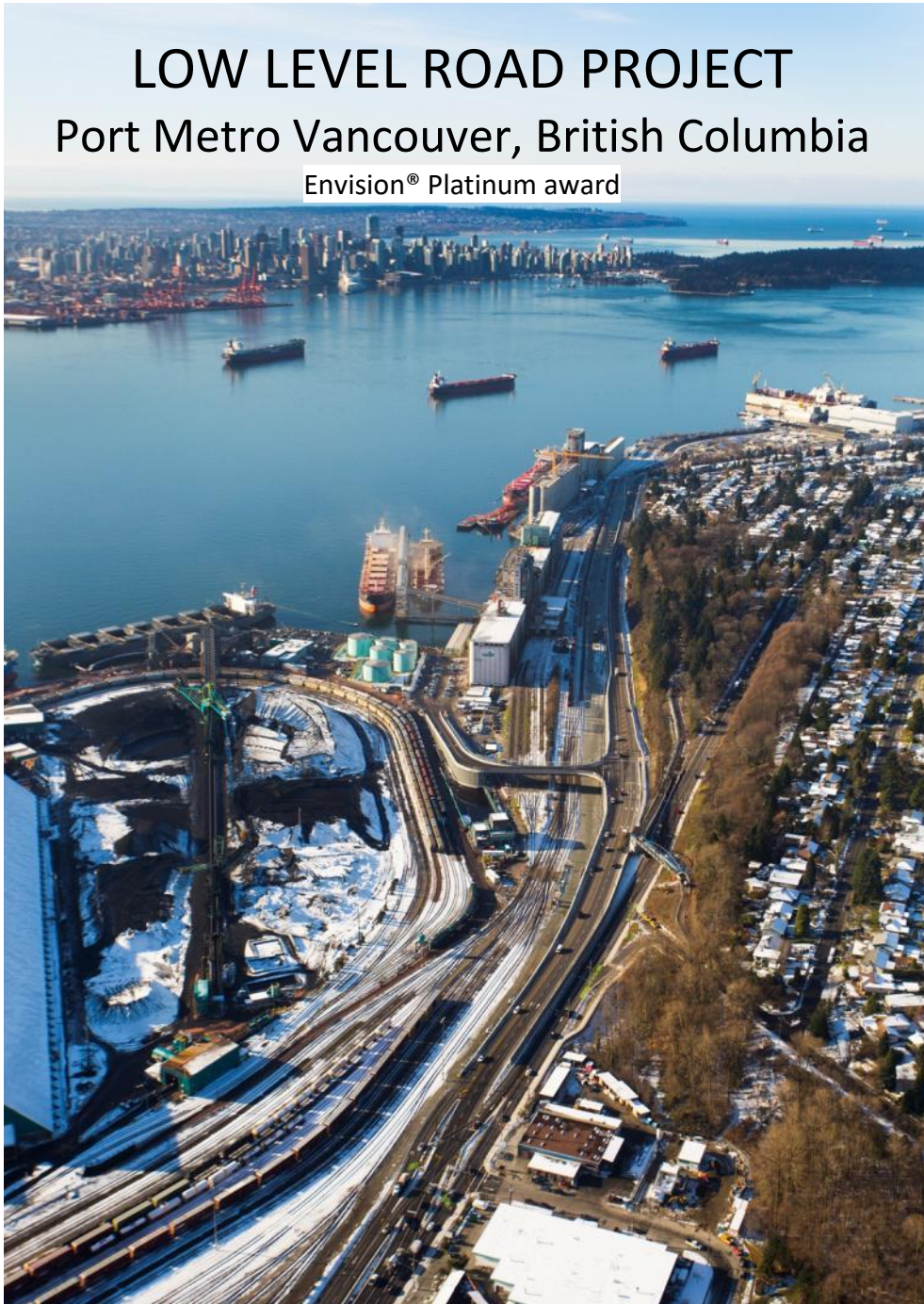


NOVEMBER 2016

LOW LEVEL ROAD PROJECT

Port Metro Vancouver, British Columbia

Envision® Platinum award



ZOFNASS PROGRAM
FOR SUSTAINABLE INFRASTRUCTURE

 Graduate School of Design
Harvard University

TABLE OF CONTENTS

1. OVERVIEW.....	3
1.1 Project History and Context	3
1.2 Project Scope	4
2. PROJECT DESCRIPTION.....	5
2.1 Project Team and Funding.....	5
2.2 Planning Process.....	6
2.3 Project Components	8
2.4 Project Challenges	9
2.5 Project Benefits	10
3. APPLICATION OF ENVISION®	10
3.1 Process.....	10
3.2 Meeting the Criteria	10
3.2.1 Quality of Life (Purpose – Well-being – Community)	11
3.2.2 Leadership (Collaboration – Management – Planning)	12
3.2.3 Resource Allocation (Materials – Energy – Water).....	13
3.2.4 Natural World (Siting – Land and Water – Biodiversity).....	13
3.2.5 Climate and Risk (Emissions – Resilience)	14
4. CONCLUSION.....	14
EXHIBITS.....	16
Exhibit A: Port Metro Vancouver.....	16
Exhibit B: Timeline and Schedule	16
Exhibit C: Project Data Sheet.....	17
Exhibit D: Envision Scoring Table.....	17
Exhibit E: Abbreviations.....	18

Eleonora Marinou prepared this case study under the supervision of Prof. Spiro N. Pollalis as the basis for class discussion rather than to illustrate either effective or ineffective handling of an administrative situation or a project. It is part of a series of case studies on projects having received Envision® certifications.

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1. OVERVIEW

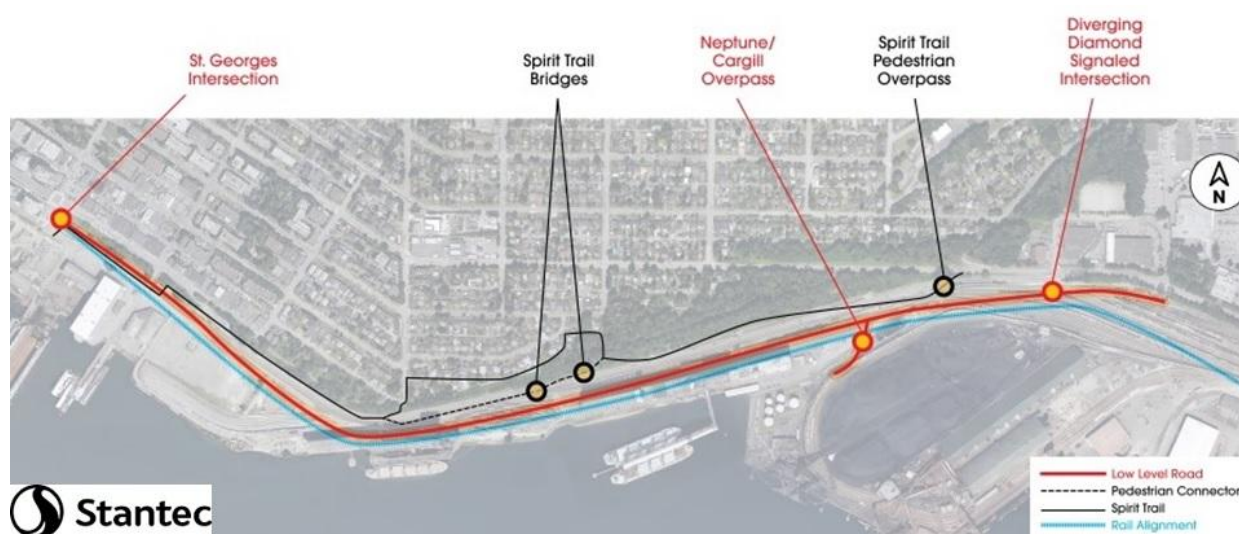


Fig. 1. Key map of the project (Source: Stantec)

1.1 Project History and Context

The sustainable report 2014 of Port Metro Vancouver (hereafter the Port) states: “Our mandate, as outlined in the Canada Marine Act, is to support the competitiveness, growth and prosperity of the Canadian economy while providing a high level of safety, protecting the environment and responding to local needs and priorities.” Toward these ends and prompted by the increasing need for more capacity along the north shore of Burrard Inlet, the Port began negotiations for the Low Level Road (LLR) project. The Port did not have the necessary land to expand and build two more rail lines that were needed to move more products from and to the port, and expansion was not possible without impacting the existing Low Level Road that bordered port lands to the north of the rail lines. Low Level Road has been an issue of much debate in the City of North Vancouver due to the historical safety concerns associated with the hillside slope that compromises the stability not only of the road but also of the residential area above. The Port proposed to the City of North Vancouver that it give the extra land that the Port needed and in return the Port would deliver a new, improved Low Level Road that addressed the slope stability challenges.

The LLR project is a key component of the North Shore Trade Area initiative, a broader investment in the area on behalf of the Government of Canada, the Province of British Columbia, Port Metro Vancouver, TransLink, the City of North Vancouver, the District of North Vancouver, Canadian Pacific Railway, Canadian National Railway, and the private sector. The North Shore Trade Area covers seven cargo terminals and industrial activities along the north shore of Burrard Inlet. It is an important export gateway toward Asia and the Pacific that supports 5,000 jobs and contributes more than CAN\$10 million in municipal taxes each year and CAN\$7.9 billion annually to British Columbia’s gross domestic product.¹ The LLR project has increased the international competitiveness of the area by improving the efficiency of port operations, while addressing long-standing community needs.

¹ <http://www.portmetrovancouver.com/news-and-media/news/low-level-road-project-approved-for-construction/>

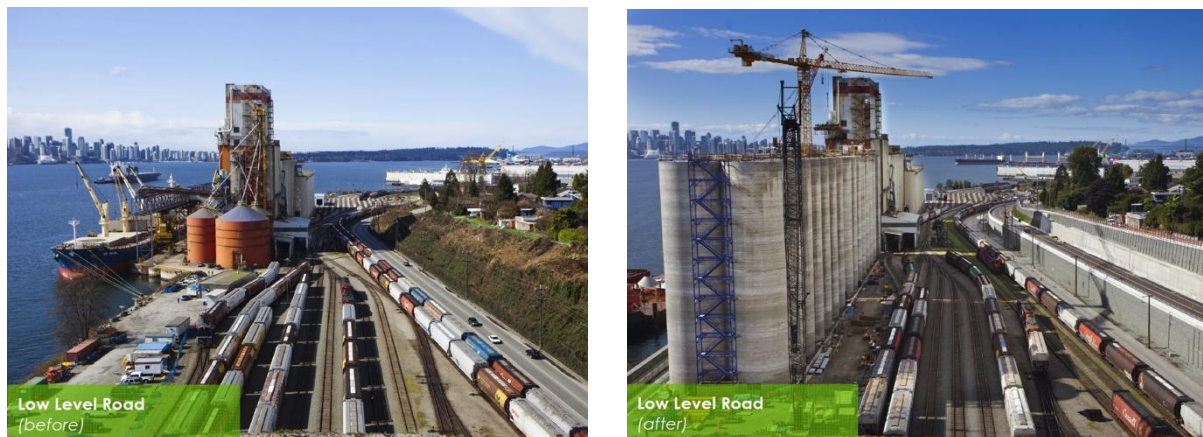


Fig. 2. Before (left) and after (right) site photos (Source: PMV)

The prior configuration for Low Level Road was substandard. In addition to the slope stability challenges, there were insufficient lanes to accommodate traffic for the port's and city's future growth, an absence of medians and traffic islands with no significant signaling in case of traffic congestion, sharp turning movements, short acceleration lanes, multiple unsignalized intersections, and few parking spaces for local business operations. The pedestrian connectivity was poor, with few sidewalks, insufficient crossings, poor illumination, and steep slopes, with an increased slipping hazard. The four existing cycle lanes were not wide enough or with enough shoulder width and were disconnected from each other. The railway and its multiple at-grade intersections with vehicles, pedestrians, and cycles were causing safety issues. The signaling in these crossings was inadequate, while noise pollution and poor air quality characterized the area.



Fig. 3. Site map of existing conditions showing key design areas during project consultation with members of the community and stakeholders (Source: PMV)

1.2 Project Scope

The project's primary objective was to increase port operations capacity while addressing safety and traffic challenges along the heavily used east-west LLR corridor. From the Port's point of view, the design had to provide safe and efficient access for trucks and users in and out of the port, as well as increased rail capacity. For the City, the project was part of a greater long-term vision for the transportation infrastructure components of the area. And for the local residents, the project had to address their concerns around noise, safety, and views.

After the completion of this project, the capacity of the new railway track would be enough to accommodate a 10,000-foot-long train, while the rail, vehicle, and pedestrian movements along the corridor were separated, with different-grade crossings that make it safer and easier to travel along

this very busy corridor and to enter or leave the port. At the same time, the redesigned LLR functions as a buffer between the port and the residential area, a bypass for the community, and a connector for the greater region. Lastly, with the completion of the Spirit Trail for active transportation users, the City's vision for a multi-use greenway has begun to be realized.



Fig. 4. Aerial view of the project (Source: PMV)

2. PROJECT DESCRIPTION

2.1 Project Team and Funding

The project started with an initiative from Port Metro Vancouver, a non-profit Federal organization. The Port does not receive tax support from municipalities. It administers money received from renting the Federal land it owns, receives general revenue from the Federal Government, and invests it back into infrastructure projects. In the LLR project the Port partnered with the City of North Vancouver and Translink; community involvement and consultation also gave crucial input throughout the project's design and construction phases. Stantec Consulting, Ltd. was the principal design consultant on the project, with B&B Heavy Civil Construction as the times and materials (T&M) contractor. The Port contracted MMM Group as the construction manager (CMA).

The total cost of the project was CAN\$101.6 million. The principal funding partners of the project were the Government of Canada with CAN\$49.4 million and Port Metro Vancouver with CAN\$31.6 million. The rest of the funding came from the Canadian National Railway with CAN\$10 million, Translink with CAN\$5 million, the Canadian Pacific Railway with CAN\$4.8 million, and the City of North Vancouver

with CAN\$800,000. The government funding was to expire in 2015, and the project was intended to be delivered by December 2015.

2.2 Planning Process

The planning process started in 2008. The study identified two infrastructure improvements needed in the area that were directly related to the site. One was an LLR realignment to create space for two additional rail tracks, and the second involved a grade separation overpass that would provide safe vehicle and pedestrian access to the port while eliminating three existing at-grade railway crossings. Based on the growing need for more rail network capacity with the two extra rail tracks, the Port decided to combine the two projects. A consultant was chosen to develop and deliver the design. His team did not go through a proper public consultation process, however. When the design proposal was completed, it was presented to the community as the final solution rather than a basis for discussion. As a result, the residents were irritated and complained to the City Council. In June 2011 the design was presented to the City of North Vancouver, but as it was not supported by residents, it was rejected by the City Council, despite its commercial urgency.²

In fall of 2011, the Port acknowledged the City's objections and decided to re-strategize the project approach in order to incorporate a more robust stakeholder consultation program that would offer synergies with the detailed design process. Following a competitive proposal submission for a new consultant, Stantec Consulting was awarded the contract for a new design with the dual objective of meeting both the Port's and the City's requirements. Working with local residents and port terminal operators, Stantec developed an updated design reflecting community inputs and fit to the surroundings, which was approved by the public in 2012.

An important factor for the second design was the engagement of the public throughout the process. "Port Metro Vancouver and the City of North Vancouver have consulted extensively with stakeholders and the community to develop the preferred design through a series of open houses and workshops, and a comprehensive online web forum. Hundreds of people participated at the events and more than 1,300 people visited the online web forum."³ According to Cozmin Radu, "The collaboration with the public was not easy, but it was the only way to succeed." The public gave significant input. A characteristic example that he describes had to do with the noise-absorbent barriers along the road. The project team believed that the 14 m elevation difference between the road and railway and the residential area was enough and that the noise would not disturb the residents. Nevertheless, a resident, an acoustic engineer by profession, insisted that the noise would be reflected by the retaining walls and bounce back from the facilities of the Port into the residential area. "The resident was right and we installed the noise barriers," says Radu.

The engagement of the public was also strengthened through the addition of public art on the 14 m high retaining walls. The team involved the local First Nations⁴ community for this. Two art pieces were commissioned; the drawing that was selected depicts the story of life. The piece of art is 500 m long and consists of panels 10 m tall, 4 m wide, and 2 inches thick, without steel structure. The Port

² See item #3 in the City of North Vancouver council minutes:

<http://cnvapps.cnv.org/minutearchive/Minutes/2011%2006%2013%20Regular%20Council%20Meeting%20Minutes.pdf>

³ <http://www.portmetrovancouver.com/news-and-media/news/low-level-road-project-approved-for-construction/>

⁴ A term that came into common usage in the 1970s to replace the word "Indian," which some people found offensive. Although the term First Nation is widely used, no legal definition of it exists. Among its uses, the term "First Nations peoples" refers to the Indian peoples in Canada, both Status and non-Status. Some Indian peoples have also adopted the term "First Nation" to replace the word "band" in the name of their community. For more information: <https://www.aadnc-aandc.gc.ca/eng/1307460755710/1307460872523>

also hired⁵ the services of the Inlailawatash Forestry Limited Partnership, a business established by the local Tsleil-Waututh First Nation in 2004. Inlailawatash staff were hired to support the completion of the Archaeological Overview Assessment as well as for the Establishment Maintenance Services required for initial planting and maintenance of the landscaping aspects of the project.

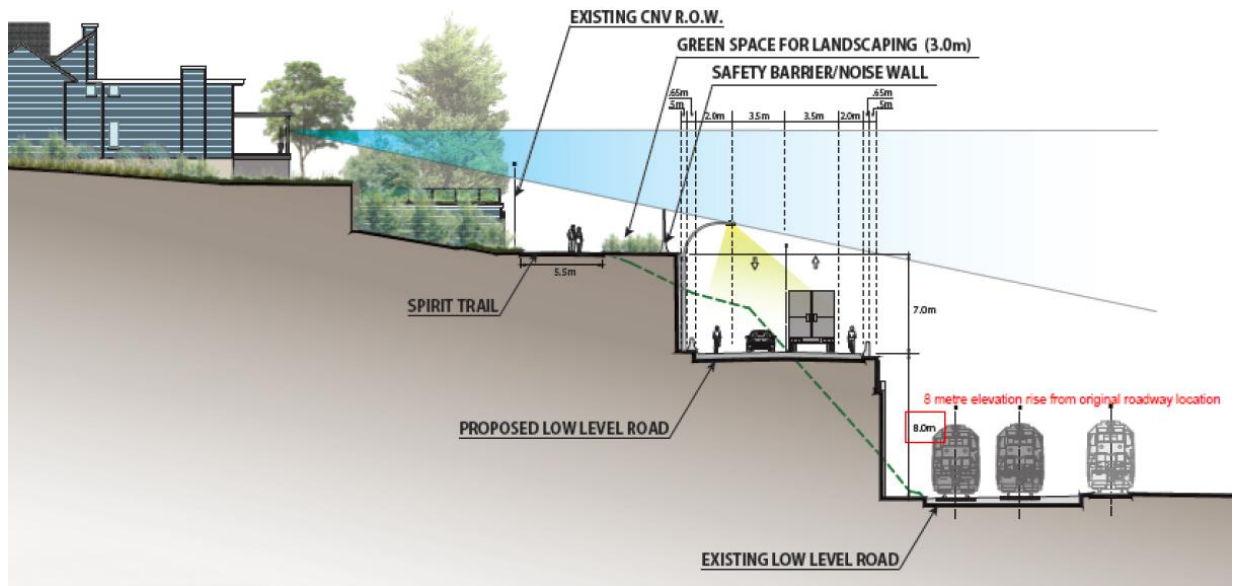


Fig. 5. LLR project section (Stantec)



Fig. 6. Driving on the east part of LLR (Stantec)



Fig. 7. Driving on the west part of LLR (Stantec)

⁵ The Port maintains an Aboriginal Business Directory which they use to identify First Nations firms with appropriate skill sets to employ in support of Port development projects. First Nations communities have typically suffered from higher levels of poverty and depressed economic opportunity. The Port's policy to promote First Nations employment is a strong commitment to supporting skills development and overall opportunity in these communities.



Fig. 8. Aerial views of the overpass at the Neptune/Cargill terminal entrance (Source: PMV)



Fig. 9. LLR typical road section (Stantec)

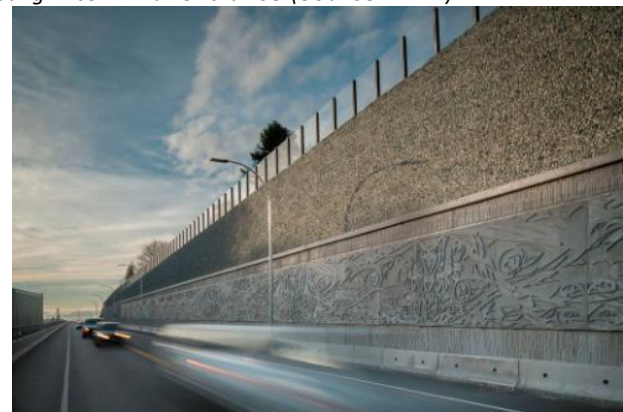


Fig. 10. LLR artwork on retaining walls (Stantec)

2.3 Project Components

The LLR project forms part of Port Metro Vancouver's broader investment in the North Shore Trade Area. The project comprised 2.2 km of roadway improvements that included the realignment and elevation. At some points, the new road is 14 m above its previous alignment between St. Georges Avenue and 3rd Street East. It also added efficient lighting. The project also included replacing the existing at-grade road-rail crossing that provided access to the Neptune and Cargill terminals with a new overpass that separates traffic and pedestrians from the rail tracks, as well as reconfiguring three at-grade intersections. The project includes a 4 m wide pedestrian steel tied-arch bridge crossing 3rd Street East, 5 km of cyclist lanes, and an addition of over 2 km to the multi-use Spirit Trail from St. Georges Avenue to Kennard Avenue, with new pedestrian connections. The Spirit Trail work also featured slope improvements, a 15 m span timber beam bridge with staircases, and a 56 m suspension bridge built along the rustic footpath portion of the Spirit Trail alignment. The project also built 4 km of new rail corridors, over 35,000 sqm of retaining walls, and over 1 km of noise-absorbent walls. Large areas covered with invasive species along the road and Spirit Trail were also revegetated with native vegetation.



Fig. 11. LLR at-grade crossing with E 3rd Street looking east (Google)



Fig. 12. LLR at-grade crossing with E 3rd Street looking west (Stantec)



Fig. 13. Pedestrian overpass at E 3rd Street (Stantec)

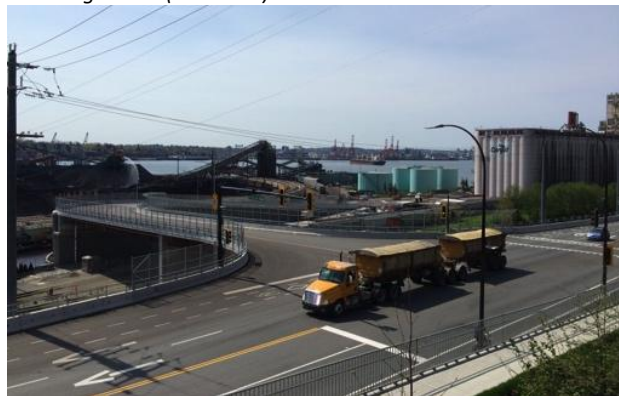


Fig. 14. View from the east of the new overpass at Neptune/Cargill terminal entrance (Stantec)



Fig. 15. Suspension Spirit Trail bridge (Stantec)



Fig. 16. Spirit Trail timber structures (Stantec)

2.4 Project Challenges

The key challenges of this project, as Kip Skabar, Structural Civil Engineer of Stantec, points out, had to do with safety concerns related to the interaction of the project’s users: vehicles, pedestrians, cyclists, and the railway. Other challenges were the existing poor drainage system that had to be upgraded, utility relocations and upgrades, two creeks inside Moodyville Park that had to be crossed, serious geotechnical issues with an unstable slope downhill of the residential area, and poor soil conditions in the vicinity of the Neptune/Cargill Overpass. Finally, during construction all existing roads and connections had to be kept open, and the impact of noise and dust from the construction site on the adjacent residential area had to be minimized. Among the most critical challenges was the involvement of the public and getting the public’s support to the project.

2.5 *Project Benefits*

The new strategic LLR infrastructure project is a major milestone for the Port's and the community's future. For the Port the project enhances rail and port operations by adding cargo capacity through the increased mainline rail and rail yard capacity, while longer trains can now approach the area. The road connections to the industries adjacent to the rail tracks are also improved, as is emergency access for police, fire department, and ambulances.

The LLR is also beneficial to the residents of the surrounding community. It reduces congestion on the local road network, increases safety, and improves quality of life as it addresses recreation, cycling, and the stability of the slope. At the same time, the economic sector of the City will benefit as well. British Columbia expects the North Shore terminals to create 5,000 additional jobs.⁶ With the expansion of the port facilities, the provincial and municipal tax revenues will increase, while the national forestry, mining, and agriculture sectors will be able to export more products. Finally, one of the most important benefits for the locals is the reduction of noise pollution from train whistles and shunting, which have been reduced with the elimination of at-grade crossings of vehicular traffic.

3. APPLICATION OF ENVISION®

3.1 *Process*

When the project started in 2008, the project team was not aware of the Envision® Rating System. In the course of the project, Stantec's Envision Sustainability Professionals approached the design team to introduce them to Envision® and the potential benefits for the client in pursuing certification. The Port recognized the opportunity, and after Stantec completed an assessment of the project, the Port decided to proceed with registration and compiling the documentation to pursue certification. The Envision process was not an additional cost to the project and started when the project was already under construction. "Despite Envision coming in late in the process, it was valuable to benchmark and validate our efforts against the Envision criteria – and finally to celebrate all the effort and commitment from all involved in making LLR a success," said Radu. "Most of the Port developments are taking place right at the interface between industrial and residential areas. An EIA [Environmental Impact Assessment] was enough to inform the City Council but not the residents as well. The Port was looking for a more comprehensive tool than the EIA. Envision landed so well and became the Green Infrastructure Guidelines for Port Metro Vancouver, as it does not deal only with the environmental component but it has a wider perspective."

3.2 *Meeting the Criteria*

The Institute for Sustainable Infrastructure (ISI) offers the Envision® sustainable infrastructure rating system, which measures the sustainability of infrastructure projects based on 60 criteria organized in five areas: Quality of Life (QL), Leadership (LD), Natural World (NW), Resource Allocation (RA), and Climate and Risk (CR). The overall credits measure the positive social, economic, and environmental impacts of an infrastructure project in the community. The tool is applied in the planning, design, construction, and maintenance stages.

⁶ <http://www.stantec.com/our-work/projects/canada-projects/low-level-road.html#.VufcmZyLSUK>

LLR received a total of 56% of the applicable Envision® credits and was awarded the Platinum Award. It was the first transportation infrastructure project to receive an ISI Envision®-verified award. For Radu, “the LLR project received the Platinum Award mainly because of the public involvement in the planning process. The only way to move the project forward was to get the public’s support. Numerous public consultation workshops and open houses led to a successful sustainable project.” According to ISI President and CEO William Bertera, “Port Metro Vancouver’s realigned Low Level Road project improves community mobility, enhances the availability of active transportation options, improves community safety and mitigates threats from unstable slopes and seismic risks. The road project’s design team also contributed to sustainable infrastructure through economic development and stability in the local community.”⁷ The project scored high in the categories of QL (78%), LD (61%), and CR (66%), whereas it scored lower in the RA (21%) and NW (54%) categories (Exhibit D). Taking a conservative approach, the project team did not pursue any innovation credits.

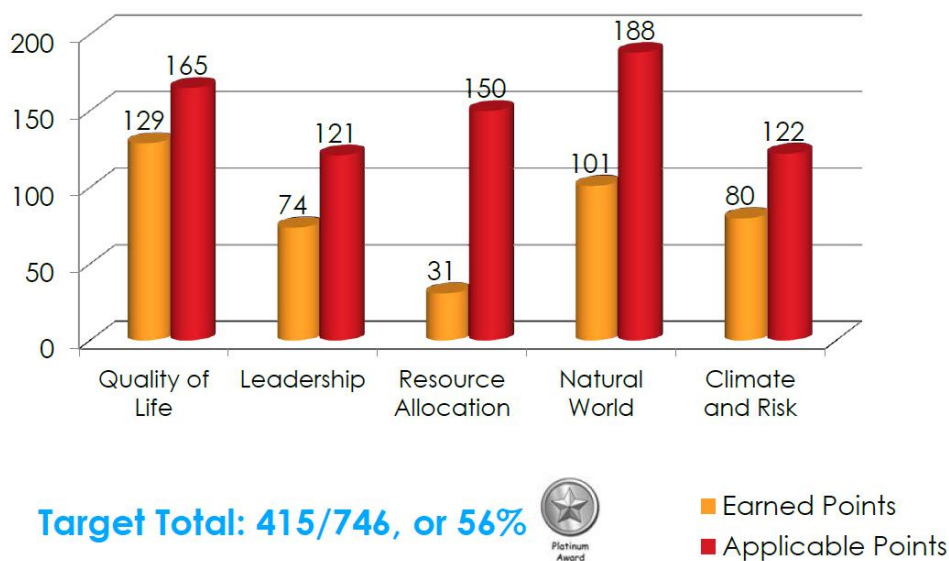


Fig. 17. Envision performance summary (Source: Stantec)

3.2.1 Quality of Life (Purpose – Well-being – Community)

The Quality of Life highlights include the development of the project through a partnership among a broad group of stakeholders and community leaders, including the Government of Canada, Port of Metro Vancouver, Canadian National Railway, Translink, Canadian Pacific Railway, port terminals, the City of North Vancouver, and other partners. A holistic stakeholder engagement program was established during the design process to ensure that the final design appropriately reflected community needs and priorities.⁸ Numerous endorsements, impact assessments, direct engagement opportunities through the PortTalk.ca website, as well as the Community Liaison Committee that was convened by the City and the Port, all led to a Restorative score that confirmed the project’s commitment to improving the community’s quality of life. The project also stimulated sustainable growth and development by enhancing community productivity and efficiency, offering essential and high-quality employment opportunities locally. 224 work-years were created during the LLR project design and construction. All the employees that worked for this project were locals. The Port maintained an Aboriginal Business Directory and committed to work with and train local First Nations-

⁷ <http://www.stantec.com/about-us/news/2015/port-metro-vancouver-llr-earns-isls-envision-platinum-award.html#.Vuqkp5yLSUk>
⁸ <http://www.stantec.com/about-us/news/2015/port-metro-vancouver-llr-earns-isls-envision-platinum-award.html#.Vuqkp5yLSUk>

owned firms. The economic benefits generated by the Port terminals are also expected to rise with the project's completion. The project is expected to support an additional 5,000 direct and indirect jobs as a result of infrastructure improvements, from 25,996 direct and indirect jobs and CAN\$1.68 billion in GDP in 2007, to 30,823 direct and indirect jobs and CAN\$2 billion in GDP by 2020.⁹

A key feature of the project that contributed to quality of life was the development of additional pedestrian and cycling facilities with the extension of the regional Spirit Trail. The reduction of noise was also very important for local residents. Everything from the retaining walls, the angles, the plants, and the noise screens that were introduced in the Noise Impact Assessment and finally used in the project demonstrate the commitment of the project team to solving this problem. The project reduced the overall noise levels, monitored them throughout the construction process, and will continue the monitoring even during the project's operation. Light pollution was also taken into consideration in the LLR project. The location of poles and the type of lighting used were carefully chosen to minimize space and reduce light pollution in the area. The community's access to transportation was enhanced by expanding rail, road, and trail networks, after extensive consultation with local business owners and residents and the production of a Traffic Impact Assessment and a Traffic Management Plan. With the completion of the project, the public has access to multimodal facilities. The installation of TransLink bus stops, the upgrading of existing parking facilities, and the new and safe cycle and pedestrian paths encourage the public to use alternative modes of transportation. Safety was also a huge concern. A three-stage safety audit was conducted by the project team in the preliminary design, the detailed design, and post-construction project phases. The final study was important for confirming that all necessary and planned measures had been implemented. Intuitive signage, road realignment, improved lane markings, and the use of the RainLine safety system were some of the safety improvements of the project.

In the Community subcategory, the project pursued two out of the three available credits. The project conducted tried to relocate existing cultural assets whereas preserved cultural resources with the addition of First Nations public art on the retaining walls. In order to preserve the views, which were very important for the residents, the team trimmed the vegetation accordingly, used a transparent and easily cleaned material for the noise walls, lowered the road elevation to preserve resident sightlines of the waterfront, and used lighting that ensured illumination toward the road and not the residences.

3.2.2 Leadership (Collaboration – Management – Planning)

In the Leadership Category, the Low Level Road project rated highest in effective leadership and commitment, provision for stakeholder involvement, and improvement of infrastructure integration. The Port used an engagement framework based on the International Association of Public Participation core values and guidelines that was the rationale for selection of stakeholders.¹⁰ Implementation of environmental and Corporate Social Responsibility (CSR) policies and participation in the Northwest Ports Clean Air Strategy, Eco Action program to incentivize use of efficient and less polluting fuels, Sustainable Gateway Initiative, and Port 2050 Scenario Planning Initiative were key elements of the approach. A sustainability management system was also established based on the Port's robust corporate-level policies. The project team also engaged with local residents, local businesses, First Nations communities, Port tenants and partners, CN Rail and CP Rail, the City of

⁹ <http://www.stantec.com/about-us/news/2015/port-metro-vancouver-llr-earns-isls-envision-platinum-award.html#.Vugkp5yLSUk>

¹⁰ <http://www.stantec.com/about-us/news/2015/port-metro-vancouver-llr-earns-isls-envision-platinum-award.html#.Vugkp5yLSUk>

North Vancouver, and TransLink.¹¹ Stakeholder involvement was provided through an extensive and frequent engagement program; the PortTalk website documented concerns and design responses.

Infrastructure integration was accomplished through the improvement of existing community-wide roads, rail, and pathways. Their design was influenced by the community feedback and finally became part of a greater national strategy for improving the efficiency of Canadian transportation systems.

Maintenance is taken over by the City of North Vancouver. Full-time environmental and noise monitoring provides weekly reports that help the City better maintain the project's components. The City has also budgeted \$26,000 per km of the Spirit Trail per year to support maintenance requirements, and TransLink provides funding support to the City for roadway maintenance. Finally, after a value engineering study and a one-day workshop that discussed potential cost-saving measures and possible design changes, 40.5 million construction costs were saved.

3.2.3 Resource Allocation (Materials – Energy – Water)

Although the project could have scored more points in the Resource Allocation category for its use of recycled materials and reduction of energy and water use, the team preferred not to pursue these credits.¹² In this category only four credits were finally pursued, and two others were found not applicable. The project scored high in the credit for use of renewable energy. Over 90% of energy generated in British Columbia comes from hydroelectric and biomass sources. LED streetlight fixtures are also used in the project, leading to 42% annual energy reductions.

The multifaceted project, involving the road, the retaining walls, the rail tracks, the overpass, and the pedestrian trail and bridges, made all-encompassing documentation complicated. In addition, LLR had already reached the highest overall Envision® recognition with 57% of the applicable credits, and the additional efforts and cost of pursuing further credits were deemed not necessary. It should be noted, however, that according to Stantec, approximately 95% of components used on the project were either reused or recycled materials. This was largely due to reuse of native soil materials upon the verification of their cleanness and the recommendation of Stantec's geotechnical engineering team during the value engineering analysis phase of the design work.¹³

3.2.4 Natural World (Siting – Land and Water – Biodiversity)¹⁴

The project rated high in the Natural World category in terms of prime habitat and species biodiversity. Pacific yew trees and bald eagle habitat on the site are of high ecological value that had the potential of being impacted. The Port hired eagle experts with the Hancock Wildlife Foundation to provide recommendations on how to minimize project impacts on the birds' health and well-being. During construction of the Spirit Trail, an environmental monitor and fencing were in place to ensure that the eagle nesting site was not disturbed. Scheduling of construction activities was significantly changed to accommodate bird nesting season, and the overall design scheme was developed to minimize/avoid impacts around the sensitive areas on site. The project also included the installation of two artificial nesting sites for eagles. In addition, 12 yew trees were identified, which have cultural value to the First Nations Communities and are native to British Columbia, and these were not

¹¹ <http://www.stantec.com/about-us/news/2015/port-metro-vancouver-llr-earns-isls-envision-platinum-award.html#.Vuqkp5yLSUk>

¹² <http://www.stantec.com/about-us/news/2015/port-metro-vancouver-llr-earns-isls-envision-platinum-award.html#.Vuqkp5yLSUk>

¹³ <http://www.stantec.com/about-us/news/2015/port-metro-vancouver-llr-earns-isls-envision-platinum-award.html#.Vuqkp5yLSUk>

¹⁴ <http://www.stantec.com/about-us/news/2015/port-metro-vancouver-llr-earns-isls-envision-platinum-award.html#.Vuqkp5yLSUk>

impacted by the development of the Low Level Road project. The areas adjacent to the road and trail were revegetated with native vegetation, and invasive species were removed.

3.2.5 Climate and Risk (Emissions – Resilience)

In the Climate and Risk category, the project received high scores through the reduction of air pollutant emissions, assessment of climate threat, avoidance of traps and vulnerabilities, and adequate preparation for long-term adaptability. By aligning the development of the design for the project with the principles of the city's adaptation plan, the design effectively prepares for expected climate change risks and impacts that were identified in the Climate Change Adaptation Plan completed by the City of North Vancouver in 2013. The previous road and rail alignment presented a significant configuration trap for users including the local community. The project addresses these vulnerabilities through realignment of the roadway up the slope to a higher elevation above the 200-year projected sea-level rise, improvements to the rail facilities, completion of mechanically stabilized earth (MSE) retaining walls in a cost-efficient method, and the extension of the Spirit Trail including the installation of two pedestrian bridges.¹⁵

The project team conducted an Air Quality Study and prepared an Air Quality Management Plan in order to have specific guidelines for the design. As a result, idling is now limited to 3 minutes or less and frequent changes in grade are minimized.

4. CONCLUSION

The westbound lane of the LLR opened in August 2014, marking a significant milestone, while the opening of the eastbound lane came in October 2014. Today fully complete, the new roadway offers wider bike lanes, green walls, public art, and improved safety by separating rail and vehicle movements. The LLR project managed to construct a major road, meeting the neighboring community's needs. It contributed to the overall economy of the area and created sustainable modes of transportation for cyclists, pedestrians, and transit. An important sustainable characteristic was that the new road and its components eliminated three at-grade crossings that were unsafe and problematic by delivering two new, grade-separated crossings, one for vehicles and rail and one for pedestrians. "Today the community is incredibly happy," says Radu. "During construction there were complaints about noise and dust, but soon the situation got better. Today, everyone from the community proudly refers to the Spirit Trail and its components as 'our trail, our pedestrian path and our suspension bridge.'"

Neal Cormack, Stantec's Managing Principal, Transportation BC, said: "On this multifaceted project our team realigned the roadways to accommodate rail expansion and increase safety, while securing the road's slopes and bridge structures to enhance resiliency, protecting against sea level rise and seismic threats."¹⁶

According to Marty Janowitz, Vice President & Practice Leader of Stantec, "One of the lessons learned through this project's Envision process was that we have the framework and we have the evaluation;

¹⁵ <http://www.stantec.com/about-us/news/2015/port-metro-vancouver-llr-earns-isis-envision-platinum-award.html#.Vuqkp5yLSUk>

¹⁶ <http://www.portmetrovancouver.com/news-and-media/news/port-metro-vancouver-low-level-road-project-first-transportation-project-to-receive-isis-envision-sustainable-infrastructure-platinum-award/>

what we haven't had was an implementation methodology, how to take a project from the moment of inception and bring it through the process with the client and the team so that it can be done coherently."



Fig. 18. Envision Award ceremony (Source: www.portmetrovancover.com)

Left to right: Neal Cormack, Managing Principal, Transportation, BC, Stantec; William Bertera, President and CEO, Institute for Sustainable Infrastructure; Cliff Stewart, Vice President Infrastructure, Port Metro Vancouver; David Duncan, Regional Leader, BC, Stantec

EXHIBITS

Exhibit A: Port Metro Vancouver¹⁷

Port Metro Vancouver is Canada’s largest port and the third largest port by tonnage in North America, responsible for Canada’s trade with more than 160 world economies. Located in a naturally beautiful setting on Canada’s west coast, Port Metro Vancouver is responsible for the efficient and reliable movement of goods and passengers, and integrates environmental, social, and economic sustainability initiatives into all areas of port operations. Port Metro Vancouver is committed to meaningful engagement with the communities in which it operates and the shared obligation to improve the quality of life for Canadians. Enabling the trade of approximately CAN\$187 billion in goods annually, the port generates an estimated 100,000 jobs, CAN\$6.1 billion in wages, and CAN\$9.7 billion in GDP across Canada. As a non-shareholder, financially self-sufficient corporation established by the Government of Canada, Port Metro Vancouver operates pursuant to the Canada Marine Act and is accountable to the Minister of Transport of the elected Federal Government.

Exhibit B: Timeline and Schedule

- 2008 _____ Planning process started
- 2010 _____ Preliminary design completed
- June 2011 _____ Design presented to the City of North Vancouver and rejected
- 2011 _____ Second design phase completed and approved
- May 2013 _____ Construction phase started
- Dec 2014 _____ Project completed

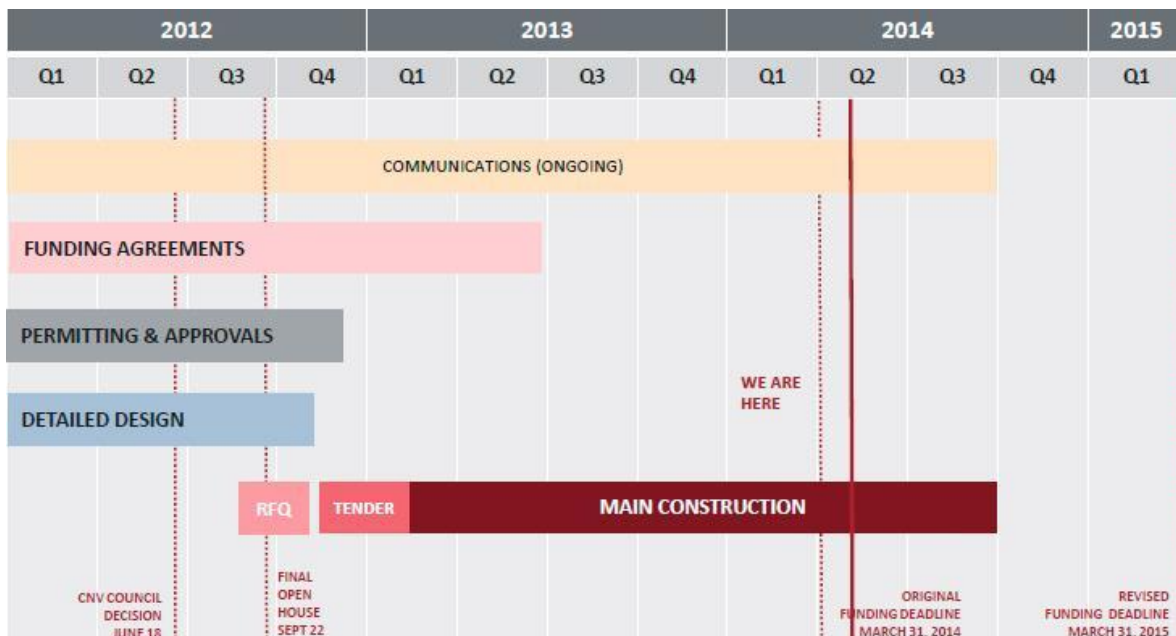


Fig. 18. LLR project schedule
 (Source: <http://www.portmetrovancover.com/wp-content/uploads/2015/05/2014-04-17-llr-project-status-update-1.pdf>)

¹⁷ <http://www.stantec.com/about-us/news/2015/port-metro-vancouver-llr-earns-isls-envision-platinum-award.html#.Vugkp5yLSUk>

Exhibit C: Project Data Sheet

PROJECT ORGANIZATION

Owner: City of North Vancouver (LLP & Spirit Trail) & Port Metro Vancouver (Cargill-Neptune overpass)

Lead: Port of Metro Vancouver

Contractor: B&B Heavy Civil Construction Ltd. (T&M contract)

CMa: MMM Group

Technical design: Stantec Consulting Ltd.

Project cost: CAN\$101.6 million

Road realignment: 2.5 km

Retaining walls: 35,000 sqm

New Spirit Trail: 1.6 km

FUNDING PARTNERS

Federal Government (Asia-Pacific Gateway & Corridor Initiative, AGPCI): CAN\$49.4 million

Port Metro Vancouver: CAN\$31.6 million

Canadian National Railway: CAN\$10 million

TransLink: CAN\$5 million

Canadian Pacific Railway: CAN\$4.8 million

City of North Vancouver: CAN\$800,000

PROJECT AWARDS

Bill Curtis Award (Transportation Project of the Year) for 2015

ACEC-BC People’s Choice Award 2015

ACEC-BC-Award of Merit in the Transportation and Bridges Category

APEGBC Peak of Excellence Award

Exhibit D: Envision Scoring Table

	Subcategory	Credit	Points	Points Awarded	Level of achievement
LOW LEVEL ROAD PROJECT					
QUALITY OF LIFE	PURPOSE	QL1.1 Improve community quality of life	25	25	Restorative
		QL1.2 Stimulate sustainable growth and development	16	13	Conserving
		QL1.3 Develop local skills and capabilities	15	12	Conserving
	WELLBEING	QL2.1 Enhance public health and safety	0	0	Excluded
		QL2.2 Minimize noise and vibration	11	11	Restorative
		QL2.3 Minimize light pollution	11	8	Conserving
		QL2.4 Improve community mobility and access	14	14	Conserving
		QL2.5 Encourage alternative modes of transportation	15	12	Conserving
		QL2.6 Improve site accessibility, safety and way finding	15	12	Conserving
	COMMUNITY	QL3.1 Preserve historic and cultural resources	16	13	Conserving
QL3.2 Preserve views and local character		14	3	Enhanced	
QL3.3 Enhance public space		13	6	Superior	
Innovation	QL0.0 Innovatice credit	8	0	None	
LEADERSHIP	COLLABORATION	LD1.1 Provide effective leadership and commitment	17	17	Conserving
		LD1.2 Establish a sustainability management system	14	4	Enhanced
		LD1.3 Foster collaboration and teamwork	15	0	None
		LD1.4 Provide for stakeholder involvement	14	14	Conserving
	MANAGEMENT	LD2.1 Pursue by-product synergy opportunities	12	1	Improved
		LD2.2 Improve infrastructure integration	13	16	Restorative
	PLANNING	LD3.1 Plan for long-term monitoring and maintenance	10	10	Conserving
		LD3.2 Address conflicting regulations and policies	8	0	None

RESOURCE ALLOCATION		LD3.3 Extend useful life	12	12	Conserving
	Innovation	LD0.0 Innovatice credit	6	0	None
	MATERIALS	RA1.1 Reduce net embodied energy	18	0	None
		RA1.2 Support sustainable procurement practices	9	0	None
		RA1.3 Use recycled materials	14	0	None
		RA1.4 Use regional materials	10	6	Enhanced
		RA1.5 Divert waste from landfills	11	0	None
		RA1.6 Reduce excavated materials taken off site	6	2	Improved
		RA1.7 Provide for deconstruction and recycling	12	0	None
	ENERGY	RA2.1 Reduce energy consumption	18	7	Enhanced
		RA2.2 Use renewable energy	20	16	Conserving
		RA2.3 Commission and monitor energy systems	11	0	None
	WATER	RA3.1 Protect fresh water availability	21	0	None
RA3.2 Reduce potable water consumption		0	0	Excluded	
RA3.3 Monitor water systems		0	0	Excluded	
Innovation	RA0.0 Innovatice credit	9	0	None	
NATURAL WORLD	SITING	NW1.1 Preserve prime habitat	18	14	Conserving
		NW1.2 Protect wetlands and surface water	18	18	Conserving
		NW1.3 Preserve prime farmland	0	0	Restorative
		NW1.4 Avoid adverse geology	5	3	Superior
		NW1.5 Preserve floodplain functions	14	2	Improved
		NW1.6 Avoid unsuitable development on steep slopes	6	4	Superior
		NW1.7 Preserve greenfields	23	23	Restorative
	LAND & WATER	NW2.1 Manage stormwater	21	0	None
		NW2.2 Reduce pesticide and fertilizer impacts	9	9	Conserving
		NW2.3 Prevent surface and groundwater contamination	18	4	Enhanced
	BIODIVERSITY	NW3.1 Preserve species biodiversity	16	13	Conserving
		NW3.2 Control invasive species	11	11	Restorative
		NW3.3 Restore disturbed soils	10	0	None
		NW3.4 Maintain wetland and surface water functions	19	0	None
Innovation	NW0.0 Innovatice credit	8	0	None	
CLIMATE AND RISK	EMISSIONS	CR1.1 Reduce greenhouse gas emissions	25	0	None
		CR1.2 Reduce air pollutant emissions	15	12	Conserving
	RESILIENCE	CR2.1 Assess climate threat	15	15	Conserving
		CR2.2 Avoid traps and vulnerabilities	20	20	Restorative
		CR2.3 Prepare for long-term adaptability	20	16	Conserving
		CR2.4 Prepare for short-term hazards	21	17	Conserving
		CR2.5 Manage heat islands effects	6	0	None
Innovation	CR0.0 Innovatice credit	5	0	None	

Exhibit E: Abbreviations

- CR** _____ Climate and Risk
- Envision™** _____ Envision™ Rating System for Sustainable Infrastructure
- ENV SP** _____ Envision™ Sustainability Professional
- ISI** _____ Institute for Sustainable Infrastructure
- LD** _____ Leadership
- NW** _____ Natural World
- QL** _____ Quality of Life
- RA** _____ Resource Allocation
- LLR** _____ Low Level Road
- Port** _____ Port Metro Vancouver
- T&M contract** _____ Time and materials contract