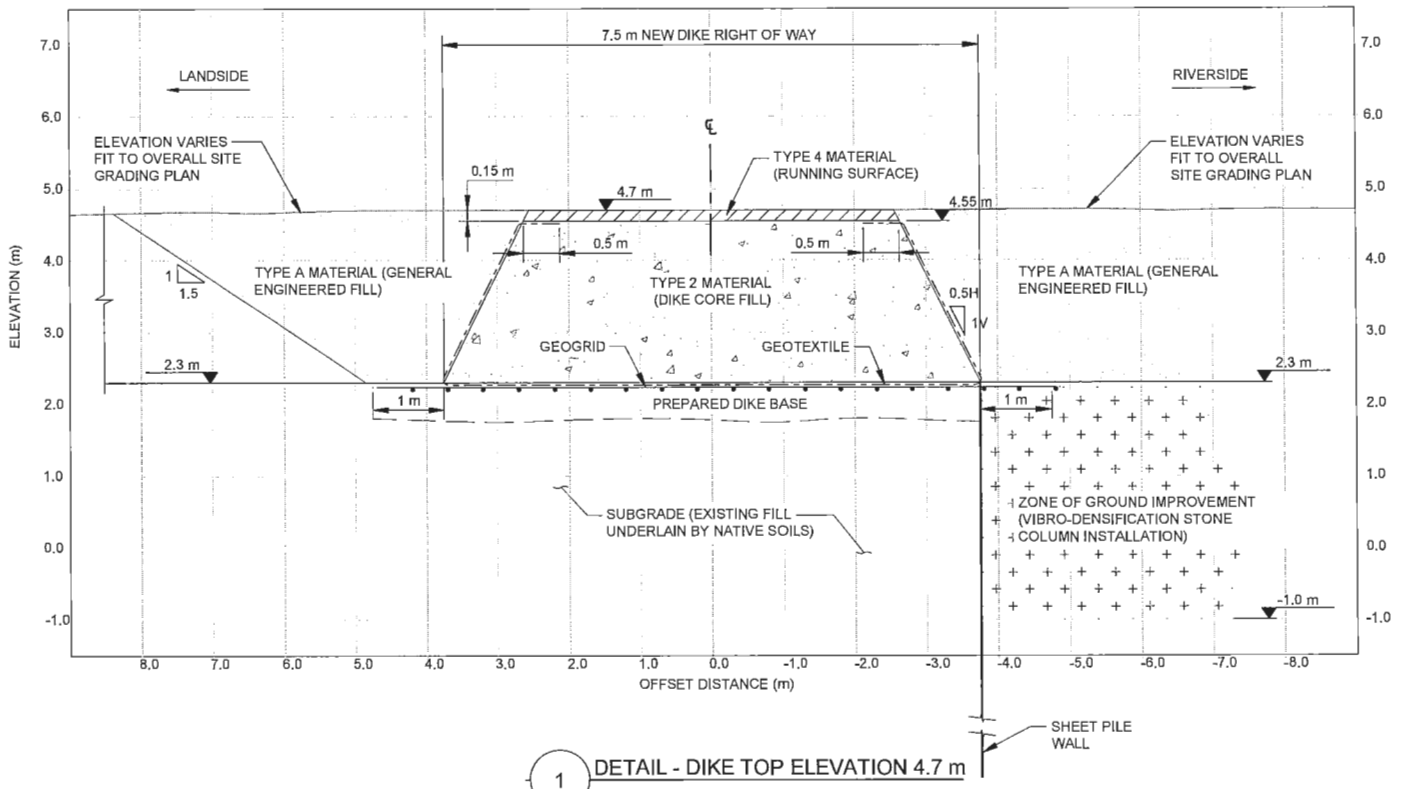
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

0 25 mm

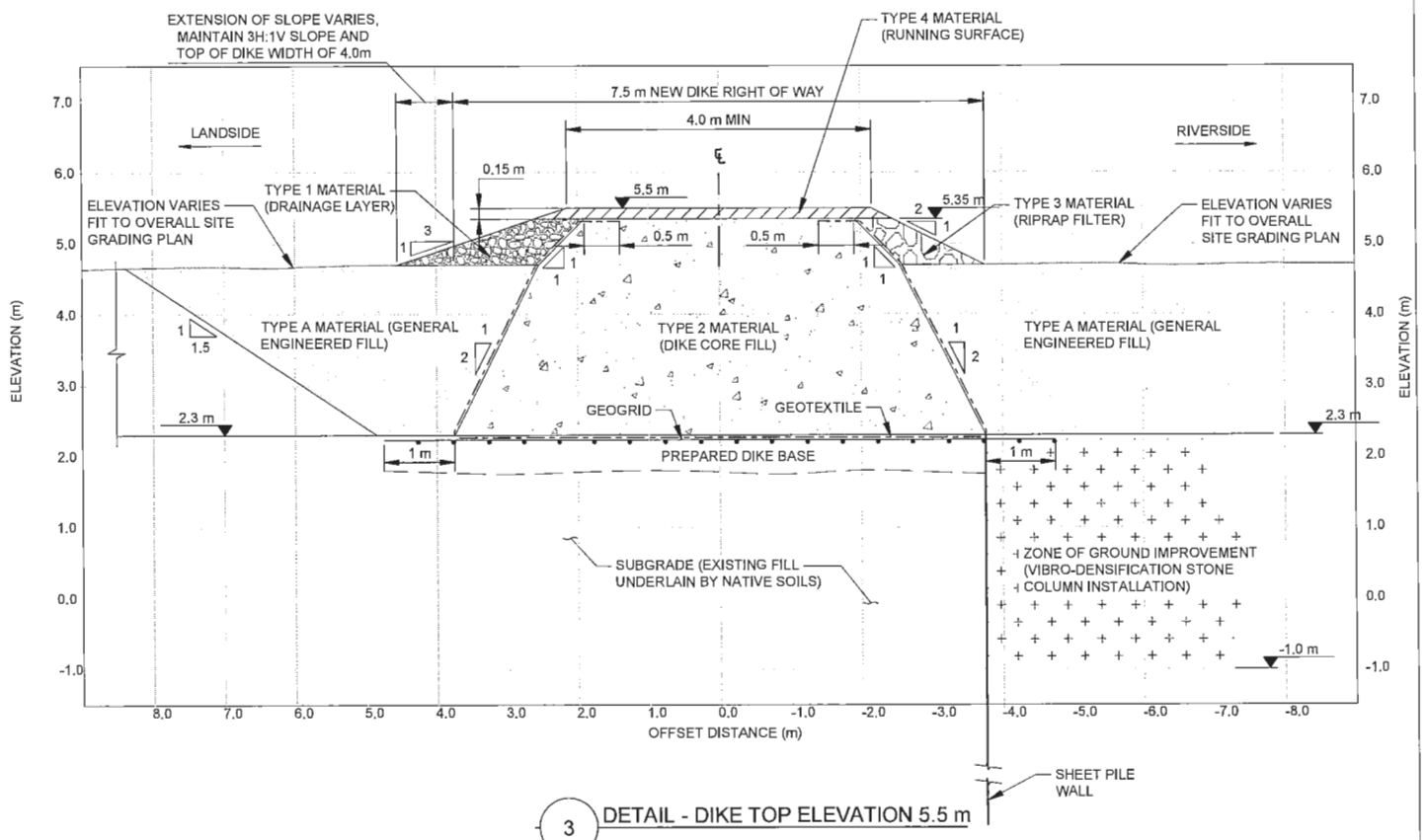
FEB 28 2018

DP 16-771771

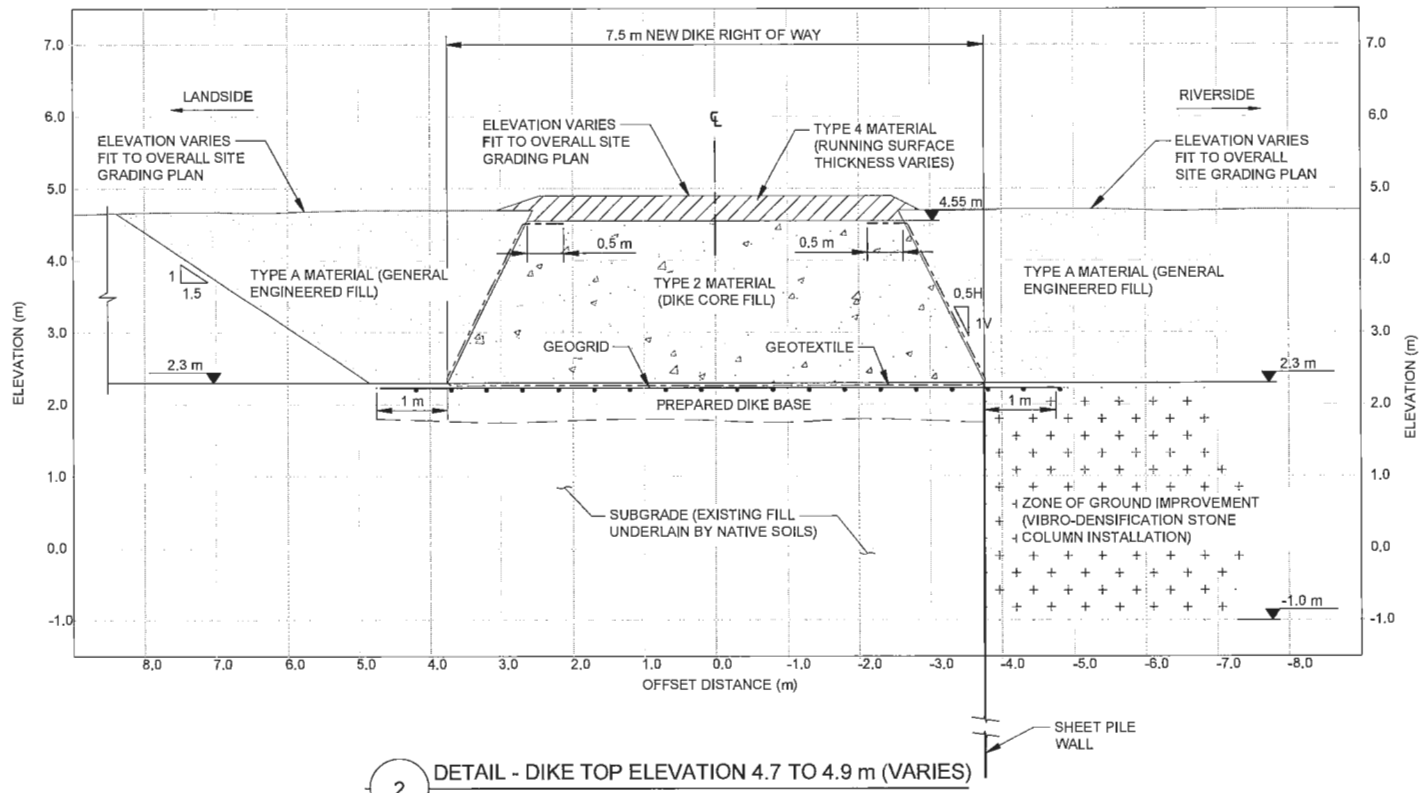
Plan #6



1 DETAIL - DIKE TOP ELEVATION 4.7 m



3 DETAIL - DIKE TOP ELEVATION 5.5 m



2 DETAIL - DIKE TOP ELEVATION 4.7 TO 4.9 m (VARIES)

TYPE 1 MATERIAL (DRAINAGE LAYER)
Type 1 material shall consist of clean well-graded 75 mm minus sand and gravel meeting the following gradation limits

PARTICLE SIZE (mm)	PERCENTAGE BY WEIGHT PASSING
75	100
37.5	60 - 100
19	35 - 80
9.5	26 - 60
4.75	20 - 40
2.36	15 - 30
1.18	10 - 20
0.6	5 - 15
0.3	3 - 10
0.075	0 - 5

TYPE 2 MATERIAL (BULK FILL OR DIKE CORE FILL)
Type 2 material shall consist of well-graded sand with 15 to 30 percent fines passing 0.075 mm sieve meeting the following gradation limits

PARTICLE SIZE (mm)	PERCENTAGE BY WEIGHT PASSING
19	100
4.75	80 - 100
0.425	25 - 90
0.15	18 - 50
0.075	15 - 30

TYPE 3 MATERIAL (RIPRAP FILTER)
Type 3 material shall consist of clean well-graded pit-run or processed sand, gravel and cobbles, or quarried stone meeting the following gradation limits

PARTICLE SIZE (mm)	PERCENTAGE BY WEIGHT PASSING
200	100
75	60 - 90
9.5	30 - 65
0.85	5 - 30
0.15	0 - 5

TYPE 4 MATERIAL (RUNNING SURFACE)
Type 4 material shall consist of clean well-graded 19mm minus sand and gravel or road mulch meeting the following gradation limits

PARTICLE SIZE (mm)	PERCENTAGE BY WEIGHT PASSING
19	100
12.5	75 - 100
9.5	60 - 90
4.75	40 - 70
2.36	27 - 55
1.18	16 - 42
0.6	8 - 30
0.3	5 - 20
0.075	2 - 8

TYPE A MATERIAL (GENERAL ENGINEERED FILL)
Type A material shall consist of clean well-graded 75 mm minus sand and gravel meeting the following gradation limits

PARTICLE SIZE (mm)	PERCENTAGE BY WEIGHT PASSING
75	100
37.5	30 - 100
19	20 - 100
4.75	10 - 60
1.18	6 - 32
0.3	4 - 15
0.075	0 - 5

DRAFT

0 2 4
1:50 METRES

NOTE(S)
1. BASE DRAWING PROVIDED BY ARGUS CONSULTING CAD FILE: L2.01.DWG. DATED RECEIVED MAY 10, 2017.
2. ELEVATION SHOWN ARE IN GEODETIC DATUM
3. DATUM NAD 83, PROJECTION ZONE 10

CLIENT
FSM MANAGEMENT GROUP

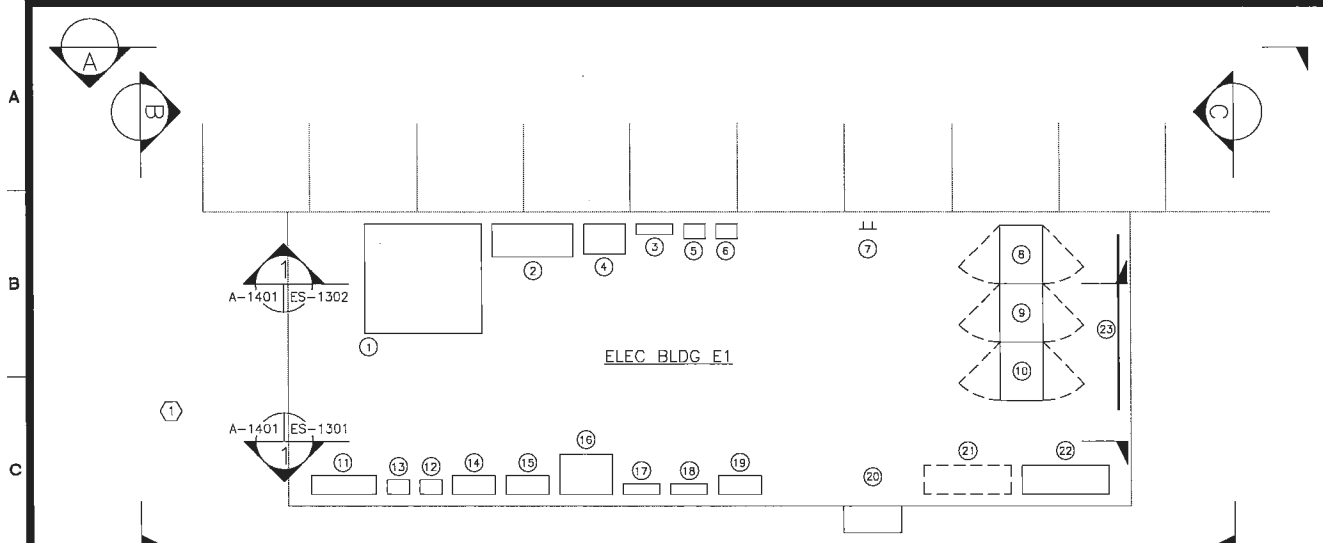
CONSULTANT
Golder Associates

YYYY-MM-DD	2017-06-19
DESIGNED	M. MIAO / J. JI
PREPARED	GB
REVIEWED	M. MIAO
APPROVED	J. JI

PROJECT
VANCOUVER AIRPORT FUEL DELIVERY PROJECT
NEW FLOOD PROTECTION DIKE
15040 WILLIAMS ROAD, RICHMOND, B.C.

TITLE
TYPICAL DETAILS

PROJECT NO.	PHASE	REV.	FIGURE
1406834	9442	B	3



1 ELECTRICAL EQUIPMENT LAYOUT
ES-1201, ES-1202 | A-1401 1:50

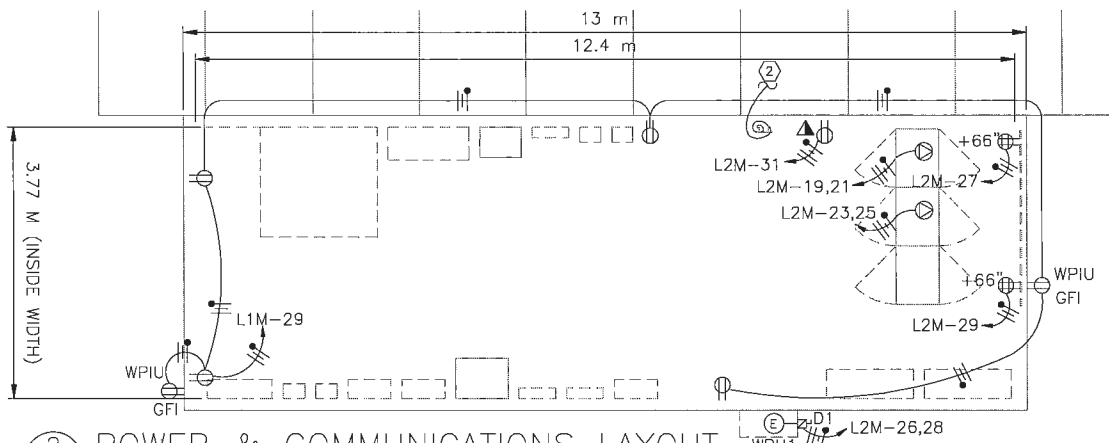
EQUIPMENT LIST			
ITEM(S)	QUANTITY	TAG(S)	DESCRIPTION
1	1	ATS1	AUTOMATIC TRANSFER SWITCH
2	1	MDP1	MAIN DISTRIBUTION PANELBOARD – NORMAL POWER
3	1	L1M	PANELBOARD L1M
4	1	T2M	TRANSFORMER
5	1	ST–SP–103	MOTOR STARTER
6	1	ST–SP–104	MOTOR STARTER
7	1	MGB1	MASTER GROUND BAR 1
8	1	CR1	COMMUNICATIONS RACK 1 (SHORE)
9	1	CR2	COMMUNICATIONS RACK 2 (PIER)
10	1	CR3	COMMUNICATIONS RACK 3 (FUTURE)
11	1	H1M	PANELBOARD H1M
12	1	ST–SP–101	MOTOR STARTER
13	1	ST–SP–102	MOTOR STARTER
14	1	H2M	PANELBOARD H2M
15	1	H2MB	PANELBOARD H2MB
16	1	T3M	TRANSFORMER
17	1	L2M	PANELBOARD L2M
18	1	L2MB	PANELBOARD L2MB
19	1	LCP1	PANELBOARD LCP1
20	1	WPU1	WALL PACKAGE UNIT 1
21	1	PLCC2	PROGRAMMABLE LOGIC CONTROLLER CAB 2 (FUTURE)
22	1	PLCC1	PROGRAMMABLE LOGIC CONTROLLER CAB 1
23	1	BKBD	PLYWOOD BACKBOARD

NOTES:

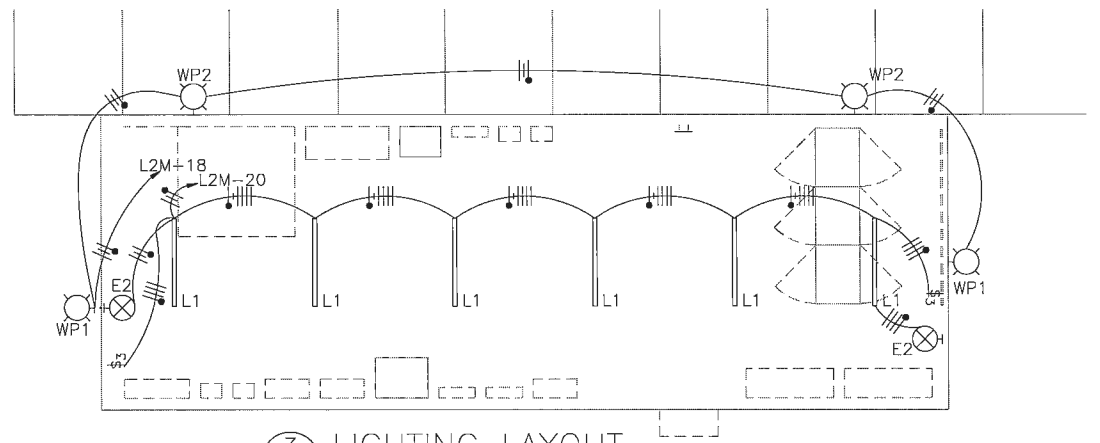
1. SEE DRAWINGS E–1001 AND E–1002 FOR LEGEND, ABBREVIATIONS AND GENERAL NOTES.
2. ELECTRICAL WORK SHOWN WITH DARK LINE WEIGHT SHALL BE PROVIDED.
3. SEE 1700 SERIES DRAWINGS FOR CABLE, DUCTBANK, LIGHTING, PANELBOARD, AND RACEWAY SCHEDULES.

⬡ KEYNOTES:

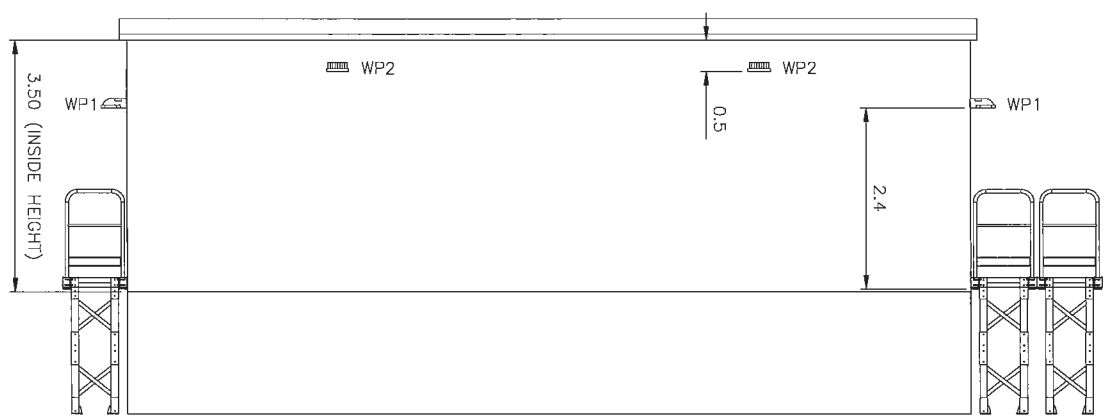
1. PROVIDE REMOVABLE RAIL WIDTH OF DOUBLE DOORS TO AID EQUIPMENT MOVEMENT. SEE STRUCTURAL DRAWINGS FOR DETAILS.
2. PROVIDE GROUND COILED. BOND TO BUILDING COUNTERPOISE FROM MASTER GROUND BAR. SEE DRAWING ES–1104 FOR CONTINUATION.



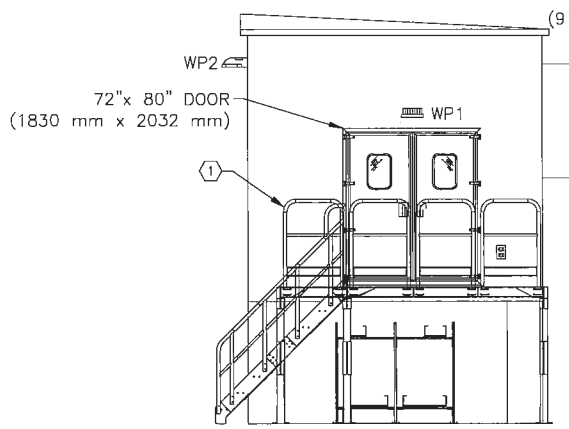
2 POWER & COMMUNICATIONS LAYOUT
ES–1201, ES–1202 | A–1401 1:50



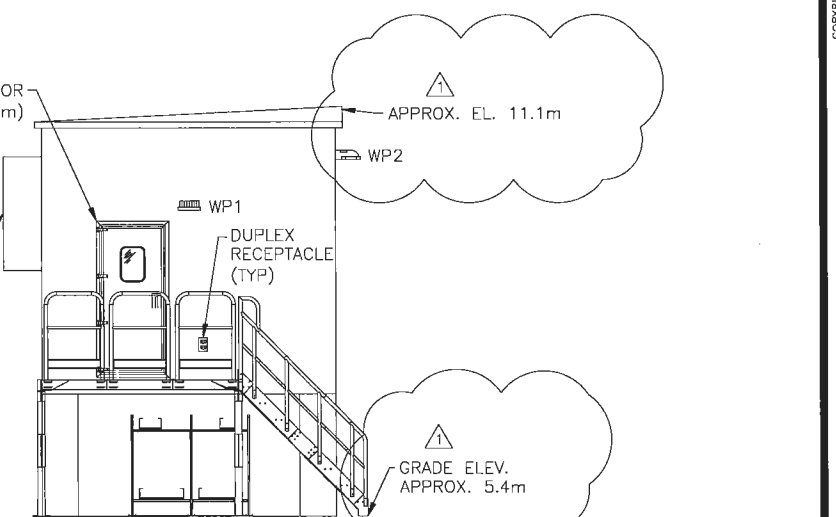
3 LIGHTING LAYOUT
ES–1201, ES–1202 | A–1401 1:50



A SECTION
A1401 | A–1401 1:50



B SECTION
A–1401 | A–1401 1:50



C SECTION
A–1401 | A–1401 1:50

1:50

ISSUE NO.	DRAWING REVISIONS	ISSUE DATE
1	ADDED ELEVATION TEXT	08/18/2017
	ISSUED FOR CONSTRUCTION	02/14/17

VAFFC Fuel Facilities Corporation
FSM MANAGEMENT GROUP
108–12300 Horseshoe Way
Richmond, BC, V7A 4Z1
604-271-7113
www.fsmgroup.ca
www.vancouverairportfuel.ca

VANCOUVER AIRPORT FUEL DELIVERY PROJECT
MARINE RECEIVING AREA

VANCOUVER AIRPORT FUEL FACILITIES CORPORATION
RICHMOND, BRITISH COLUMBIA

SEAL

D.W. PRANG
10640
PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
8/18/2017

LOGO

Argus
ENGINEERING | PLANNING | MANAGEMENT
ARGUS CONSULTING, INC.
6363 College Boulevard, Suite 600
Overland Park, Kansas 66211
816.228.7500 FAX 816.228.7535
www.argusconsulting.com

PROJECT NO:	15004.22
DATE:	03/19/16
DESIGNED BY:	WBJ
DRAWN BY:	SMF
CHECKED BY:	DWF
CAD FILE NAME:	15004.22C–A1401

E1 ELEC BLDG FLOOR PLAN

DRAWING NO.: A-1401

PLEASE RECYCLE

ISSUED FOR CONSTRUCTION
FEB 28 2018
DP 17-771

Plotted: Y:\Comm\YVR – Vancouver\15004 VAFDP\Dwgs\22–Marine\22C – Design\Arch\15004.22C–A1401.dwg on 08/18/17 at 5:53 PM by SNEWBOLD using acad.stb

Plan #8

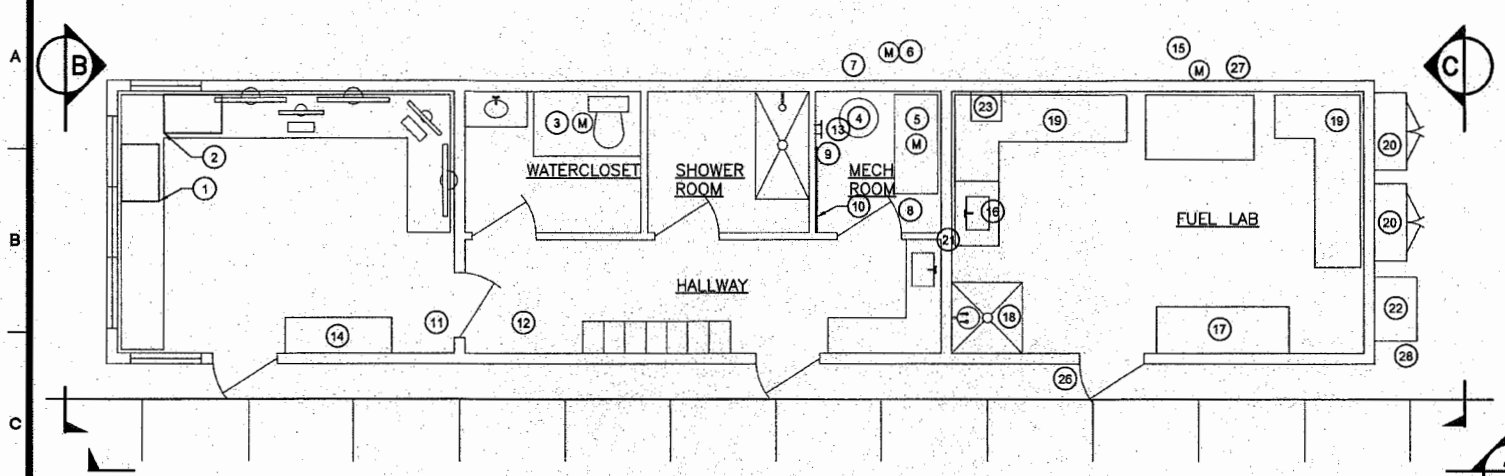
EQUIPMENT LIST			
ITEM(S)	QUANTITY	TAG(S)	DESCRIPTION
1	1	MR-CR-4	COMMUNICATIONS RACK 4
2	1	MR-CR-5	COMMUNICATIONS RACK 5
3	1	EF1	EXHAUST FAN 1
4	1	WH1	WATER HEATER 1
5	1	FCU2	FAN COIL UNIT 2
6	1	CU2	CONDENSING UNIT 2
7	1	D5	SERVICE DISCONNECT (CU2)
8	1	D4	SERVICE DISCONNECT (FCU2)
9	1	D3	SERVICE DISCONNECT (WH1)
10	1	BKBD	PLYWOOD BACKBOARD
11	1	GAP1	GENERATOR ANUNCIATOR PANEL
12	1	L3M	PANELBOARD L3M
13	1	MGB2	MASTER GROUND BAR 2
14	1	NODE1	FIRE ALARM CONTROL PANEL
15	1	EH1	EXHAUST HOOD
16	1	CT1	WATER ONLY SINK
17	1	CB1	WORKBENCH BASE CABINETS
18	1	EWSH1	EYE WASH / SHOWER STATION
19	2	CB2	CABINET BASE AND OVERHEAD UNIT (LEFT CORNER)
20	2	CO	OUTDOOR FUEL SAMPLE CABINETS
21	1	FW1	FIRE WALL BETWEEN OPERATIONS AND FUEL LAB
22	1	WPU2	WALL PACKAGE UNIT 2
23	1	EF2	EXHAUST FAN
24	1	D6	SERVICE DISCONNECT (EF2)
25	1	D7	SERVICE DISCONNECT (WPU2)
26	1	ST-EF2	MOTOR STARTER (EF2)
27	1	ST-EH1	MOTOR STARTER (EH1)

NOTES:

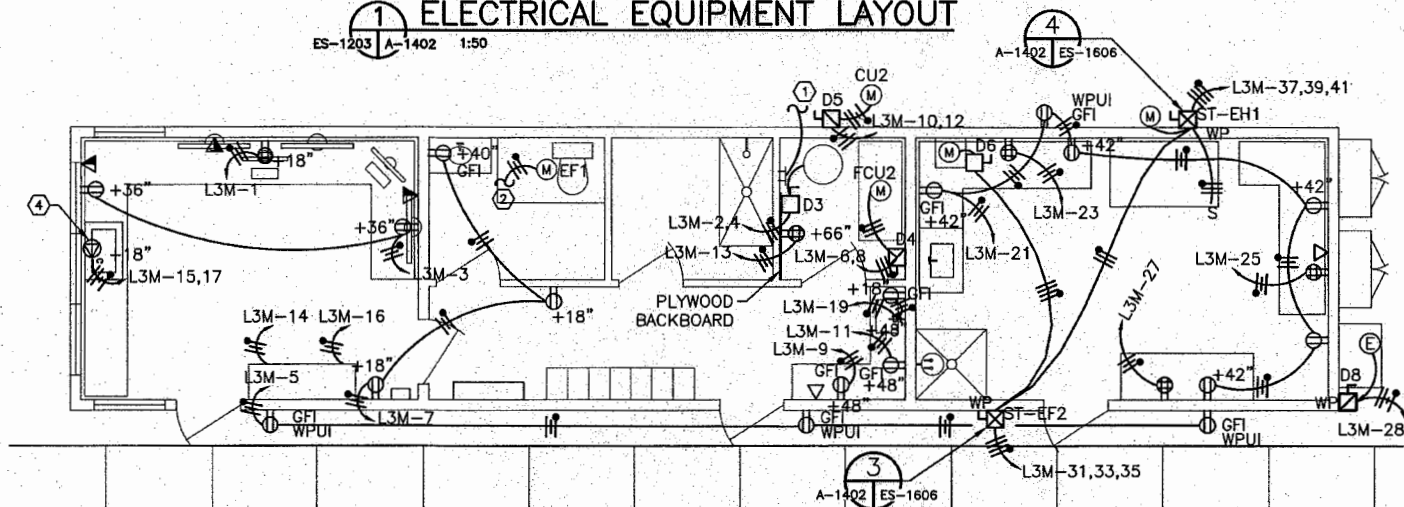
1. SEE DRAWINGS E-1001 AND E-1002 FOR LEGEND, ABBREVIATIONS AND GENERAL NOTES.
2. ELECTRICAL WORK SHOWN WITH DARK LINE WEIGHT SHALL BE PROVIDED.
3. SEE 1700 SERIES DRAWINGS FOR CABLE, DUCTBANK, LIGHTING, PANELBOARD, AND RACEWAY SCHEDULES.

KEYNOTES:

1. PROVIDE GROUND COILED IN MECHANICAL ROOM. BOND TO BUILDING COUNTERPOISE FROM MASTER GROUND BAR. SEE DRAWING ES-1104 FOR CONTINUATION.
2. SEE CONTINUATION FOR EXHAUST FAN ON DETAIL 3 LIGHTING LAYOUT ON THIS SHEET.
3. SEE CONTINUATION FOR EXHAUST FAN ON DETAIL 2 POWER LAYOUT ON THIS SHEET.
4. PROVIDE RECEPTACLE TO MATCH UPS EQUIPMENT PLUG.



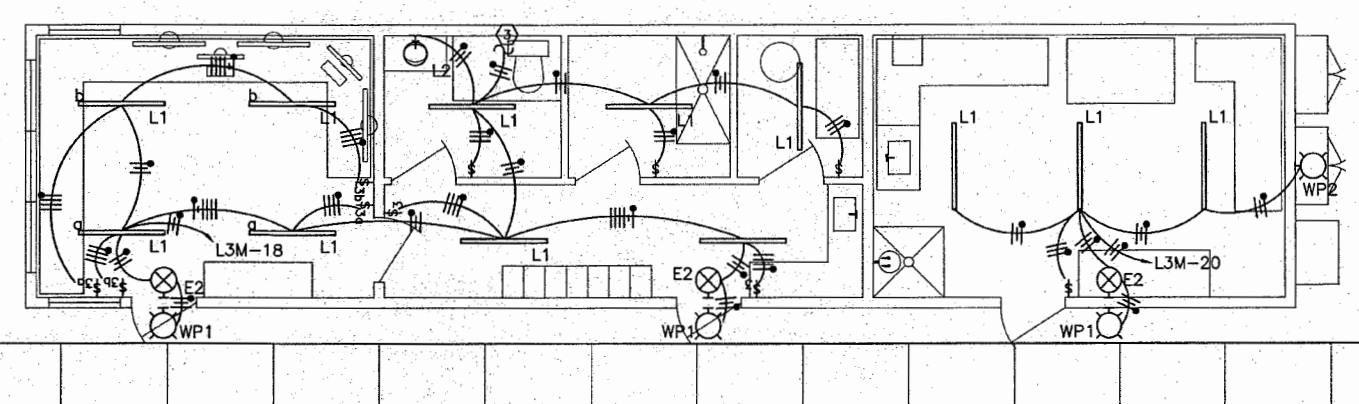
1 ELECTRICAL EQUIPMENT LAYOUT
ES-1203 | A-1402 1:50



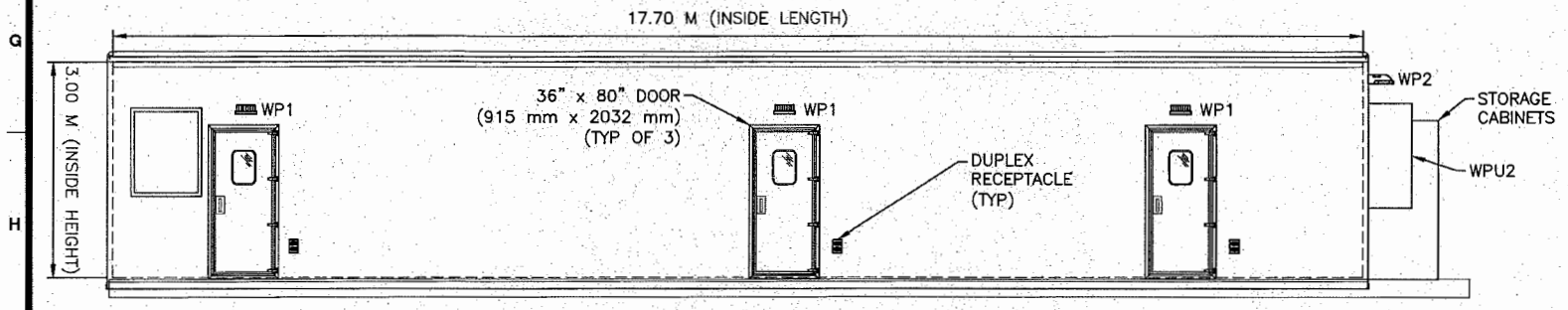
4 A-1402 | ES-1606

3 A-1402 | ES-1606

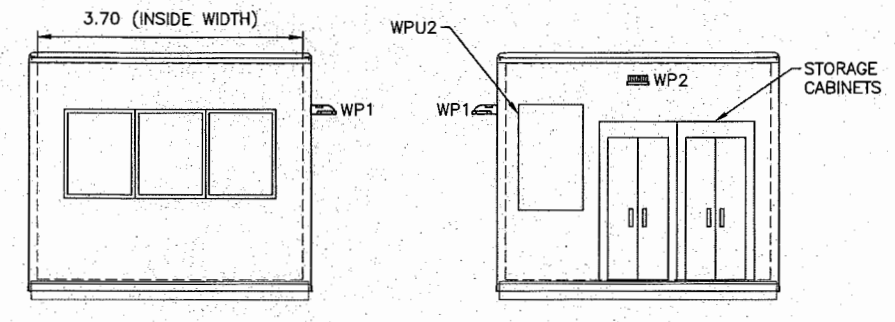
2 POWER & COMMUNICATIONS LAYOUT
ES-1203 | A-1402 1:50



3 LIGHTING LAYOUT
ES-1203 | A-1402 1:50



A SECTION
ES-1203 | A-1402 1:50



B SECTION
ES-1203 | A-1402 1:50

C SECTION
ES-1203 | A-1402 1:50

N

0 0.5 1 1.5 2 2.5m
1:38

ISSUE NO.	DRAWING REVISIONS	ISSUE DATE
	ISSUED FOR CONSTRUCTION	02/14/17

VAFFC / Vancouver Airport Fuel Facilities Corporation
AN FBM GROUP MANAGED CORPORATION
FBM MANAGEMENT GROUP
108 - 12300 Horseshoe Way
Richmond, BC, V7A 4Z1
604.271.7113
www.fbmgroup.ca
www.vancouverairportfuel.ca

VANCOUVER AIRPORT FUEL DELIVERY PROJECT
MARINE RECEIVING AREA

VANCOUVER AIRPORT FUEL FACILITIES CORPORATION
RICHMOND, BRITISH COLUMBIA

SEAL: PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA D. W. FRANK # 108408 — 3/7/17

LOGO

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Overland Park, Kansas 66211
816.228.7500 FAX 816.228.7535
www.argusconsulting.com

PROJECT NO: 15004.22	OPS1 OPERATIONS BLDG AND FL1 FUEL LAB FLOOR PLANS
DATE: 03/19/16	
DESIGNED BY: WBJ	
DRAWN BY: SMF	
CHECKED BY: DWF	DRAWING NO.: A-1402
CAD FILE NAME: 15004.22CA1402	

PLEASE RECYCLE

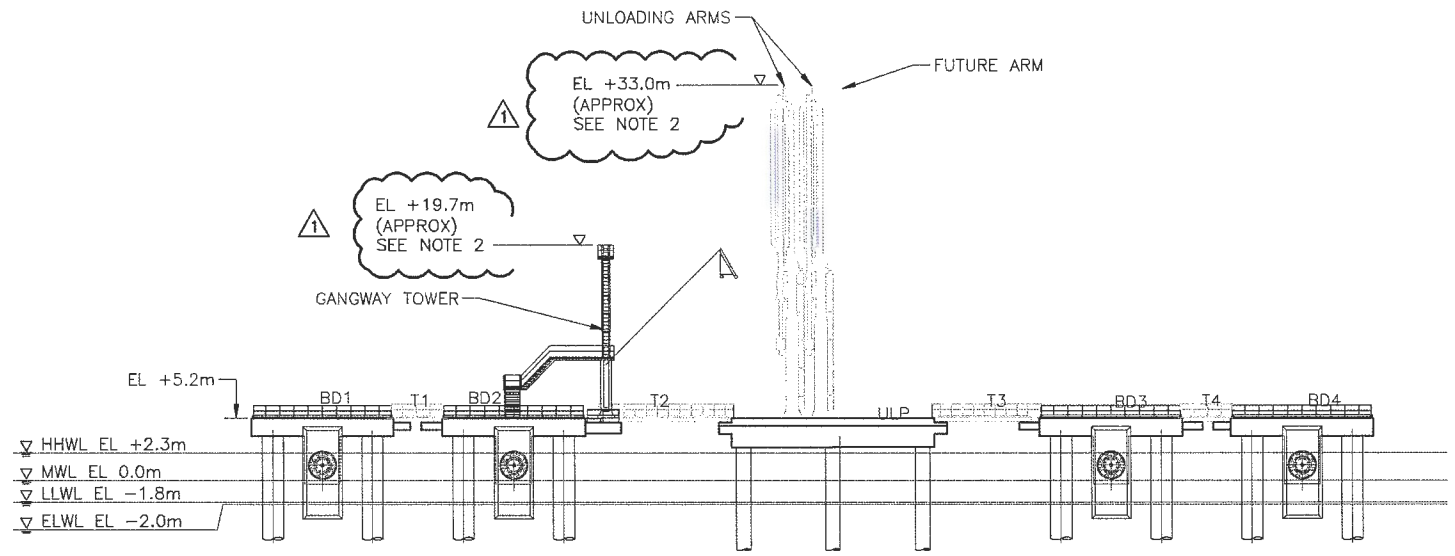
FEB 28 2018

ISSUED FOR CONSTRUCTION

DP 16-741741

Plotted: Y:\Comm\YVR - Vancouver\15004 VAFDP\Dwgs\22-Marine\22C - Design\Arch\15004.22CA1402.dwg on 03/6/17 at 1:58 PM by GCROWDER using acad.stb

Plan #9



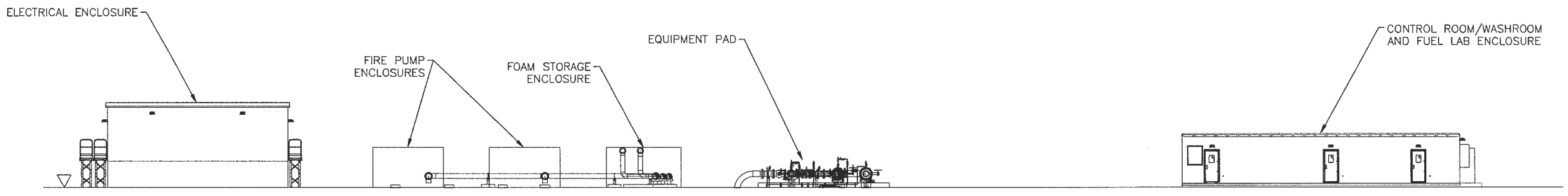
A ELEVATION
CS-101
1:300

0 6 12 18 30m
1:300

NOTES:

1. ELEVATIONS ARE TO GEODETIC DATUM.
1. 2. ELEVATIONS OF VENDOR SUPPLIED MECHANICAL EQUIPMENT SHOWN ARE APPROXIMATE AND SUBJECT TO CHANGE ONCE EQUIPMENT IS ORDERED AND SHOP DRAWINGS PRODUCED.

BUILDING AREA AND STRUCTURE ELEVATIONS			
BUILDING NAME	FLOOR AREA (M^2)	STRUCTURE HEIGHT (M)	STRUCTURE ELEVATION (M)
CONTROL ROOM AND WASHROOM ENCLOSURE	43.29	3.5	9.0
FUEL LAB ENCLOSURE	21.65	3.5	9.0
FIRE PUMP ENCLOSURE 1	33.51	2.6	8.1
FIRE PUMP ENCLOSURE 2	33.51	2.6	8.1
FOAM STORAGE ENCLOSURE	28.01	2.6	8.1
ELECTRICAL ENCLOSURE	45.97	5.5	11.0
DOCK UNLOADING ARMS	N/A	33.0	37.8
DOCK GANGWAY TOWER	N/A	19.7	24.5
NOTE: THE MARINE UNLOADING ARMS ELEVATION ARE TO BE DETERMINED BY THE MANUFACTURER. APPROXIMATE ELEVATIONS OF THE STRUCTURE ARE LISTED ABOVE.			
SITE AREA: 40,468 M^2 LOT COVERAGE AREA: 0.52%			



B ELEVATION
CS-101
1:150

0 3 6 9 15m
1:150

ISSUE NO.	DRAWING REVISIONS	ISSUE DATE
2	ISSUED FOR DEVELOPMENT PERMIT REVIEW	05/05/2017
1	ELEVATIONS ADDED	04/27/2017
0	ISSUED FOR CONSTRUCTION	02/14/2017

VAFFC
Fuel Facilities Corporation
FBM MANAGEMENT GROUP
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Richmond, BC, V7A 4Z1
604-271-7113
www.fbmgroup.ca
www.vancouverairportfuel.ca

VANCOUVER AIRPORT FUEL DELIVERY PROJECT
MARINE RECEIVING AREA
MARINE DESIGN PACKAGE
VANCOUVER AIRPORT FUEL FACILITIES CORPORATION
RICHMOND, BRITISH COLUMBIA

SEAL

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PROJECT NO:	15004.22C
DATE:	12/18/15
DESIGNED BY:	FS
DRAWN BY:	AVM
CHECKED BY:	RB
CAD FILE NAME:	15004.22C-G031

ELEVATION

DRAWING NO.: G-031

PLEASE RECYCLE

FEB 28 2018

ISSUED FOR DEVELOPMENT PERMIT REVIEW

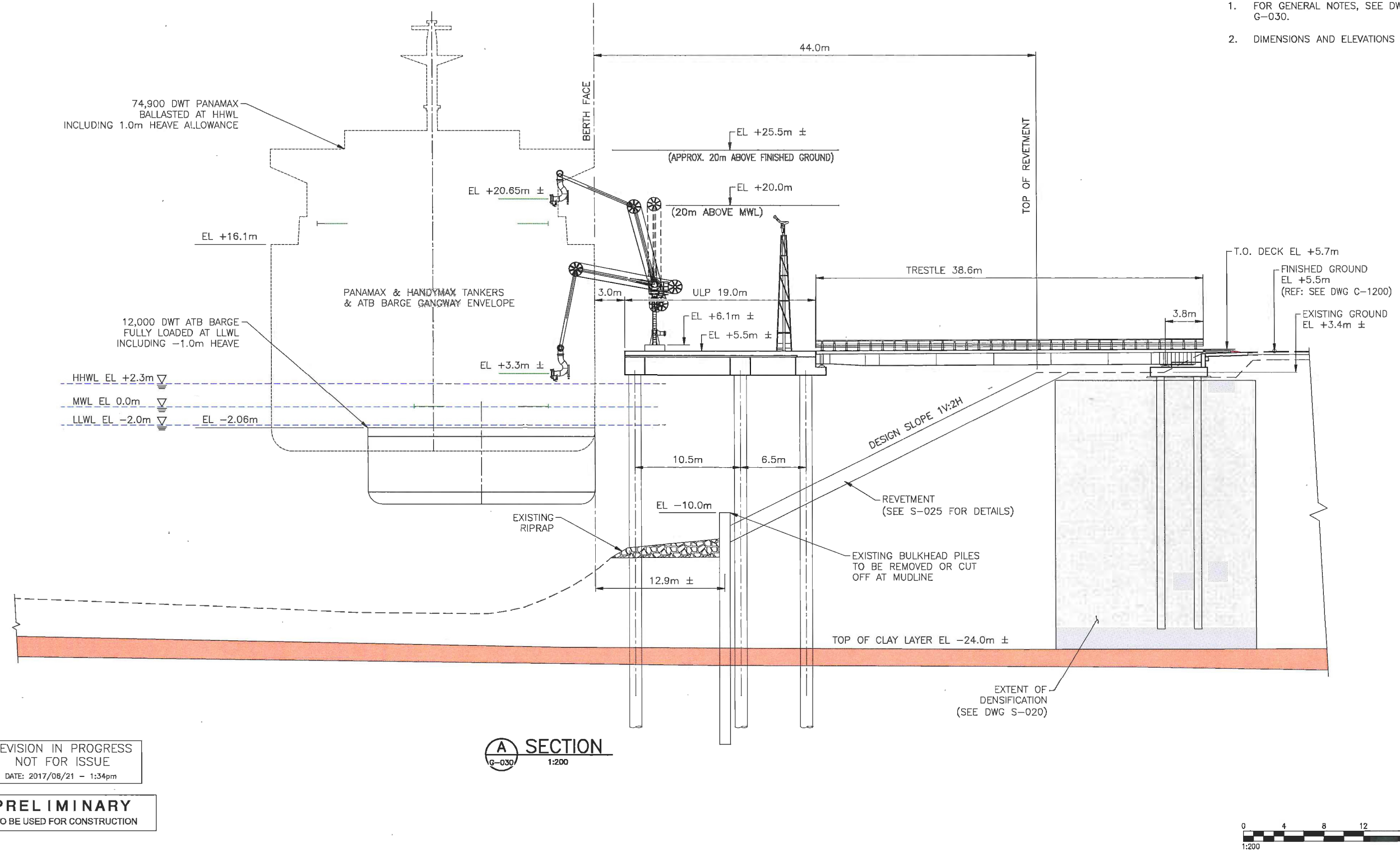
DP 16-731414

Plotted: Y:\Comm\YVR – Vancouver\15004 VAFDP\Dwgs\22-Marine\22A – Permit\Gen\15004.22C-G031 ELEVATION 2017-05-01\15004.22C-G031.dwg on 05/5/17 at 8:13 AM by NPARK using acad.stb

Plan #10

NOTES:

1. FOR GENERAL NOTES, SEE DWGS G–003 & G–030.
2. DIMENSIONS AND ELEVATIONS IN METRES (m).



A SECTION
G–030 1:200

REVISION IN PROGRESS
NOT FOR ISSUE
DATE: 2017/08/21 – 1:34pm

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

0 4 8 12 20m
1:200

ISSUE NO.	DRAWING REVISIONS	ISSUE DATE

VAFFC / Vancouver Airport
Fuel Facilities Corporation
A PSPIB GROUP MANAGED OPERATION
108–12300 Horseshoe Way
Richmond, BC, V7A 4Z1
604-271-7113
www.ffmgroup.ca
www.vancouverairportfuel.ca

VANCOUVER AIRPORT FUEL DELIVERY PROJECT
MARINE RECEIVING AREA
MARINE DESIGN PACKAGE
VANCOUVER AIRPORT FUEL FACILITIES CORPORATION
RICHMOND, BRITISH COLUMBIA

SEAL

LOGO
moffatt & nichol
777 WEST BROADWAY, STE 301
VANCOUVER, BC CANADA V5Z 4J7
604–707–9004

Argus
ENGINEERING | PLANNING | MANAGEMENT
ARGUS CONSULTING, INC.
6363 College Boulevard, Suite 600
Overland Park, Kansas 66211
816.228.7500 FAX 816.228.7535
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PROJECT NO:	15004.22C
DATE:	10/20/15
DESIGNED BY:	SP
DRAWN BY:	AVM
CHECKED BY:	RB
CAD FILE NAME:	15004.22C–G034

UNLOADING PLATFORM
SECTION

DRAWING NO.: G-034

Plotted: P:\8338 VC Vancouver Airport Fuel Delivery Project\CADD_Active\15004.22C–G034.dwg on 06/21/17 at 1:34 PM by AMANUZON using Argus.stb

Plan #11

FEB 28 2018

ISSUED FOR CONSTRUCTION

DP 16-741741

Figure 1 Vancouver Airport Fuel Delivery Project – Marine terminal proposed habitat compensation areas

Legend

- Ground-Truthed High Water Mark
- Marine Terminal Site
- Proposed Trail
- Canadian National Railway Right-of-Way

Designated and Inferred Habitat Areas

- Intertidal ESA
- Shoreline ESA
- RMA

Habitat Compensation Areas

- Intertidal ESA
- RMA
- Inferred RMA
- Shoreline ESA
- EN

0 25 50 75 m N

Scale: 1:2,500

Projection: NAD 1983 UTM Zone 10N

Data Sources:
a) Compensation and Treatment Areas, Hatfield 2017.
b) Trail Data, Damon Orient Ltd., Modified by Hatfield 2017.
c) ESA Data Layers, City of Richmond, Modified by Hatfield 2017.
d) Background Image, ESRI Online Service.

Hatfield CONSULTANTS

K:\Data\Project\VAFFC6773\A_MXD\HabitatComp\MarineTerminal\VAFFC6773_Fig1_MT_HabitatComp_20170629_v1_13_SJ.mxd

This plan is reprinted from the
ESA and RMA Environmental Impacts Report
by
Hatfield Environmental Consultants

18 Dec. 2017 Development Permit Application Resubmission - DPP Comments
31 Oct. 2017 Development Permit Application Resubmission - ADP Comments

DAMON ORIENTE LTD.
landscape architects

#306 - 4464 West 10th Avenue
Vancouver, BC, Canada
V6R 2H9

t. 604-222-9200
e. dvo@telus.net
w. damonoriente.ca

Project
VAFFC MARINE TERMINAL FACILITY

15040 Williams Road, Richmond BC

Drawing
PROPOSED COMPENSATION AREAS

Issue:

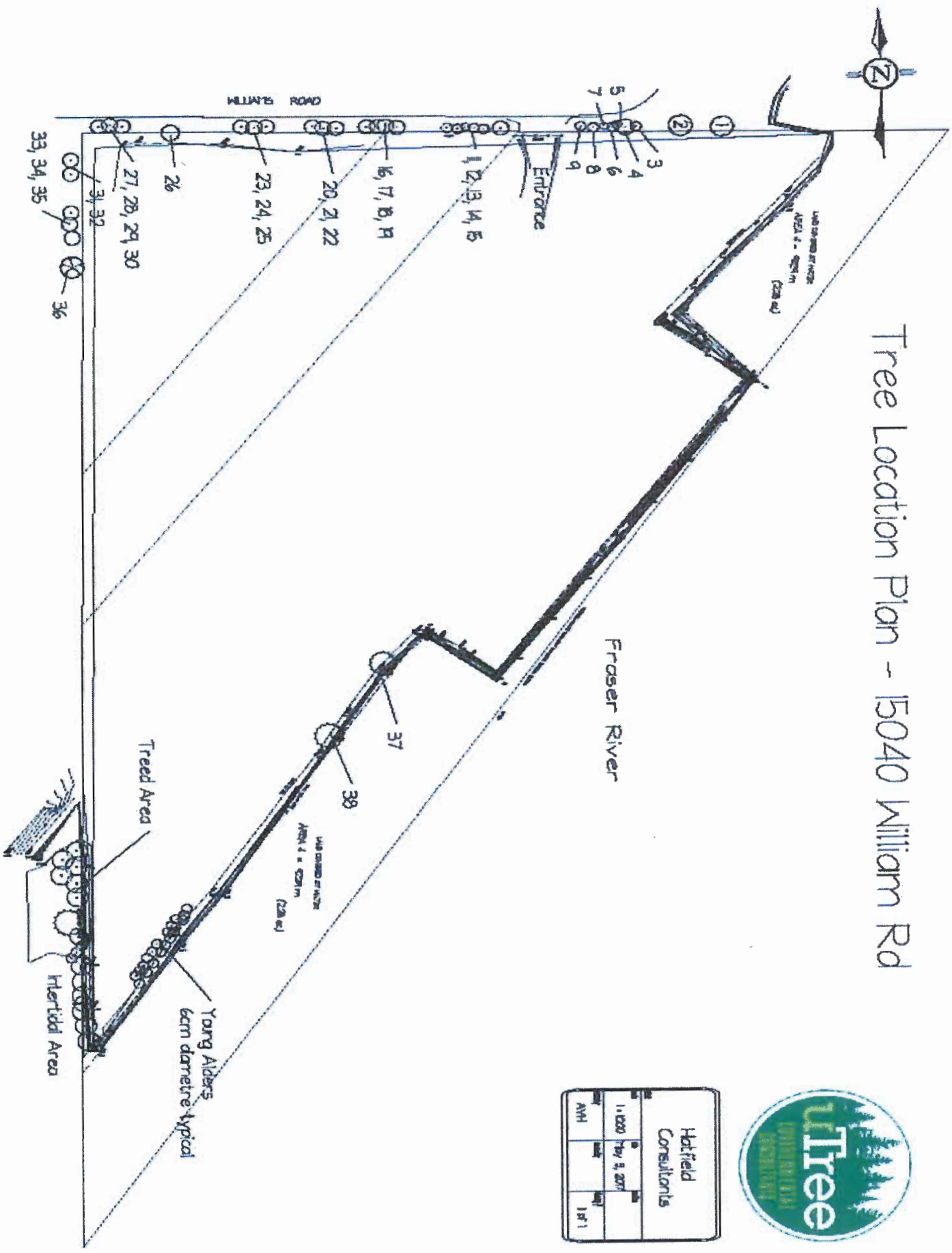
Scale: nts

Date:

Project Number: 2014-280

Dwg
L0.03

Tree Location Plan - 15040 William Rd



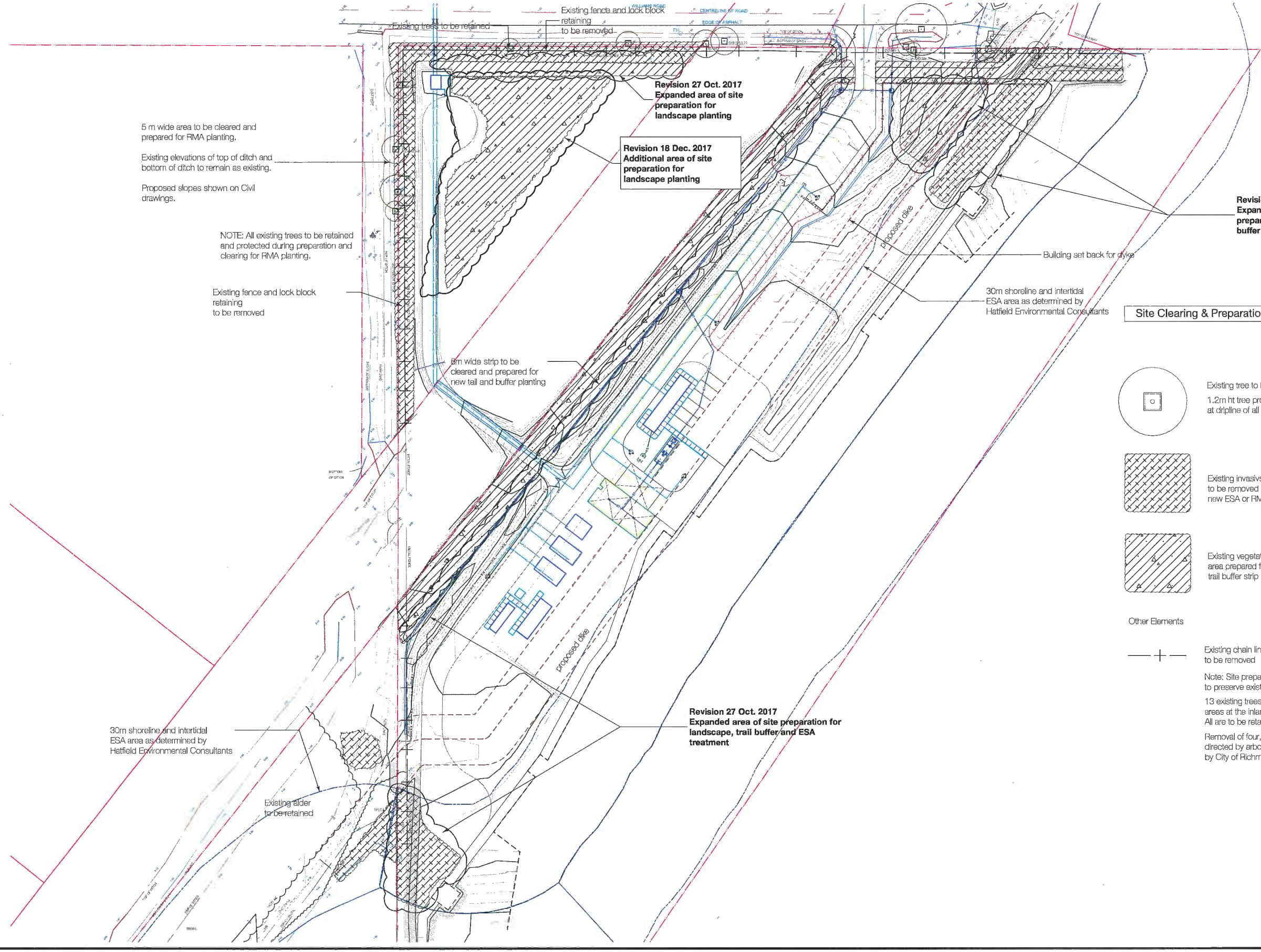
uTree Environmental Consultants.

p 604-328-0614 e avanderhelm1@gmail.com w www.utree.com

Plan # 13

DP 16-741741

FEB 28 2018



Site Clearing & Preparation Key - Landscape

Existing tree to be retained

1.2m ht tree protection fencing to be erected at dripline of all existing trees to be retained

Existing invasivse species of vegetation to be removed and area prepared for new ESA or RMA planting

Existing vegetation to be removed and area prepared for new gravel trail and trail buffer strip planting

Other Elements

Existing chain link and/ or metal panel fence to be removed

Note: Site preparation work in RMA and ESA areas to preserve existing ditch slopes and locations.

13 existing trees are found on the RMA areas at the inland site perimeter. All are to be retained

Removal of four, off-site trees only as directed by arborist and as approved by City of Richmond Parks Staff

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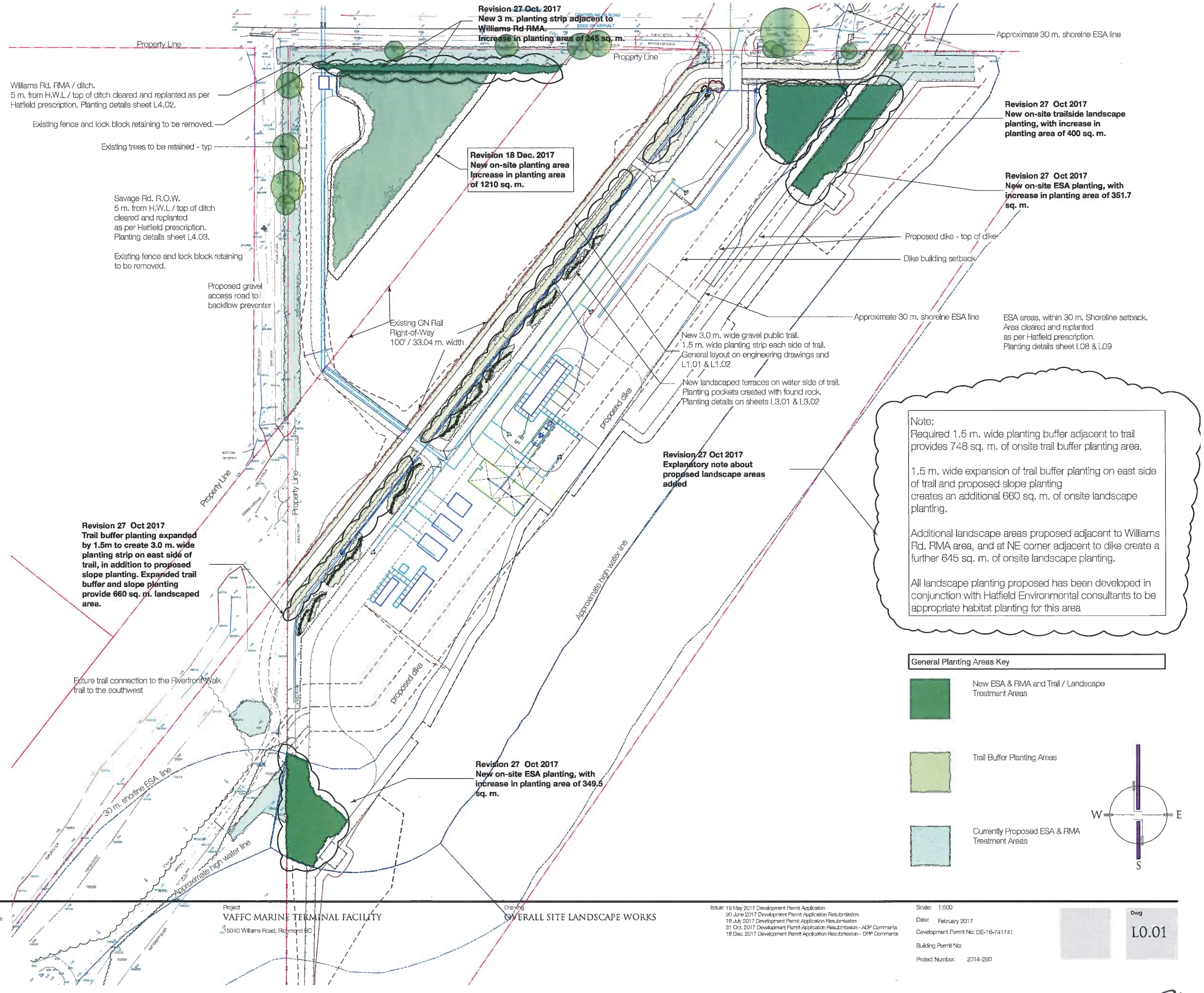
Project
VAFFC MARINE TERMINAL FACILITY
15040 Williams Road, Richmond BC

Drawing
SITE PREPARATION & CLEARING

Issue: 19 May 2017 Development Permit Application
30 June 2017 Development Permit Application Resubmission
18 July 2017 Development Permit Application Resubmission
31 Oct. 2017 Development Permit Application Resubmission - ADP Comments
18 Dec. 2017 Development Permit Application Resubmission - DPP Comments

Scale: 1:500
Date: February 2017
Development Permit No: DE-16-741741
Building Permit No:
Project Number: 2014-280

Dwg
L1.01



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Drawing
OVERALL SITE LANDSCAPE WORKS

Issue: 19 May 2017 Development Permit Application
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L0.01

Revision 18 Dec. 2017
Additional area of on site landscape planting

Revision 27 Oct 2017
New on-site landscape planting

Revision 27 Oct 2017
Expanded trail buffer strip planting on east side of proposed trail

30m shoreline and intertidal ESA area as determined by Hatfield Environmental Consultants from City of Richmond Data

Revision 27 Oct 2017
New on-site landscape planting

Revision 27 Oct 2017
Referenced trail section revised

1.5 m wide planted buffer strip each side of new gravel trail

See sheets L3.01 & L3.02

Section 1 Sheet L2.01

New security fence approximately midway up slope.

See Civil drawings for fence alignment

Areas of stacked rock retaining on slope to create planting areas

Section 4 Sheet L2.01

Trail slopes down towards Williams Rd @1.9%

Trail slopes up towards river @ 7.6%

CHAINLINK FENCE

TOP OF DITCH

BOTTOM OF DITCH

B. ditch as existing 0.47m

T. ditch as existing 1.06m

B. ditch as existing 0.68m

T. ditch as existing 1.83m

T. ditch as existing 1.42m

B. ditch as existing 0.68m

Trail 1.647 m

Trail 4.7 m

Trail 3.091 m

Trail 3.035 m

CB inlet 2.029 m

CB inlet 3.191 m

CB inlet 3.000 m

Top slope 4.025 m

2m

3m

4m

5m

1.50m

3.00m

1.50m

proposed dike

Top of dyke

See Sheet L1.03

See Sheet L1.03

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Drawing
TRAIL LAYOUT - NORTH

Issues: 19 May 2017 Development Permit Application
30 June 2017 Development Permit Application Resubmission
18 July 2017 Development Permit Application Resubmission
31 Oct. 2017 Development Permit Application Resubmission - ADP Comments
18 Dec. 2017 Development Permit Application Resubmission - DPP Comments

Scale: 1:200
Date: February 2017
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Building Permit No:
Project Number: 2014-280

Dwg
L1.02

Plan #16

See Sheet L1.02

See Sheet L1.02

Revision 27 Oct 2017
Expanded trail buffer strip planting on east side of proposed trail

B. ditch as existing
0.45 m

T. ditch as existing
1.70 m

BOTTOM OF SLOPE
DIRT PATH
TDITCH
BDITCH
PATH CL
BSLOPE
METAL FENCE
BOTTOM OF DITCH
TOP OF DITCH
CHAINLINK FENCE
GATE
FL

3m
4m
2m
5m

Trail
4.7

Trail section showing condition of greatest elevation difference between trail and adjacent facility grade.

Trail slopes down to SW @ 1.72%

Section 4 Sheet L2.01

New chain link security fence
See Detail 1 Sheet L2.01

New surface drainage ditch
See Civil drawings

CB Inlet
2.415 m

T. ditch as existing
TDITCH 2.82 m

T. ditch as existing
TDITCH 2.76 m

B. ditch as existing
BDITCH 0.78 m

Trail
2.883 m

Top slope
5.024 m

proposed dike

Top of dyke

30m shoreline and intertidal ESA area as determined by
Hatfield Environmental Consultants based on City of Richmond Data

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DP 16-741741

Plan #17

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Project
VAFFC MARINE TERMINAL FACILITY
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Drawing
TRAIL LAYOUT - SOUTH

Issue: 19 May 2017 Development Permit Application
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Date: February 2017
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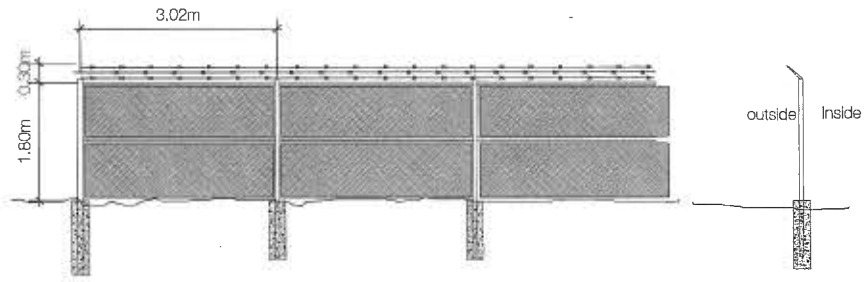
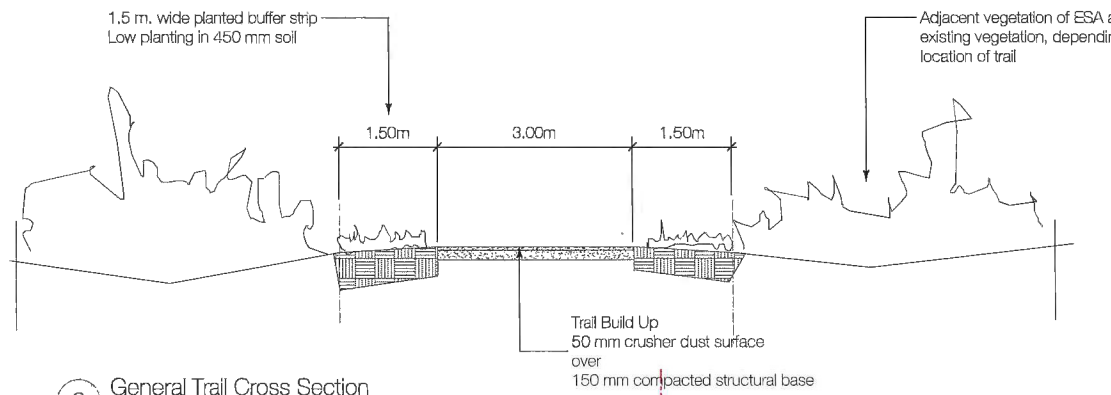
Building Permit No:
Project Number: 2014-280

Dwg
L1.03

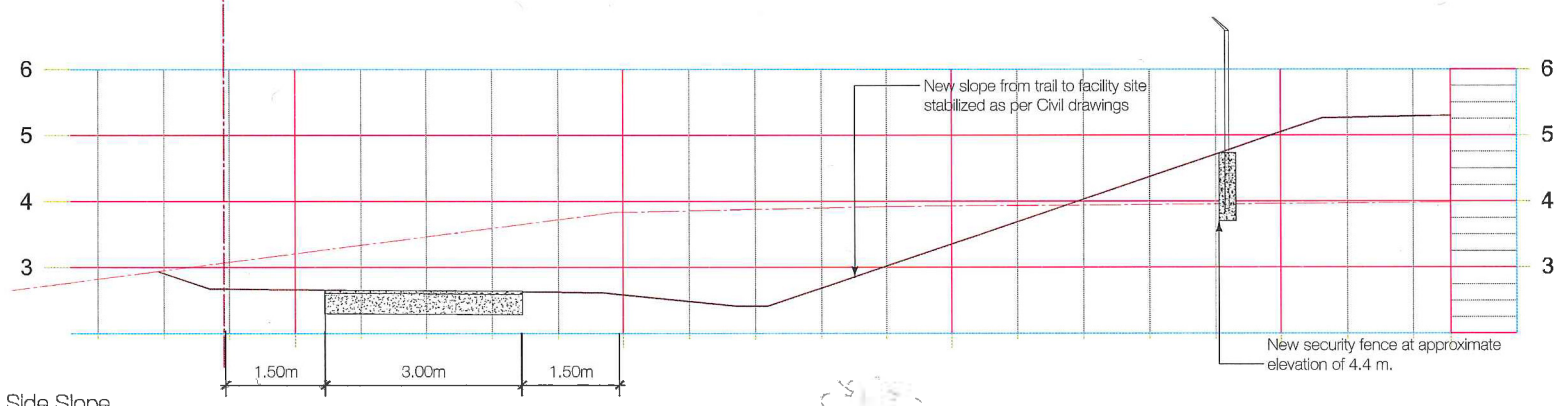
Galvanized 2" sq. chain link fence with galvanized steel posts. Angled security band with barbed wire at top.



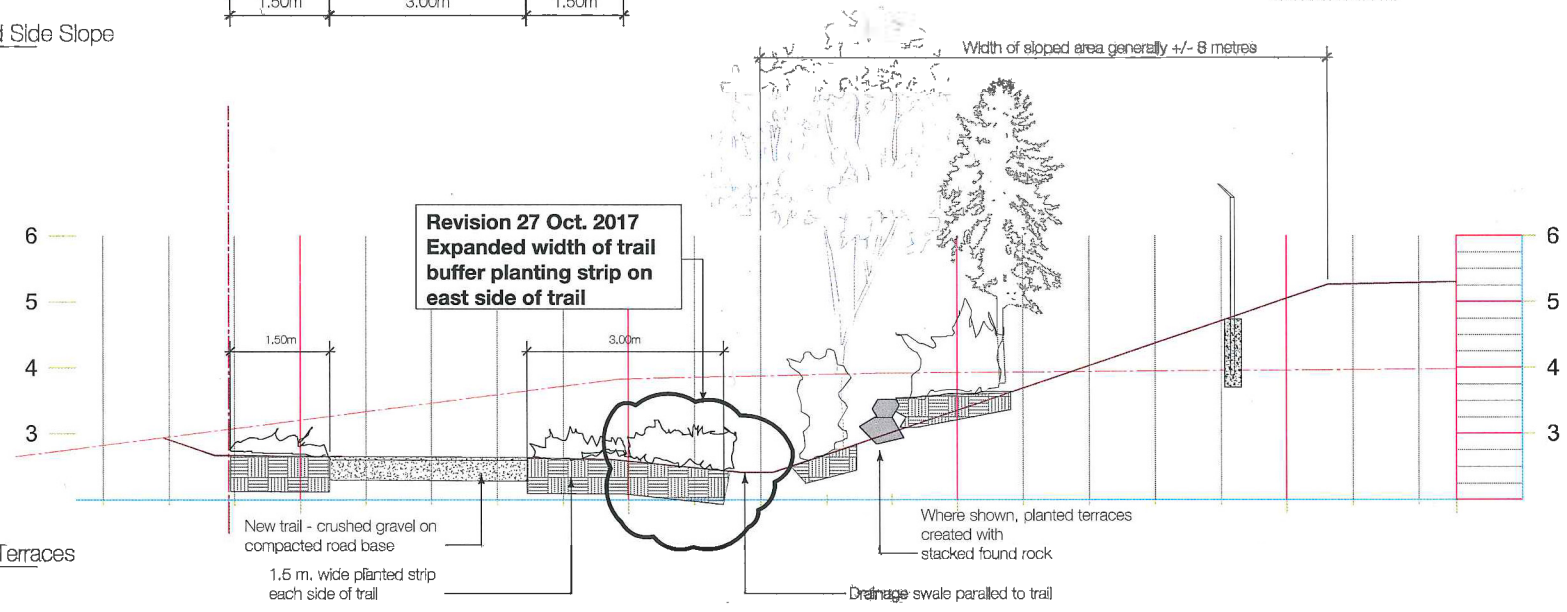
1 Security Fence - Typical



2 General Trail Cross Section



3 Trail Through Facility Site - Standard Side Slope



4 Trail Through Facility Site - Planted Terraces

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Drawing
TRAIL SECTIONS

Issue: 19 May 2017 Development Permit Application
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Building Permit No:
Project Number: 2014-280

Dwg
L2.01

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DP 16-741741

Plan #18

CENTRELINE OF ROAD

EDGE OF ASPHALT

TOP OF DITCH

BOTTOM OF DITCH

CHAIN LINK FENCE

Revision 27 Oct 2017
New on-site landscape planting adjacent to RMA planting

See sheet L3.03 for details of additional landscape planting this area

Groundcover and Grasses

Groundcover

Revision 27 Oct 2017
Expanded trail buffer strip planting on east side of proposed trail

Groundcover and Shrubs

Groundcover

30 m. shoreline ESA setback line

Revision 27 Oct 2017
New on-site landscape planting

proposed dike

Top of dyke

Building setback for dyke

GATE

LOCKBLOCKS

Groundcover and Grasses

Groundcover and Shrubs

See Sheet L3.02

See Sheet L3.02

W E S

Trail Buffer Planting Areas Key

Trail Planting 1 - Groundcover

ac	Arctostaphyllos uva-ursi	Kinnikinnick	4 plants per sq. m.
fc	Fragraria chiloensis	Coastal strawberry	4 plants per sq. m.

Trail Planting 2 - Groundcover & Grasses

ac	Arctostaphyllos uva-ursi	Kinnikinnick	2 plants per sq. m.
Eg	ELymus glaucus	Blue lyme grass	3 plants per sq. m.
Lm	Leymus mollis	Dune grass	3 plants per sq. m.

Trail Planting 3 - Groundcover & Shrubs

Rosa	Rosa gymnocarpa	Baldhip rose	1 plant per sq. m.
Mn	Mahonia nervosa	Dull Oregon grape	1 plant per sq. m.
Ma	Mahonia aquafolium	Oregon grape	0.25 plants per sq. m.
ac	Arctostaphyllos uva-ursi	Kinnikinnick	2 plants per sq. m.

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Drawing
TRAIL PLANTING AREA 1

Issue: 19 May 2017 Development Permit Application
30 June 2017 Development Permit Application Resubmission
18 July 2017 Development Permit Application Resubmission
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18 Dec. 2017 Development Permit Application Resubmission - DPP Comments

Scale: 1:200
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Building Permit No:
Project Number: 2014-280

Dwg
L3.01

Plan #19

See Sheet L3.01

See Sheet L3.01

BOTTOM OF SLOPE
DIRT PATH
TDITCH
BDITCH
PATH CL
BSLOPE
BOTTOM OF DITCH
TOP OF DITCH
METAL FENCE
CHAINLINK FENCE
GATE
FL
CI

Revision 27 Oct 2017
Expanded trail buffer strip planting on east side of proposed trail

Groundcover and Grasses

Groundcover and Shrubs

Tops of dyke

Building setback for dyke

30 m. shoreline ESA setback line

proposed dike

General Planting Areas Key

Trail Planting 1 - Groundcover

ac	Arctostaphyllos uva-ursi	Kinnikinnick
fc	Fragraria chiloensis	Coastal strawberry

Trail Planting 2 - Groundcover & Grasses

ac	Arctostaphyllos uva-ursi	Kinnikinnick
Eg	ELymus glaucus	Blue lyme grass
Lm	Leymus mollis	Dune grass

Trail Planting 3 - Groundcover & Shrubs

Rosa	Rosa gymnocarpa	Baldhip rose	1 plant per sq. m.
Mn	Mahonia nervosa	Dull Oregon grape	1 plant per sq. m.
Ma	Mahonia aquafolium	Oregon grape	0.25 plants per sq. m.
ac	Arctostaphyllos uva-ursi	Kinnikinnick	2 plants per sq. m.

W E S

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DP 16-741741

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Drawing
TRAIL PLANTING AREA 2

Issue: 19 May 2017 Development Permit Application
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Date: February 2017
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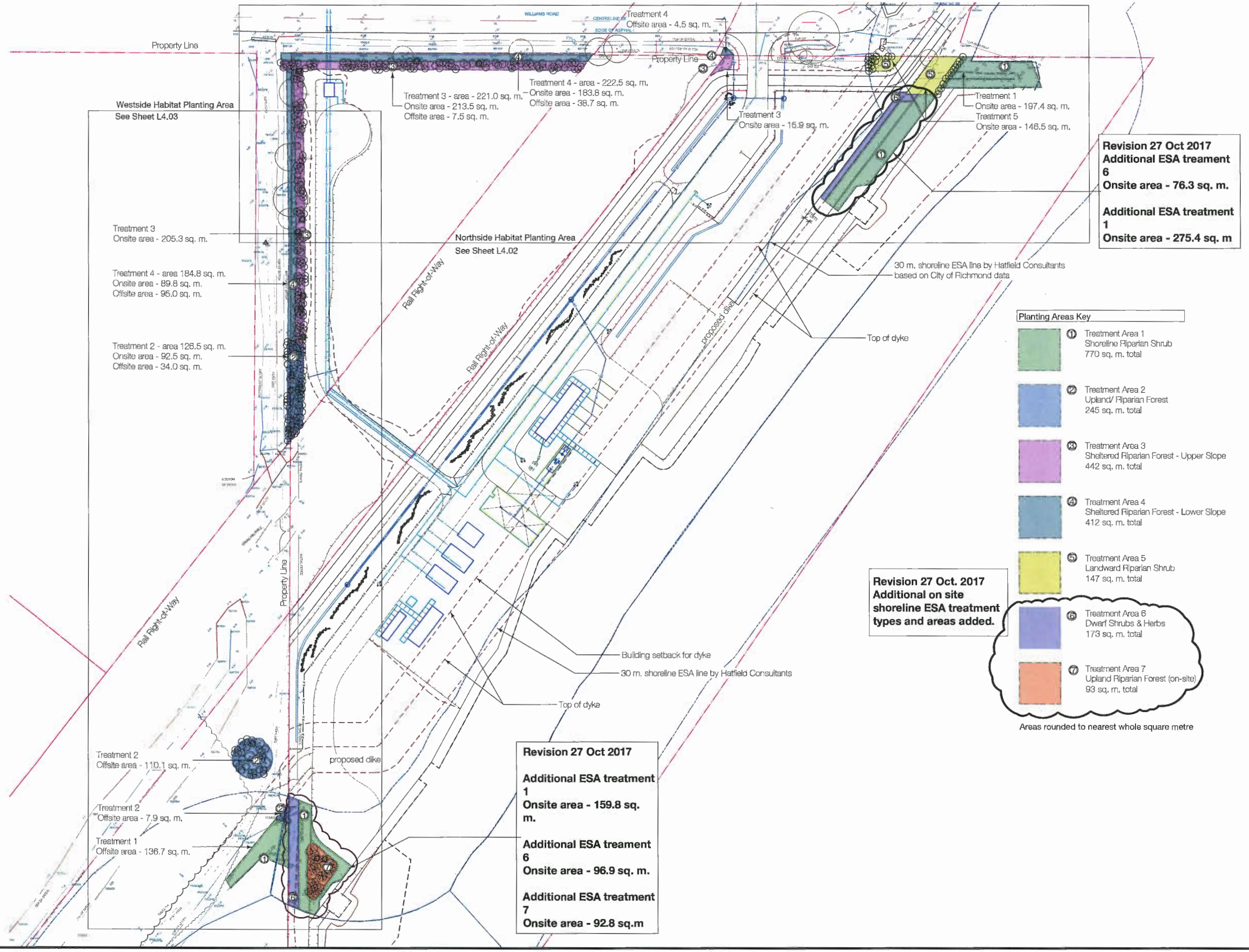
Building Permit No:
Project Number: 2014-280

Dwg
L3.02

Plan #20



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Project
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Drawing
ESA & RMA PLANTING OVERVIEW

Issue: 18 May 2017 Development Permit Application
30 June 2017 Development Permit Application Resubmission
18 July 2017 Development Permit Application Resubmission
31 Oct. 2017 Development Permit Application Resubmission - ADP Comments
18 Dec. 2017 Development Permit Application Resubmission - DPP Comments

Scale: 1:500
Date: February 2017
Development Permit No: DE-16-741741
Building Permit No:
Project Number: 2014-280

Dwg
L4.01

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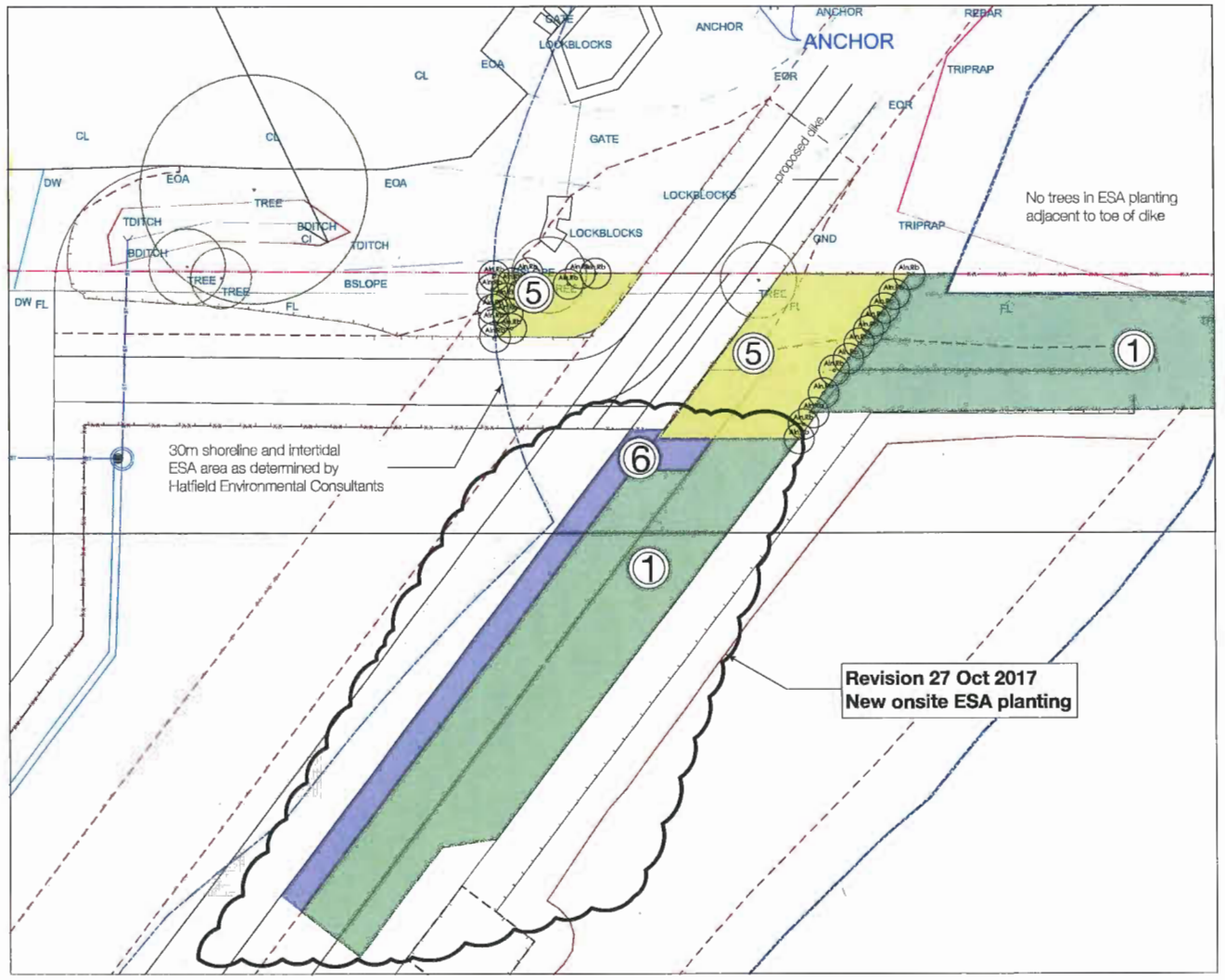
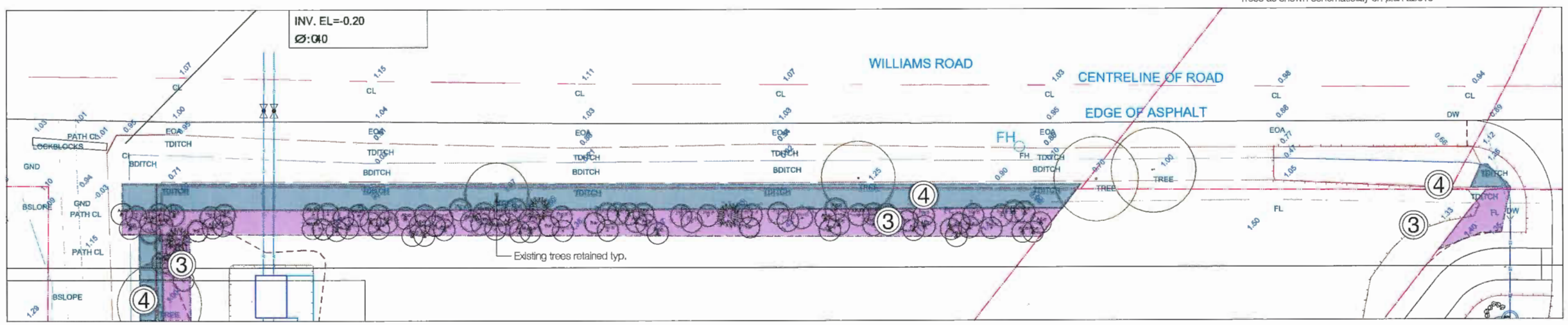
DP 16-741741

Plan #21



1 Northeast Shoreline ESA Areas

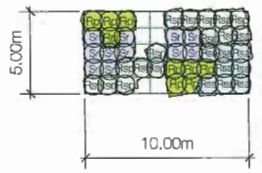


2 Williams Road RMA Areas

Treatment Area 1 - Shoreline Riparian Shrub

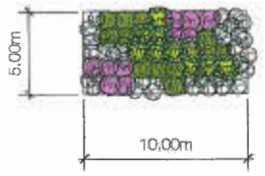
M	Mahonia nervosa	10% of area
Rp	Rubus parviflorus	10% of area
Rsp	Rubus spectabilis	50% of area
Sd	Spirea douglasii	20% of area
Sa	Symphoricarpos albus	10% of area

Treatment Area 5 - Landward Riparian Shrub



	Alnus rubra as shown on plan in blank areas on sample plan to left	18% of area
Rp	Rubus parviflorus	15% of area
Rsp	Rubus spectabilis	30% of area
Rsa	Ribes sanguineum	15% of area
Sr	Sambucus racemosa	22% of area

Treatment 6 - Dwarf Shrubs & Herbs



M	Mahonia nervosa	25% of area
Rn	Rosa nootkensis	20% of area
Pm	Polystichum munitum	20% of area
AU	Arctostaphyllos uva-ursi	20% of area
Fc	Fragraria chiloensis	15% of area

Treatment 3 Sheltered Riparian Forest - Upper Slope

Ps	Physocarpus albus	7% of area
Pm	Polystichum munitum	9% of area
Rsp	Rubus spectabilis	23% of area
Sa	Symphoricarpos albus	8% of area
	Alnus rubra	10% of area
	Acer circinatum	18% of area
	Populus trichocarpa	10% of area
	Thuja plicata	8% of area
	Tsuga heterophyla	7% of area

Trees as shown schematically on plan above

Treatment 4 Sheltered Riparian Forest - Lower Slope

Cs	Cornus stolonifera	15% of area
Ps	Physocarpus albus	10% of area
Rsp	Rubus spectabilis	25% of area
Sx	Salix sitchensis	15% of area
Sd	Spirea douglasii	20% of area
Sa	Symphoricarpos albus	15% of area

Note on Planting Layout

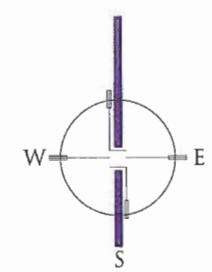
Planting detail area plans show the extent the applicable habitat planting treatment. The trees for each treatment area prescription are shown in a probable layout.

The shrub keys show a general arrangment for layout of shrubs and herbs. Where the sample area has white or open space, this space indicates the approximate area, based on percent coverage, that will be occupied by the trees proposed for that treatment area.

Colours shown in shrub key areas are intended to illustrate the general grouping of shrubs in each area.x

Note that habitat planing plans are guides. It is standard practice that final layout of trees and shrubs be done in the field at the time of planting.

REVIEW
17 DEC. 2017



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DP 16-741741

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Project
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15040 Williams Road, Richmond BC

Drawing
NORTH SIDE ESA & RMA PLANTING

Issue: 19 May 2017 Development Permit Application
30 June 2017 Development Permit Application Resubmission
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18 Dec. 2017 Development Permit Application Resubmission - DPP Comments

Scale: 1:200
Date: February 2017
Development Permit No: DP-16-741741
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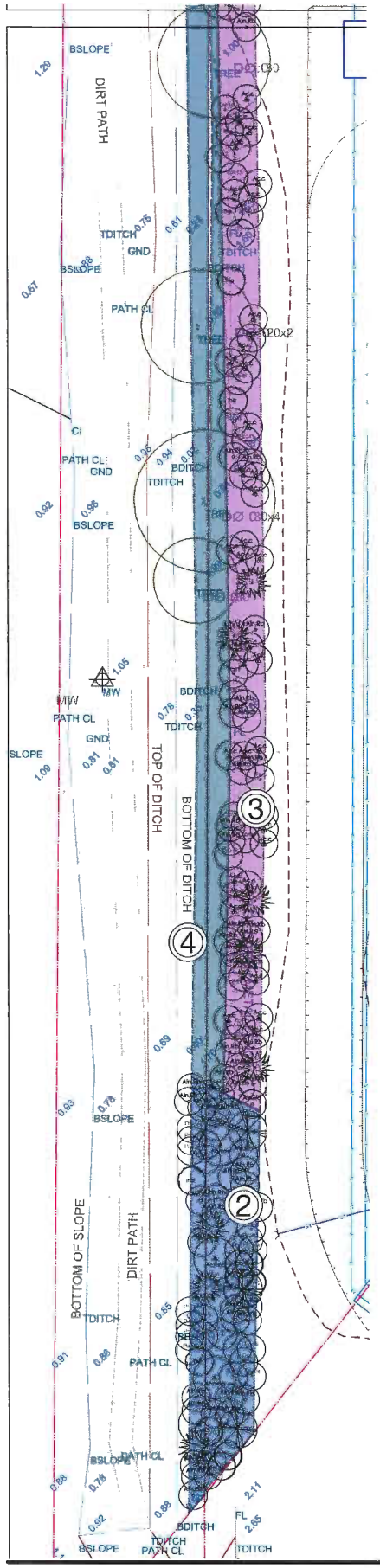
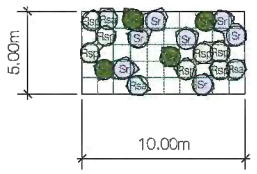
Project Number: 2014-280

Dwg
L4.02

Plan #22



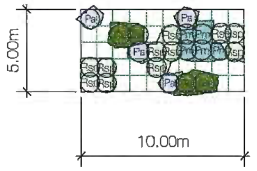
Treatment 2 - Upland/ Riparian Forest



Rsp	Rubus spectabilis	14% of area
Rpa	Ribes sanguineum	5% of area
Sr	Sambucus racemosa	15% of area
Sa	Symphoricarpos albus	7% of area

Acer macrophyllum	6% of area
Alnus rubra	17% of area
Corylus comuta var. Californica	7% of area
Populus trichocarpa	12% of area
Pseudotsuga douglasii	6% of area
Thuja plicata	6% of area
Tsuga heterophyla	7% of area

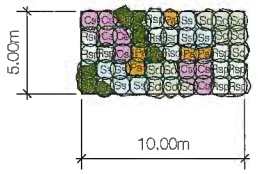
Treatment 3 - Sheltered Riparian Forest - Upper Slope



Pa	Physocarpus albus	7% of area
Pm	Polystichum munitum	9% of area
Rsp	Rubus spectabilis	23% of area
Sa	Symphoricarpos albus	8% of area

Alnus rubra	10% of area
Acer circinatum	18% of area
Populus trichocarpa	10% of area
Thuja plicata	8% of area
Tsuga heterophyla	7% of area

Treatment 4 - Sheltered Riparian Forest - Lower Slope



Cs	Cornus stolonifera	15% of area
Pa	Physocarpus albus	10% of area
Rsp	Rubus spectabilis	25% of area
Ss	Salix sitchensis	15% of area
Sp	Spirea douglasii	20% of area
Sa	Symphoricarpos albus	15% of area

Note on Planting Layout

Planting detail area plans show the extent the applicable habitat planting treatment. The trees for each treatment area prescription are shown in a probable layout.

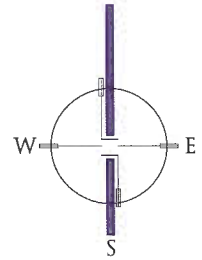
The shrub keys show a general arrangment for layout of shrubs and herbs. Where the sample area has white or open space, this space indicates the approximate area, based on percent coverage, that will be occupied by the trees proposed for that treatment area.

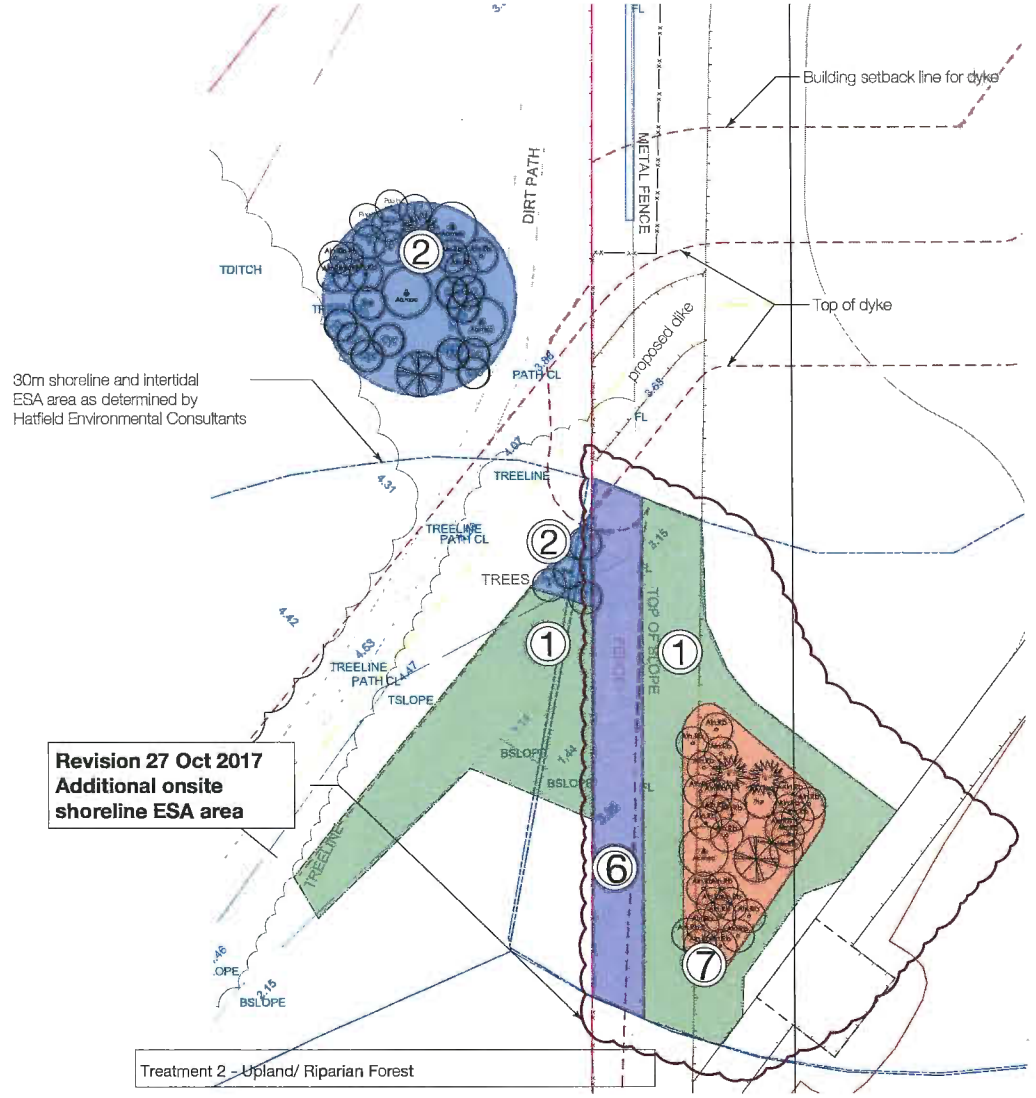
Colours shown in shrub key areas are intended to illustrate the general grouping of shrubs in each area.x

Note that habitat planing plans are guides. It is standard practice that final layout of trees and shrubs be done in the field at the time of planting.

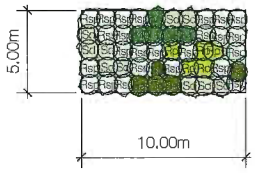
Revision 27 Oct 2017
Additional ESA plant prescriptions

3 Savage Road R.O.W RMA Areas



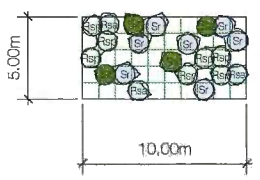


Treatment Area 1 - Shoreline Riparian Shrub



M	Mahonia nervosa	10% of area
Rp	Rubus parviflorus	10% of area
Rsp	Rubus spectabilis	50% of area
Sd	Spirea douglasii	20% of area
Sa	Symphoricarpos albus	10% of area

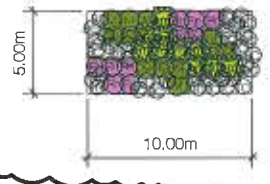
Treatment 2 - Upland/ Riparian Forest



Rsp	Rubus spectabilis	14% of area
Rpa	Ribes sanguineum	5% of area
Sr	Sambucus racemosa	15% of area
Sa	Symphoricarpos albus	7% of area

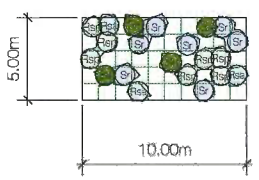
Acer macrophyllum	6% of area
Alnus rubra	17% of area
Corylus comuta var. Californica	7% of area
Populus trichocarpa	12% of area
Pseudotsuga douglasii	6% of area
Thuja plicata	6% of area
Tsuga heterophyla	7% of area

Treatment 6 - Dwarf Shrubs & Herbs



M	Mahonia nervosa	25% of area
Rn	Rosa nootkensis	20% of area
Pm	Polystichum munitum	20% of area
AC	Arctostaphyllos uva-ursi	20% of area
Fc	Fragraria chiloensis	15% of area

Treatment 7 - Upland/ Riparian Forest (Onsite)



Rsp	Rubus spectabilis	20% of area
Sr	Sambucus racemosa	15% of area
Sd	Spirea douglasii	15% of area

Pseudotsuga douglasii	5% of area
Tsuga heterophyla	10% of area
Acer macrophyllum	5% of area
Alnus rubra	3% of area

4 Southwest Corner ESA Area

FEB 28 2018

DP 16-741741

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Project
VAFFC MARINE TERMINAL FACILITY
15040 Williams Road, Richmond BC

Drawing
WESTSIDE ESA & RMA PLANTING

Issue: 19 May 2017 Development Permit Application
30 June 2017 Development Permit Application Resubmission
18 July 2017 Development Permit Application Resubmission
31 Oct. 2017 Development Permit Application Resubmission - ADP Comments
18 Dec. 2017 Development Permit Application Resubmission - DPP Comments

Scale: 1:200
Date: February 2017
Development Permit No: DP-16-741741
Building Permit No:
Project Number: 2014-280

Dwg
L4.03

Plan #23

Plant List for ESA, RMA Planting Areas

Revision 27 Oct 2017
Plant list updates to reflect additional ESA areas

Trees

ID	Quantity	Latin Name	Common Name	Scheduled Size	Notes
	0				
	80	Acer circinatum	Vine maple	#5 pot	
	8	Acer macrophyllum	Bigleaf maple	#5 pot	
	144	Alnus rubra	Red alder	#3 pot	
	17	Corylus cornuta var. 'Californica"	Beaked hazlenut	#2 pot	
	74	Populus trichocarpa	Black cottonwood	#3 pot	
	5	Pseudotsuga menziesii	Douglas fir	3.0 m. ht.	
	13	Thuja plicata	Western redcedar	3.0 m. ht.	
	14	Tsuga heterophylla	Western hemlock	3.0 m. ht.	

Revision 18 Dec. 2017
Plant list updates to reflect increased plant sizes

Shrubs & Herbs

ID	Quantity	Latin Name	Common Name	Scheduled Size	Notes
	0				
	62	Cornus stolonifera	Redosier dogwood	#2 pot	
	180	Mahonia nervosa	Dull Oregon grape	#2 pot	
	72	Physocarpus albus	Pacific ninebark	#2 pot	
	74	Polystichum munitum	Swordfern	#2 pot	
	69	Ribes sanguineum	Red flowering currant	#2 pot	
	96	Rubus parviflorus	Thimbleberry	#2 pot	
	696	Rubus spectabilis	Salmonberry	#2 pot	
	76	Sambuccus racemosa	Red elderberry	#2 pot	
	62	Salix sitchensis	Sitka willow	#2 pot	
	248	Spiraea douglasii	Steeplebush	#2 pot	
	179	Symphorocarpus albus	Snowberry	#2 pot	
	140	Arctostaphyllos uva-ursi	Kinnikinnick	#2 pot	
	104	Fragraria virginiana	Wild strawberry	#1 pot	

Plant List for Trail Buffer Planting Areas

Shrubs & Herbs

ID	Quantity	Latin Name	Common Name	Scheduled Size	Notes
	0				
	80	Mahonia aquafolium	Oregon grape	#2 pot	
	324	Mahonia nervosa	Dull Oregon grape	#2 pot	
	325	Rosa gymnocarpa	Baldhip rose	#2 pot	

Groundcover & Grasses

ID	Quantity	Latin Name	Common Name	Scheduled Size	Notes
	0				
	1252	Arctostaphylls uva-ursi	Kinnikinnick	#1 pot	
	1252	Elymus glacus	Blue lyme grass	#1 pot	
	115	Fragraria chiloensis	Coastal straberry	#1 pot	
	980	Leymus mollis	Dune grass	#1 pot	

Revision 18 Dec. 2017
Plant list updates to reflect increased plant sizes

Plant List for On-site Slope Areas and Additional Landscape Planting

Revision 27 Oct 2017
Plant list updates to reflect additional landscape planting areas

Trees

ID	Quantity	Latin Name	Common Name	Scheduled Size	Notes
A.l	15	Amelanchier laevis	Allegheny Serviceberry	5 cm. cal	
Be.pap	2	Betula papyrifera	Paper birch	2.5 m. ht.	
P.con	17	Pinus contorta	Shore pine	3 m. ht.	
P.doug	10	Pseudotsuga menziesii	Douglas fir	3 m. ht.	

Shrubs

ID	Quantity	Latin Name	Common Name	Scheduled Size	Notes
au	852	Arctostaphylos uva-ursi 'Vancouver Jade'	Vancouver Jade Kinnikinick	#1 pot	
cs	23	Cornus sericea 'stolonifera'	Redosier Dogwood	#2 pot	
gs	71	Gaultheria shallon	Salal	#1 pot	
Hol.d	24	Holodiscus discolor	Oceanspray	#2 pot	
M.aq	19	Mahonia aquafolium	Oregon grape	#3 pot	
R.san	14	Ribes sanguineum 'King Edward VII'	King Edward Vii Flowering Currant	#2 pot	
sp.d	21	Spiraea douglasii	Hardhack spiraea	#2 pot	

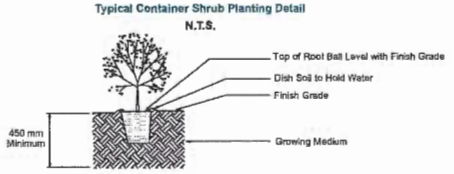
Groundcover & Grasses

ID	Quantity	Latin Name	Common Name	Scheduled Size	Notes
	0				
	1252	Arctostaphylls uva-ursi	Kinnikinnick	#1 pot	
	1252	Elymus glacus	Blue lyme grass	#1 pot	
	115	Fragraria chiloensis	Coastal straberry	#1 pot	
	980	Leymus mollis	Dune grass	#1 pot	

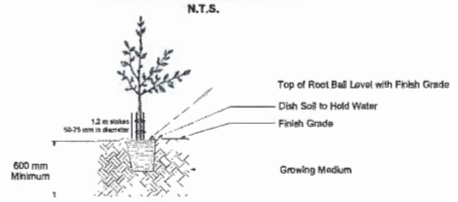
General Landscape Specifications

- Areas requiring topsoil shall be fine graded by raking out spoil material and debris such as rocks, asphalt and concrete over 50 mm in diameter, and scarified to a minimum depth of 150 mm immediately before placing topsoil.
- Topsoil and any amendments to the growing medium shall meet the criteria described in the British Columbia Landscape Standards for background (natural) areas (refer to adjacent table for particle size, acidity and drainage specifications).
- Topsoil shall be tested by an accredited soil testing laboratory, prior to delivery.
- Screened topsoil must be applied with a minimum thickness of 450 mm in shrub planting areas and 600 mm in treed areas. Topsoil must be free of subsoil, wood (including woody plant parts), toxic materials, stones over 30 mm, foreign objects, propagules of plant species designated as noxious under the BC Weed Control Act and Regulation, and other invasive or undesirable plant species.
- All plant material that has not been salvaged from the construction footprint shall be of guaranteed nursery stock, densely branched, well-established (minimum leaf density of 50%), free of invasive/noxious plant material and meet the criteria specified in City of Richmond Engineering and Public Works Department Supplementary Specifications and Detail Drawings, Version 3, 2016, Schedule G – Tree Planting on Sidewalks and Boulevards (they replace the specifications in Section 32 93 01 – Planting of Trees, Shrubs, and Ground Covers in the MMCD Platinum Edition).
- Plants in containers shall have a well-established root system, reaching the sides of the container but not being root bound. Soil must hold together when a plant is removed from its container.
- The City of Richmond's Engineering and Public Works department must be notified once nursery stock has arrived on site, for inspection prior to planting. Fall planting (following the last drought period in September or October), or spring planting (March or April) is recommended.
- Native trees, shrubs and herbs must be set plumb and fully immersed in growing medium, such that the top of the rootball is set at or slightly above the finished grade. Planting wells will be established to increase the capture and retention of water. The soil around each new plant will be tamped and watered in layers. Trees will be securely staked on both sides.
- The soil must be raked once the revegetation work is complete. A fall rye should be spread in the enhancement areas to prevent erosion and provide some shelter for new plants until they become fully established.
- Habitat enhancement works should be supervised by a certified landscape architect (or horticulturalist) to ensure compliance with the BC Landscape Standards and City and Richmond specifications for the planting of trees, shrubs, and ground cover.
- The contractor shall provide maintenance including, watering, removal of invasive species and replacement of dead stock for a period of three (3) years following planting.

Typical Container Shrub Planting Detail
N.T.S.



Typical Container Tree Planting Detail
N.T.S.



Topsoil (growing medium) specifications.

Soil Attribute	Criteria
Gravel 2 - 30 mm	≤ 10% of dry weight
Sand 0.05 – 2 mm	30 – 70% of dry weight
Silt and clay combined	Max of 60% of dry weight
Organic content	10 – 20% of dry weight
Hydraulic conductivity	2 cm/hour
pH	4.5 – 7.0

Hatfield Consultants	Vancouver Airport Fuel Delivery Project – Habitat Enhancement On/By Marine Terminal		
DESIGN: LD	DRAWN: TK	PROFESSIONAL SEAL	DRAWING NUMBER: 6773-01
REVISION: 0	DATE: Feb 2, 2017		

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Treatment 1 (Shoreline Riparian Shrub)

Common name	Botanical Name	% of Area	Stock Size	Planting Density
Salmonberry	Rubus spectabilis	50	No. 3 pot	1 plant per 1 m2
Thimbleberry	Rubus parviflorus	10	No. 2 pot	1 plant per 1 m2
Steeplebush	Spirea douglasii	20	No. 2 pot	1 plant per 1 m2
Snowberry	Symphorlcarpos albus	10	No. 2 pot	1 plant per 1 m2
Dull Oregon Grape	Mahonia nervosa	10	No. 2 pot	1 plant per 1 m2

Treatment 2 (Upland/Riparian Forest)

Common name	Botanical Name	% of Area	Stock Size	Planting Density
Coastal Douglas-fir	Pseudotsuga douglasii	6	No. 15 pot	1 plant per 4 m2
Western redcedar	Thuja plicata	6	No. 15 pot	1 plant per 4 m2
Western hemlock	Tsuga heterophylla	7	No. 15 pot	1 plant per 4 m2
Bigleaf maple	Acer macrophyllum	6	No. 5 pot	1 plant per 2 m2
Red alder	Alnus Rubra	17	No. 3 pot	1 plant per 1 m2
Black cottonwood	Populus trichocarpa	12	No. 3 pot	1 plant per 1 m2
Salmonberry	Rubus spectabilis	14	No. 3 pot	1 plant per 1 m2
Beaked hazelnut	Corylus cornuta var. Californica	7	No. 2 pot	1 plant per 1 m2
Red elderberry	Sambucus racemosa	15	No. 3 pot	1 plant per 1 m2
Red-flowering currant	Ribes sanguineum	5	No. 2 pot	1 plant per 1 m2
Snowberry	Symphoricarpos albus	7	No. 2 pot	1 plant per 1 m2

Treatment 3 (Sheltered Riparian Forest – Upper Slope)

Common name		% of Area	Stock Size	Planting Density
Western redcedar	Thuja plicata	8	No. 15 pot	1 plant per 4 m2
Western hemlock	Tsuga heterophylla	7	No. 15 pot	1 plant per 4 m2
Red alder	Alnus Rubra Populus	10	No. 3 pot	1 plant per 1 m2
Black cottonwood	trichocarpa Rubus	10	No. 3 pot	1 plant per 1 m2
Salmonberry	spectabilis	23	No. 3 pot	1 plant per 1 m2
Pacific ninebark	Physocarpus albus	7	No. 2 pot	1 plant per 1 m2
Vine maple	Acer circinatum	18	No. 3 pot	1 plant per 1 m2
Snowberry	Symphoricarpos albus	8	No. 2 pot	1 plant per 1 m2
Sword fern	Polystichum munitum	9	No. 2 pot	1 plant per 1 m2

Treatment 4 (Sheltered Riparian Forest – Lower Slope)

Common name	Botanical Name	% of Area	Stock Size	Planting Density
Redosier dogwood	Cornus stolonifera	15	No. 2 pot	1 plant per 1 m2
Sitka willow	Salix sitchensis	15	No. 2 pot	1 plant per 1 m2
Salmonberry	Rubus spectabilis	25	No. 2 pot	1 plant per 1 m2
Pacific ninebark	Physocarpus albus	10	No. 2 pot	1 plant per 1 m2
Snowberry	Symphoricarpos albus	15	No. 2 pot	1 plant per 1 m2
Steeplebush	Spirea douglasii	20	No. 2 pot	1 plant per 1 m2

Treatment 5 (Landward Riparian Shrub)

Common name	Botanical Name	% of Area	Stock Size	Planting Density
Red alder	Alnus rubra	18	No. 2 pot	1 plant per 1 m2
Red elderberry	Sambucus racemosa	22	No. 3 pot	1 plant per 1 m2
Salmonberry	Rubus spectabilis	30	No. 2 pot	1 plant per 1 m2
Thimbleberry	Rubus parviflorus	15	No. 2 pot	1 plant per 1 m2
Red-flowering currant	Ribes sanguineum	15	No. 2 pot	1 plant per 1 m2

Treatment 6 (Dwarf Shrubs and Herbs)

Common name	Botanical Name	% of Area	Stock Size	Planting Density
Nootka rose	*Rosa nootkana*	0.2	No. 2 pot	1 plant per 1 m2
Dwarf oregon-grape	*Mahonia nervosa*	0.25	No. 2 pot	1 plant per 1 m2
Kinnikinnick	*Arctostaphylos uva-ursi*	0.2	No. 2 pot	1 plant per 0.25 m2
Wild strawberry	*Fragaria virginiana*	0.15	No. 1 pot	1 plant per 0.25 m2
Sword fern	*Polystichum munitum*	0.2	No. 1 pot	1 plant per 1 m2

Treatment 7 (On-Site Upland/Riparian Forest)

Common name	Botanical Name	% of Area	Stock Size	Planting Density
Douglas-fir	*Pseudotsuga douglasii*	0.05	No. 15 pot	1 plant per 4 m2
Western hemlock	*Tsuga heterophylla*	0.1	No. 15 pot	1 plant per 4 m2
Bigleaf maple	*Acer macrophyllum*	0.05	No. 10 pot	1 plant per 4 m2
Red alder	*Alnus rubra*	0.3	No. 3 pot	1 plant per 1 m2
Salmonberry	*Rubus spectabilitis*	0.2	No. 2 pot	1 plant per 1 m2
Red elderberry	*Sambucus racemosa*	0.15	No. 2 pot	1 plant per 1 m2
Steeplebush	*Spirea douglasii*	0.15	No. 2 pot	1 plant per 1 m2

Revision 18 Dec. 2017
Increased plant sizes shown in plant list upper left superceed sizes shown here

Revision 27 Oct 2017
Plant list updates to reflect additional ESA areas

Hatfield Consultants	Vancouver Airport Fuel Delivery Project – Habitat Enhancement On/By Marine Terminal		
DESIGN: LD	DRAWN: TK	PROFESSIONAL SEAL	DRAWING NUMBER: 6773-01
REVISION	DATE: Oct. 30, 2017		

FEB 28 2018

DP 16-741741

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Project
VAFFC MARINE TERMINAL FACILITY
15040 Williams Road, Richmond BC

Drawing
SPECIFICATION NOTES AND PLANT LISTS

Issue: 19 May 2017 Development Permit Application
30 June 2017 Development Permit Application Resubmission
18 July 2017 Development Permit Application Resubmission
31 Oct. 2017 Development Permit Application Resubmission - ADP Comments
18 Dec. 2017 Development Permit Application Resubmission - DPP Comments

Scale: 1:500
Date: February 2017
Development Permit No: DE-16-741741
Building Permit No:
Project Number: 2014-280

Dwg
L0.05

Plan #24

Inland triangle site additional planting area: 1210 sq m.

Proposed planting is a combination of ESA planting treatment 2 & treatment 3, with modifications to suit the environment of the triangle site.

Internal planting area of 760 sq. m.
Preliminary plant list and area coverages:

61	Tsuga heterophyla	Western hemlock
38	Pseudotsuga douglasii	Douglas fir
152	Alnus rubra	Red alder
38	Acer macrophyllum	Bigleaf maple
61	Acer circinatum	Vine maple
61	Corylus cornuta var. Calif.	Beaked hazelnut
190	Rubus spectabilis	Salmonberry
114	Rubus parviflorus	Thimbleberry
38	Symphoricarpos albus	Snowberry
23	Physocarpus albus	Pacific ninebark

Perimeter planting area of 450 sq. m.
Preliminary plant list and area coverages:

Perimeter Planting - Shrubs, Groundcovers & Grasses

450	Rosa gymnocarpa	Baldhip rose
450	Mahonia nervosa	Dull Oregon grape
1350	ELymus glaucus	Blue lyme grass
1350	Leymus mollis	Dune grass
1800	Arctostaphyllos uva-ursi	Kinnikinnick
1800	Fragraria chiloensis	Coastal strawberry

NOTE: tree graphics indicate general areas of probable tree groupings, but do not represent quantities in plant lists above

REVIEW
17 DEC. 2017

FEB 28 2018

DP 16-741741

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Project
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15040 Williams Road, Richmond BC

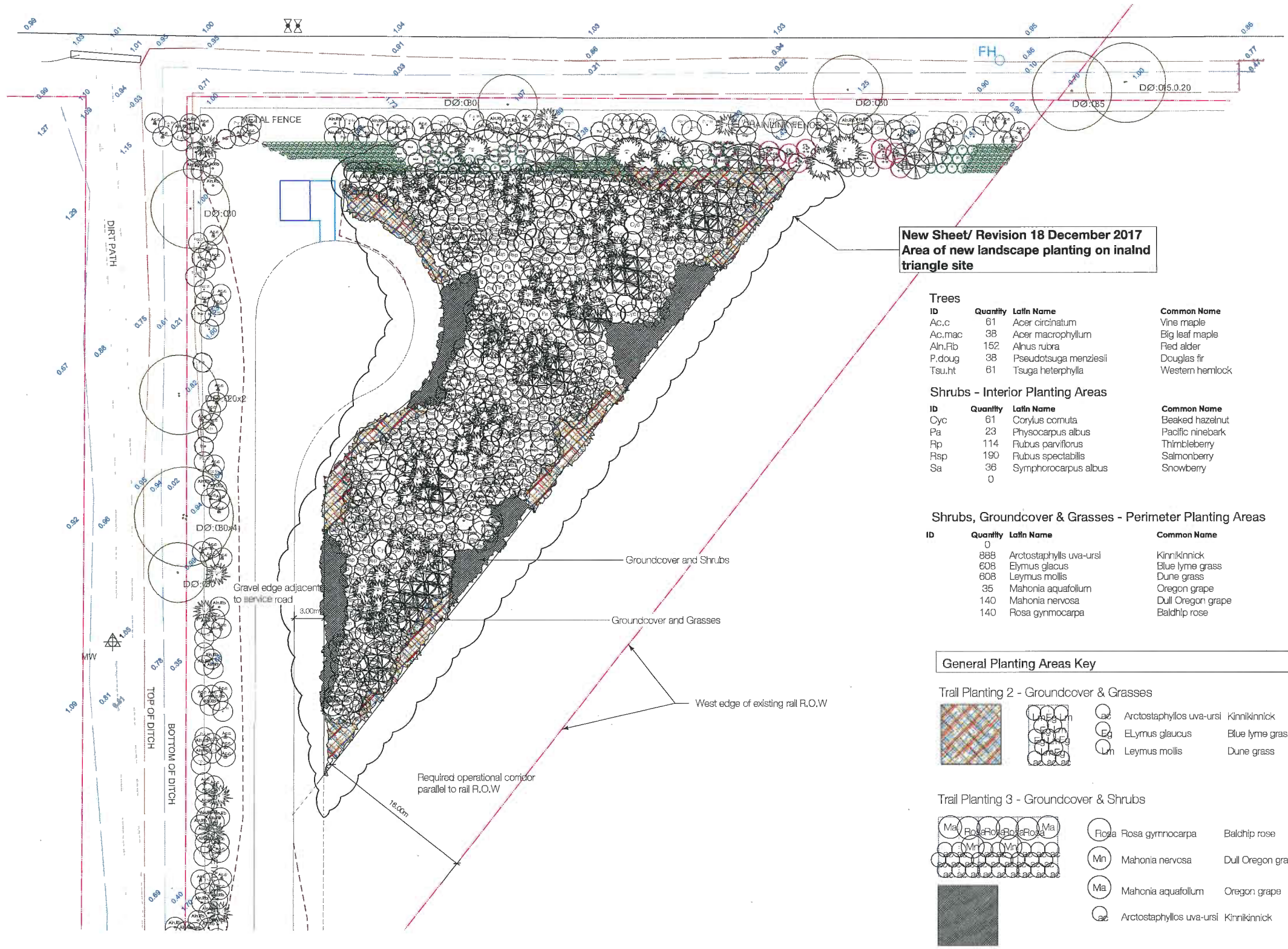
Drawing
TRIANGLE SITE PLANTING SKETCH

Issue:
31 Oct. 2017 Development Permit Application Resubmission - ADP Comments

Scale: 1:300
Date:
Project Number: 2014-280

Dwg
L0.00

Plan #25



New Sheet/ Revision 18 December 2017
Area of new landscape planting on inalnd triangle site

Trees

ID	Quantity	Latin Name	Common Name	Scheduled Size	Notes
Ac.c	61	Acer circinatum	Vine maple	3.0 m ht.	
Ac.mac	38	Acer macrophyllum	Big leaf maple	#5 pot	
Aln.Rb	152	Alnus rubra	Red alder	#3 pot	
P.doug	38	Pseudotsuga menziesii	Douglas fir	3.0 m. ht.	
Tsu.ht	61	Tsuga heterphylla	Western hemlock	3.0 m. ht.	

Shrubs - Interior Planting Areas

ID	Quantity	Latin Name	Common Name	Scheduled Size	Notes
Cyc	61	Corylus cornuta	Beaked hazelnut	1.5m. ht.	
Pa	23	Physocarpus albus	Pacific ninebark	#2 pot	
Rp	114	Rubus parviflorus	Thimbleberry	#2 pot	
Rsp	190	Rubus spectabilis	Salmonberry	#2 pot	
Sa	36	Symphorocarpus albus	Snowberry	#2 pot	
	0				

Shrubs, Groundcover & Grasses - Perimeter Planting Areas

ID	Quantity	Latin Name	Common Name	Scheduled Size	Notes
	0				
	888	Arctostaphylls uva-ursi	Kinnikinnick	10 cm pot	
	608	Elymus glacus	Blue lyme grass	10 cm pot	
	608	Leymus mollis	Dune grass	10 cm pot	
	35	Mahonia aquafolium	Oregon grape	#2 pot	
	140	Mahonia nervosa	Dull Oregon grape	#2 pot	
	140	Rosa gymnocarpa	Baldhip rose	#2 pot	

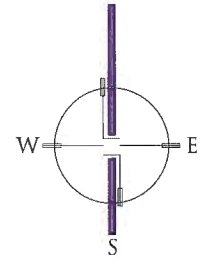
General Planting Areas Key

Trail Planting 2 - Groundcover & Grasses

ac Arctostaphyllos uva-ursi Kinnikinnick
Eg ELymus glaucus Blue lyme grass
Lm Leymus mollis Dune grass

Trail Planting 3 - Groundcover & Shrubs

Rosa Rosa gymnocarpa Baldhip rose
Mn Mahonia nervosa Dull Oregon grape
Ma Mahonia aquafolium Oregon grape
ac Arctostaphyllos uva-ursi Kinnikinnick



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15040 Williams Road, Richmond BC

Drawing
TRIANGLE SITE PLANTING AREA

Issue: 18 Dec. 2017 Development Permit Application Resubmission - DPP Comments

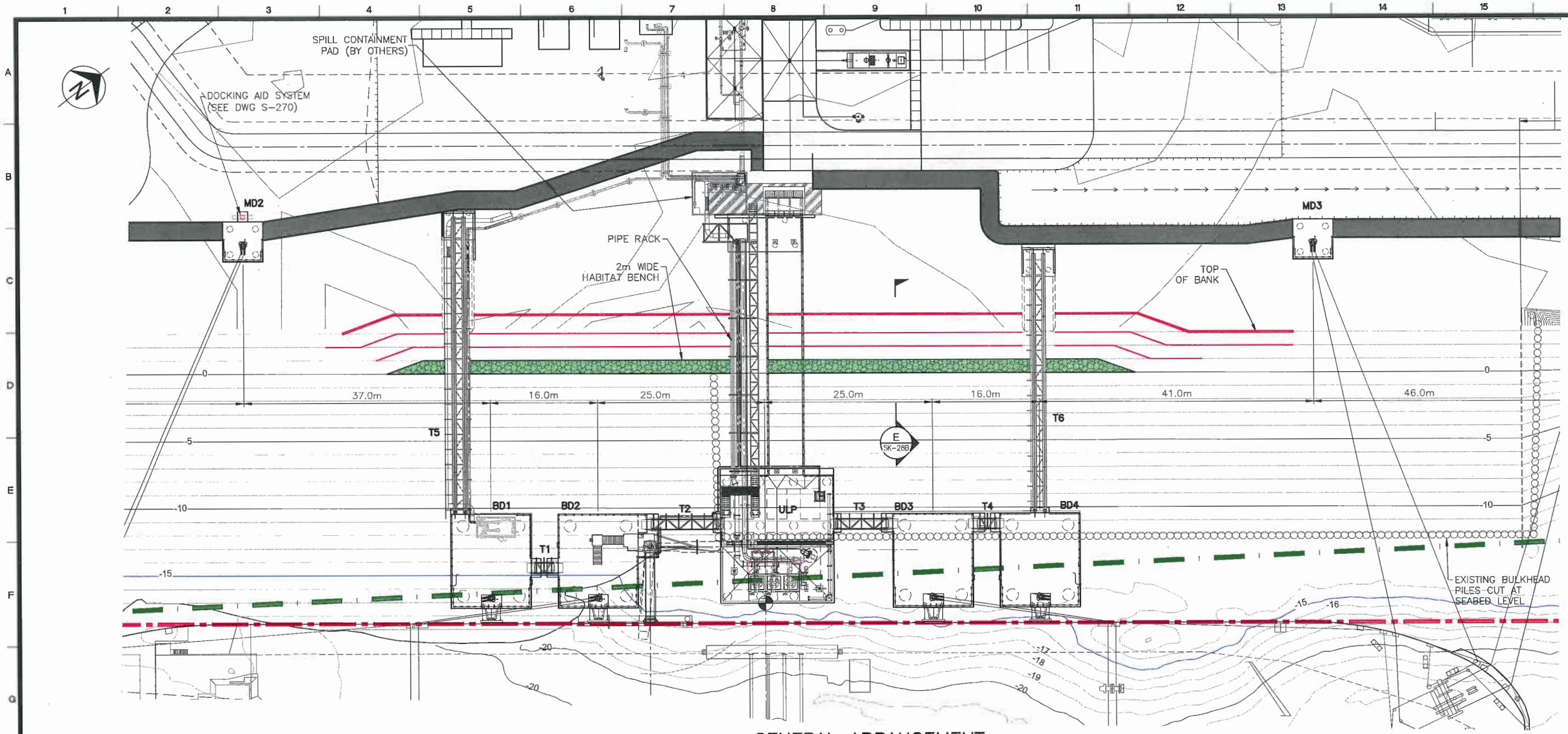
Scale: 1:200
Date: December 2017
Development Permit No: DE-16-741741
Building Permit No:
Project Number: 2014-280

Dwg
L3.03

FEB 28 2018

DP 16-741741

Plan #26



GENERAL ARRANGEMENT

1:300

NOTES:

1. CONTOURS ARE BASED ON GEODETIC DATUM.
2. SURVEY DATA BASED ON MATSON PECK & TOPLISS CAD FILE 17647-001-TPG-000.dwg. ANY COORDINATES SHOWN IN PLAN ARE LOCAL GROUND COORDINATES. TO COMPUTE UTM NAD83 (CSRS) GRID 4.0.0.BC.1 COORDINATES, ADD 5,440,000 TO NORTHINGS AND 490,000 TO EASTINGS, THEN MULTIPLY BY COMBINED SCALE FACTOR OF 0.99960272.

LEGEND:

- PROPERTY BOUNDARY
- BERTHING LINE
- MD MOORING DOLPHIN
- BD BREASTING DOLPHIN
- T CATWALK
- ULP UNLOADING PLATFORM

0 6 12 18 30m
1:300

ISSUE NO.	DRAWING REVISIONS	ISSUE DATE
B	ISSUED FOR DISCUSSION	JAN.03/2018
A	ISSUED FOR DISCUSSION	DEC.11/2017

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www.lfmgroup.ca
www.vancouverairportfuel.ca

VANCOUVER AIRPORT FUEL DELIVERY PROJECT
MARINE RECEIVING AREA
MARINE DESIGN PACKAGE
VANCOUVER AIRPORT FUEL FACILITIES CORPORATION
RICHMOND, BRITISH COLUMBIA

SEAL

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Overland Park, Kansas 66211
816.228.7500 FAX 816.228.7535
www.arguscansulting.com

PROJECT NO: 15004.22C	GENERAL ARRANGEMENT
DATE: 12/08/17	
DESIGNED BY: RB	
DRAWN BY: LL	
CHECKED BY: RB	DRAWING NO.: SK-28A
CAD FILE NAME: 15004.22C-SK-28A	

Plotted: P:\8338 VC Vancouver Airport Fuel Delivery Project\CADD_Active\15004.22C-SK-28A.dwg on 01/3/18 at 4:53 PM by LLU using Argus.stb

FEB 28 2018

ISSUED FOR CONSTRUCTION

DP 16-741741

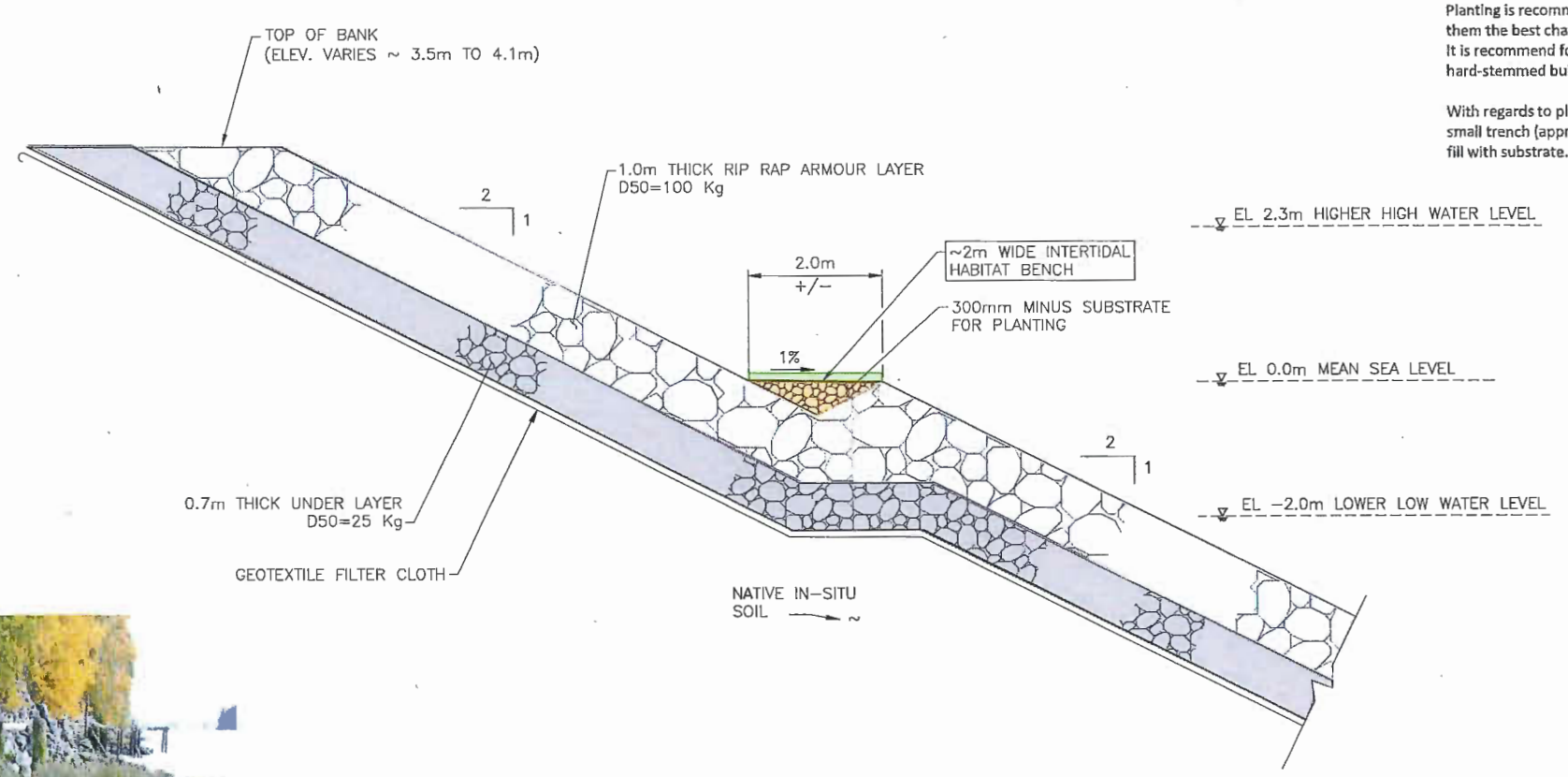
Plan #27

Intertidal Habitat Bench					
Common Name	**Botanical Name**	**% of Area**	**Number**	**Stock Size**	**Planting Density**
Baltic rush	*Juncus balticus*	60	360	Bare Root	3 plants per m^2
Lyngby's sedge	*Carex lyngbyei*	20	120	Bare Root	3 plants per m^2
Hard-stemmed bulrush	*Schoenoplectus acutus*	20	120	Bare Root	3 plants per m^2

Given the location of the salt wedge in this region it is recommended to go with species more typical of a brackish environment. Bare root, if available, will have the best chance to survive in this substrate over plugs (rhizomes will spread quicker). Baltic rush has proven success in this substrate; however, substitutions for the Lyngby's sedge and hard-stemmed bulrush, would be acceptable, if the nurseries are having difficulty sourcing them.

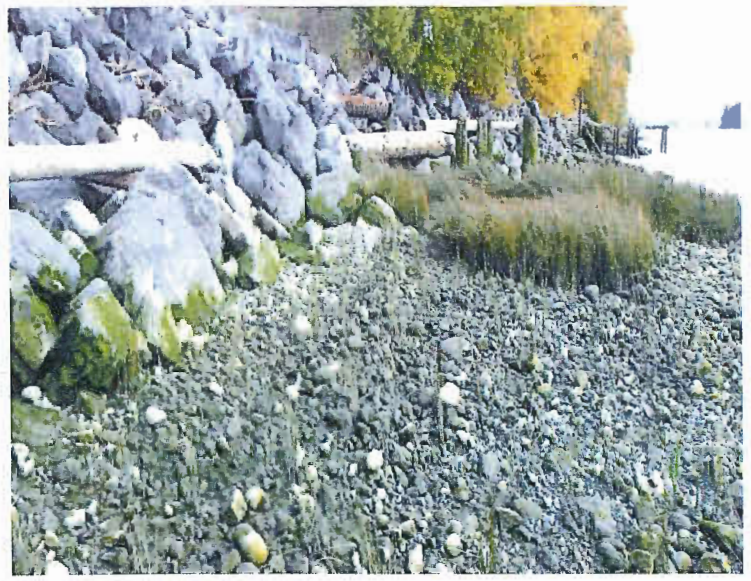
Planting is recommend in late fall or early winter when the bare root stock will be dormant, this will give them the best chance of survival and allow roots to become established in early spring prior to freshet. It is recommend focusing the Baltic rush on the waterward side of the bench and the Lyngby's sedge and hard-stemmed bulrush on the landward side of the bench.

With regards to planting procedures these will need to be installed by hand. Essentially you would dig a small trench (approximately 10 to 15 cm deep) and install the rhizome of each bare root stock and back fill with substrate.



E SECTION
SK-28A 1:50

Note: The placement of the intertidal bench marsh to be positioned closer to, or just below the mean annual high tide level (as outlined in the report by PGL Environmental Consultants dated February 8, 2018. DP Requirement.



THE FOLLOWING SPECIES WOULD BE SUITABLE FOR PLANING IN THIS AREA:
i. BALTIC RUSH (JUNCUS BALTICUS)
ii. LYNGBYE'S SEDGE (CAREX LYNGBYEI)
iii. HARD STEMMED BULLRUSH (SCHOENOPLECTUS ACUTUS)

0 1 2 3 5m
1:50

ISSUE NO.	DRAWING REVISIONS	ISSUE DATE
A	ISSUED FOR DISCUSSION	DEC.11/2017

VAFFC / Vancouver Airport
Fuel Facilities Corporation
A PSPIB GROUP OF FUNDS JOINT VENTURE
FSM MANAGEMENT GROUP
108-12300 Horseshoe Way
Richmond, BC, V7A 4Z1
604-271-7113
www.fsmgroup.ca
www.vancouverairportfuel.ca

VANCOUVER AIRPORT FUEL DELIVERY PROJECT
MARINE RECEIVING AREA
MARINE DESIGN PACKAGE
VANCOUVER AIRPORT FUEL FACILITIES CORPORATION
RICHMOND, BRITISH COLUMBIA

SEAL

moffatt & nichol
777 WEST BROADWAY, STE 301
VANCOUVER, BC CANADA V5Z 4J7
604-707-9004

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PROJECT NO:	15004.22C
DATE:	12/08/17
DESIGNED BY:	RB
DRAWN BY:	LL
CHECKED BY:	RB
CAD FILE NAME:	15004.22C-SK-28B

SECTION THROUGH INTERTIDAL HABITAT BENCH

DRAWING NO.: SK-28B

ISSUED FOR CONSTRUCTION
DP 16-741741
FEB 28 2018

PLEASE RECYCLE

Plotted: P:\8338 VC Vancouver Airport Fuel Delivery Project\CADD_Active\15004.22C-SK-28B.dwg on 12/11/17 at 10:24 AM by LLU using Argus.stb

Plan #28

Habitat Balance Sheet for the Marine Terminal Site Development.

Location	Habitat (m^2)				Comments
Habitat Impact Summary					
Marine Terminal Property	**Existing**	**Post-construction**	**Net Change**	**Enhancement Area**	
Shoreline ESA	208.0	1046	+837	+1046	Existing ESA is an area of fill and gravel, and largely barren. Two young trees and one small marginal habitat patch containing native red alder and black cottonwood saplings with an understory of invasive shrubs and herbs will be lost to development. A 5.1:1 compensation for this loss will be achieved by enhancing Shoreline ESA in the SW (350 m^2) and NE corner (696 m^2) of the property and adjacent to the property (see below). Overall, 88% of ESA enhancement works would be onsite.
Intertidal ESA	Refer to comments				Green-coded low productivity habitat. Replacing the existing 3,256 m^2 wharf structure with clean, stable erosion bank protection (armour) that will restore approximately 36,000 m^3 of open river flow environment and provide approximately 3,800 m^3 of new, artificial 'reef' habitat aimed to provide micro-refugia for aquatic flora and fauna. Upgrading concrete rubble rip-rap on either side of the existing wharf footprint will improve stability and quality of substrate refugia over 4,400 m^3 (total of 8,000 m^3 at base of slope along marine terminal property). Refer to Hatfield memo dated October 31, 2017 for additional information. In response to the DP Panel comments of November 29th, 2017, 200m2 of intertidal planting has been added.
Williams Road RMA	176.3	413.2	+236.9	+413.2	These RMAs are degraded by invasive species and dust generated by the high volume of Ecowaste truck traffic. Only the trees are native and these will not be eliminated by the development. Although there is no defensible ecological rationale for it, 2.2:1 habitat compensation is proposed, by removing the existing fences to restore the full 5 m width of each RMA, and by regrading the sites and replacing invasive shrubs and herbs with native vegetation. Overall, 82% of RMA enhancement works would be onsite.
Savage Road RMA (inferred)	95.0	387.6	+292.6	+387.6	
Upland Habitat	0.0	1210.0	+1210.0	+1210.0	Upland habitat is being added to the triangle area north of the CN ROW, to address comments of the November 29, 2017, DP Panel. This habitat is contiguous with the Williams Road RMA and will help improve the functionality of the RMA and the effectiveness of the local Ecological Network.
Proposed Habitat Compensation					
Adjacent to Property					
Shoreline ESA	N/A	N/A	N/A	+144.6	To further compensate for marginal habitat loss from the marine terminal property Shoreline ESA, invasive plants southwest of the property, by some red-coded intertidal habitat, would be replaced with native plants.
Williams Road RMA	50.7	50.7	0	50.7	A portion of the RMAs are beyond the property boundary, which would thus involve limited offsite enhancement work (11% for Williams Road RMA; 25% for Savage Road RMA).
Savage Road RMA (inferred)	129.0	129.0	0	129.0	
Upland Habitat	N/A	N/A	N/A	+110.1	A portion of the CN ROW in the Williams Road RMA would be compensated for by replacing invasive species with native ones between the Savage Road RMA and Shoreline ESA, as a contribution to the local Ecological Network (the remaining 72 m^2 of the ROW compensation area was shifted to the onsite Shoreline ESA).
Gains and Losses					
Terrestrial Habitat				+3,491 m^2	5.7:1 habitat enhancement in Shoreline ESAs for a 208 m^2 onsite shoreline disturbance and a portion of the Williams RMA overlapping with the CN ROW (53% on site). Approximately 2:1 habitat compensation and enhancement to RMAs (54% on site). A total of 1,320 m^2 of upland vegetation was added alongside these local ESAs.
Aquatic Habitat				+3,800.0 m^3	Improvements to Intertidal ESA by replacing vertical steel-pile wharf with clean, stable erosion protection of Fraser River shoreline and secondary artificial reef for brackish environments.

Revision 02 Feb. 2018
Table updated with latest Hatfield information

This schedule is reprinted from the
ESA and RMA Environmental Impacts Report
by
Hatfield Environmental Consultants

02 Feb. 2018 Development Permit Application Resubmission - DPP Comments
18 Dec. 2017 Development Permit Application Resubmission - DPP Comments
31 Oct. 2017 Development Permit Application Resubmission - ADP Comments

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landscape architects
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Vancouver, BC, Canada
V6R 2H9
t. 604-222-9200
e. dvo@telus.net
w. damonoriente.ca

Project
VAFFC MARINE TERMINAL FACILITY
15040 Williams Road, Richmond BC

Drawing
HABITAT BALANCE

Issue:

Scale: nts
Date:
Project Number: 2014-280

Dwg
L0.04

Plan #29

City of Richmond

Development Permit

No. DP 16-741741

To the Holder:	VANCOUVER AIRPORT FUEL FACILITIES CORPORATION (VAFFC)
Property Address:	15040 WILLIAMS ROAD
Address:	C/O FSM MANAGEMENT GROUP INC. 108-12300 HORSESHOE WAY RICHMOND, BC V7A 4Z1

1. This Development Permit is issued subject to compliance with all of the Bylaws of the City applicable thereto, except as specifically varied or supplemented by this Permit.
2. This Development Permit applies to and only to those lands shown cross-hatched on the attached Schedule "A" and any and all buildings, structures and other development thereon.
3. Subject to Section 692 of the Local Government Act, R.S.B.C.: buildings and structures; off-street parking and loading facilities; roads and parking areas; and landscaping and screening shall be constructed generally in accordance with Plans #1 to #29 attached hereto.
4. Sanitary sewers, water, drainage, highways, street lighting, underground wiring, and sidewalks, shall be provided as required.
5. As a condition of the issuance of this Permit, the City is holding the security in the amount of $428,253.65 (including, on-site ESA/RMA $87,329.00, on-site Trail and Buffer Strip $146,674.00, On-site Trail Slope landscaping $65,678.50, three years of maintenance $81,720.00, three years of monitoring $7,920.00 and a 10% contingency $38,932.15) to ensure that development is carried out in accordance with the terms and conditions of this Permit. An additional security in the amount of $38,224.00 covering five years of adaptive management / detailed success monitoring plan implementation with annual reporting by a Qualified Environmental Professional (QEP) is held by the City to ensure monitoring of the intertidal bench marsh. Should any interest be earned upon the security, it shall accrue to the Holder if the security is returned. The condition of the posting of the security is that should the Holder fail to carry out the development hereby authorized, according to the terms and conditions of this Permit within the time provided, the City may use the security to carry out the work by its servants, agents or contractors, and any surplus shall be paid over to the Holder. Should the Holder carry out the development permitted by this permit within the time set out herein, the security shall be returned to the Holder. The City may retain the security for up to three years after inspection of the completed landscaping in order to ensure that plant material has survived.
6. If the Holder does not commence the construction permitted by this Permit within 24 months of the date of this Permit, this Permit shall lapse and the security shall be returned in full.

Development Permit
No. DP 2016-741741

To the Holder:	VANCOUVER AIRPORT FUEL FACILITIES CORPORATION (VAFFC)
Property Address:	15040 WILLIAMS ROAD
Address:	C/O FSM MANAGEMENT GROUP INC. 108-12300 HORSESHOE WAY RICHMOND, BC V7A 4Z1

7. The land described herein shall be developed generally in accordance with the terms and conditions and provisions of this Permit and any plans and specifications attached to this Permit which shall form a part hereof.

   This Permit is not a Building Permit.

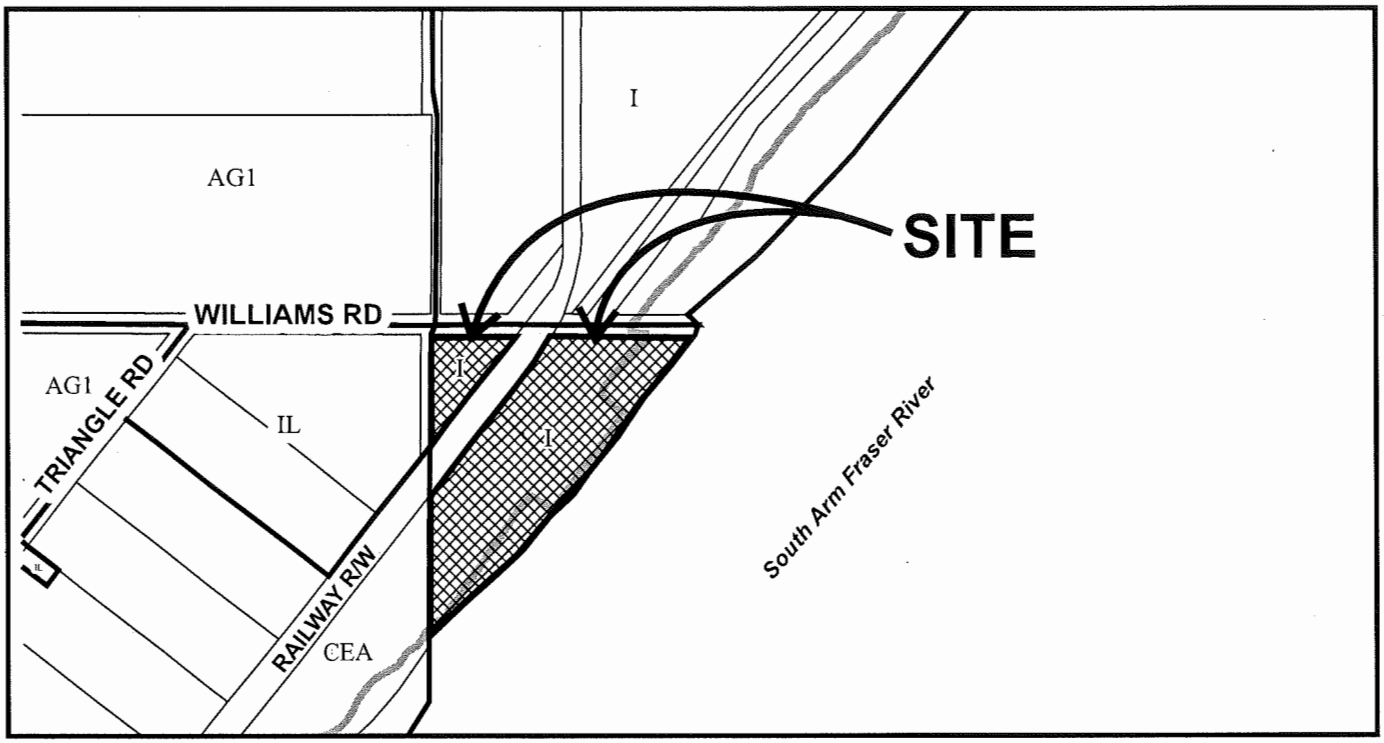
AUTHORIZING RESOLUTION NO. ISSUED BY THE COUNCIL THE DAY OF , .

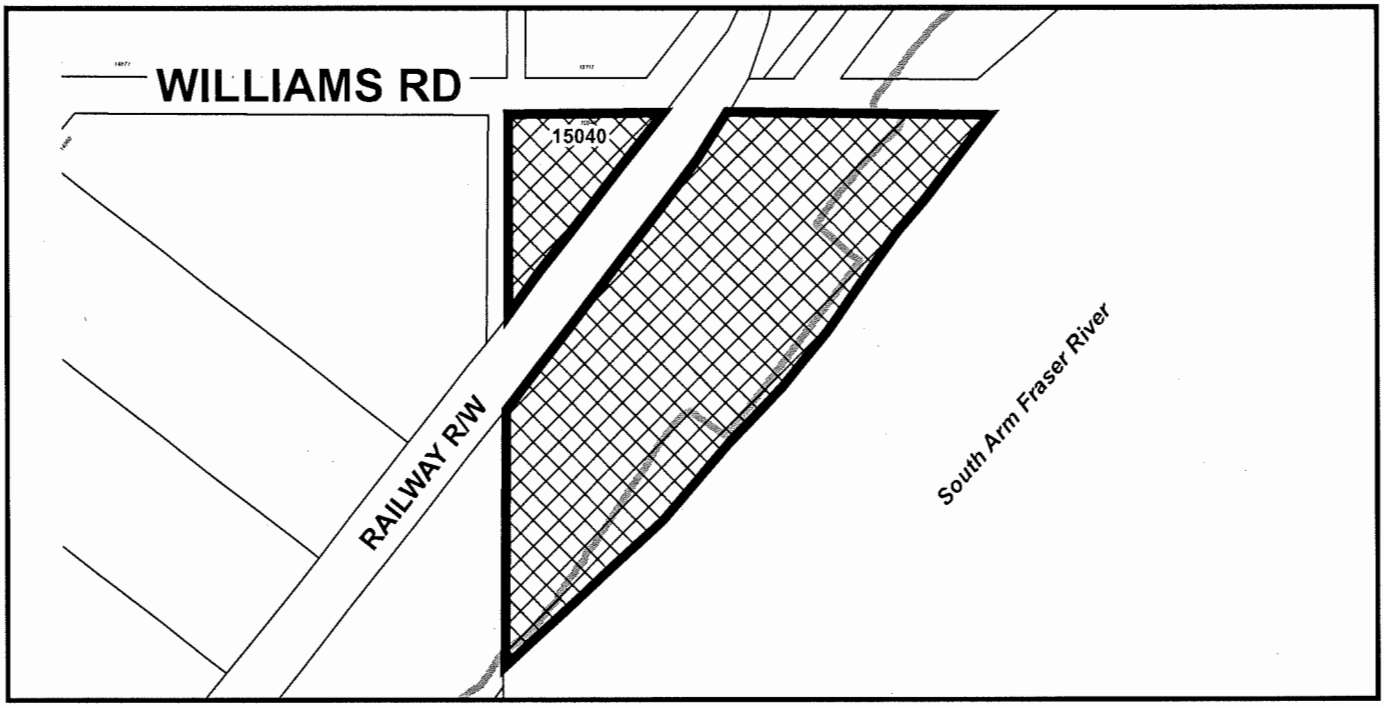
DELIVERED THIS DAY OF , .

_____

MAYOR

City of
Richmond





DP 16-741741
SCHEDULE "A"

Original Date: 08/22/16

Revision Date:

Note: Dimensions are in METRES