Port of Everett
Dolphin Berth Improvements

Submitted to
Port of Everett
Everett, Washington
Envision Case Study

Port of Everett
Dolphin Berth Improvements

Submitted to
Port of Everett
Everett, Washington

30 January 2013

Submitted by
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| **Project name or title** | Dolphin Berth Improvements |

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| **Industry** | Shipping Terminals, Marinas, and Properties |
| **Number of employees** | 106 (as of 2013) |
| **Annual budget** | $56 million (as of 2013) |

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EXECUTIVE SUMMARY

To determine the level of sustainability achieved on a typical small capital improvement project, the Port of Everett (Port) tested Envision™, a new rating system for sustainable infrastructure. Envision was created by a joint collaboration of the Institute for Sustainable Infrastructure (ISI) and the Zofnass Program for Sustainable Infrastructure at the Harvard University Graduate School of Design. The ISI is a nonprofit organization founded by the American Council of Engineering Companies (ACEC), the American Public Works Association (APWA), and the American Society of Civil Engineers (ASCE). Its purpose is to establish a framework for evaluating infrastructure projects by emphasizing their overall contribution to a community through stakeholder engagement, cultural awareness, business sustainability, and environmental stewardship.

The dolphin berth improvement project was chosen because it represented a typical small industrial port project. Through this project, the Port will have the capacity for roll-on, roll-off operations. A minimal impact design strategy of integrating with an existing facility was chosen to reduce cost and environmental impacts. The strategy comprises installing a new breasting dolphin, repairing and upgrading an existing dolphin, and upgrading the existing fender system at South Terminal and removing creosote treated piles.

Overall, the project achieved 26.2 percent of the total applicable points. Results across Envision’s five categories are presented below.

- Quality of Life – 18.7 percent (of applicable points)
- Leadership – 18.4 percent
- Resource Allocation – 18.1 percent
- Natural World – 41.0 percent
- Climate and Risk – 36.1 percent

If the project was verified through the ISI’s 3rd party verification program, a Bronze Level of Recognition would be achieved. The project did score particularly well for a typical Port project, which can be attributed to the Port’s strong commitments to sustainability through environmental stewardship and community outreach. The results also highlight opportunities for the Port to improve its sustainability practices and score higher on future projects.

It is recommended that the following be pursued on future projects to increase the Port’s sustainable performance. These actions could result in achieving the silver or gold recognition levels on future projects.

1. Create a sustainability plan for the specific project and commit to goals at the conceptual level of the project. The plan should include a sustainability lead responsible for coordinating and documenting the project’s goals.

2. Track energy and emission performance through life cycle analysis at the early stages of the project; implement strategies to reduce project energy consumption and emissions. Benefits should also be explained in terms of life cycle costs.
3. Suggest meeting more stringent air quality standards, such as the California Ambient Air Quality Standards.

4. Report sustainability measures annually online.

5. Incorporate long-term commissioning and monitoring of water and energy systems.

6. Support sustainable procurement practices on construction projects by requiring contractors to purchase from suppliers who also have commitments to operating sustainably.

7. Reduce emissions by working with clients who call at the Port’s terminals to reduce energy consumption.

8. Conduct a climate change impact and risk assessment for the entire Port and implement mitigation strategies.

9. Improve the Port’s adaptability to short- and long-term hazards (i.e., storms, tsunamis, and earthquakes).
1.0 COMPANY PROFILE
Located just north of Seattle on Port Gardner Bay, the Port of Everett is a natural deep-water port that is an economic development driver for the City of Everett and greater region. Formed in 1918, the Port is one of the country’s closest seaports to Asia, is the third-largest container seaport in Washington, and has the largest public marina on the West Coast.

Business at the Port includes operating marine terminals and a public marina, leasing property, and managing public space. Currently, its marine terminals are used for trading containerized, break bulk and bulk goods, both domestically and abroad.

Each of the three Port Commissioners represents a Port district; together, these elected officials are responsible for policy-making and regulations and for managing 3,000 acres of property, including 900 developable acres. The Commission’s twice-monthly meetings are open to the public, and Commissioners often attend neighborhood meetings and other community gatherings.

2.0 CURRENT SUSTAINABILITY SITUATION
As part of embracing the principles of sustainability, the Port sought to measure the level of sustainability achieved by a typical Port project. The goal was to identify ways to enhance the level of sustainability involved in Port planning, development, and operations.

Many principles of sustainability are already woven into the Port’s organization and activities. For instance, the Commissioners are responsible for carrying out the Port’s mission of being an “Economic Development Enterprise carrying out the public’s trust to manage and develop resources, transportation facilities and supporting infrastructure to enable community opportunity.”

The Port is advancing environmental initiatives to improve air and water quality in the Puget Sound. As an active participant in the Puget Sound Maritime Air Forum, a collaboration of maritime organizations, regional air agencies, and other groups, the Port voluntarily quantifies its air emissions and develops strategies to reduce the impacts of the air pollution they generate. Some of these strategies include switching to electric gantry cranes, purchasing hybrid vehicles, and switching to low-sulfur emitting diesel fuel. The Port also employs low impact development strategies to collect and treat stormwater.

Along with its progressive policy of environmental stewardship, the Port has tracked sustainability measures since 2008 and publishes a report on the topic every three years. The Port also engages the community through a variety of outreach methods, including project outreach, publications, digital media, its open commission meeting policy, and by providing public access to the waterfront. This interest in public engagement is returned, for example, People for Puget Sound, a non-profit group of volunteers,
removes invasive plant species from Jetty Island, the Port’s man-made habitat and Union Slough, a salt-marsh restoration site.

In addition to improving the environment and engaging the community, the Port is an economic driver for the City of Everett and region. The Port is responsible for supporting more than 35,000 jobs (direct, induced, and indirect) and $4.2 billion in revenue in 2012. The Port consistently produces clean financial audits and received an excellent investment grade from Moody’s.

In short, as a leader and model for other ports in North America, the Port of Everett views measuring sustainability as it relates to planning, development, and operations as an essential part of a well-functioning infrastructure enterprise, and intends to find effective ways to implement sustainable strategies that will improve the quality of life in the region.

3.0 PROJECT DESCRIPTION

As an economic enterprise for the cities of Everett, Mukilteo, and broader region, the Port decided to pursue emerging cargo opportunities by increasing the operational capacity of the Port through roll-on roll-off operations. Instead of building a new wharf structure and facility, the Port looked for synergistic opportunities to integrate existing facilities and took a minimal impact approach to achieve its goals.

Originally designed as a log handling facility, the dolphin berth at the Port’s South Terminal can accommodate vessels up to 600 feet long with a maximum loaded displacement of approximately 44,000 long tons. To be capable of berthing vessels up to 860 feet long displacing a maximum of approximately 67,000 metric tons, the facility requires an upgrade that consists of these three major elements:

- Construct one new berthing dolphin
- Repair and upgrade an existing collision-damaged dolphin
- Removal of creosote treated piles
- Upgrade the fender system elements on all dolphin berth structures

The dolphin berth at South Terminal targeted for the upgrade is located in water depths sufficient for the new operations, and the location will not require dredging, thereby lessening the project impacts on the ecosystem.

The two existing dolphins will be removed, along with the existing 16 creosote-treated timber piles and rubber energy-absorbing elements that form the existing fender system for the concrete service platforms. The northern dolphin has suffered collision damage and, if it is to be used for the upgraded operations, must be repaired. The concrete platform on that dolphin will be removed and recycled as much as is practicable. The steel pipe piles that support the platform will be cut approximately three feet below the platform level. New sections of pipe pile will be welded to them along with a new platform which will be identical in size to the existing platform.
The new dolphin will be located between the north end of the South Terminal wharf and the service platform of the dolphin berth. It will be constructed by driving nine 24-inch, precast/prestressed, octagonal concrete piles then constructing a 225-square foot, 4-foot-deep, cast-in-place concrete platform on top of them at a deck elevation of +19 feet Mean Lower Low Water. This is well above the 100-year flood plain and anticipated 100-year sea-level rise elevation for the region.

Concrete elements were chosen because, when compared to galvanized steel pipe piles, they have a longer maintenance-free service life with lesser impacts to aquatic life. The new dolphin will be connected to the berth’s existing service roadway by a short, open-grated gangway, 4 feet wide and 12 feet long (48 square feet). The new dolphin’s fender system will use a large rubber unit fender and will be installed at all of the existing structures.

Design synergies were also implemented through the use of materials. Instances include replacing 25 percent of cement in concrete with one of two industrial process byproducts, either ground blast furnace slag or flyash which will result in reduced corrosion and an increase in reflection of heat.

3.1 Envision Rating Tool

Envision is a rating system for infrastructure projects developed under a joint collaboration between the Zofnass Program for Sustainable Infrastructure at the Harvard University Graduate School of Design and the Institute for Sustainable Infrastructure (ISI), a nonprofit organization founded by the American Council of Engineering Companies (ACEC), the American Public Works Association (APWA), and the American Society of Civil Engineers (ASCE). Envision offers a way to assess the sustainability of an infrastructure project by emphasizing its overall contribution to a community through stakeholder engagement, cultural awareness, business sustainability, and environmental stewardship.

When a project is rated highly according to the Envision rating system, recognition is conferred at one of four award levels: bronze, silver, gold, or platinum. The level is based on the percentage of the total points accumulated across five categories: quality of life, leadership, resource allocation, natural world, and climate and risk. Currently, the ISI has made available several assessment tools to use through the various stages of an infrastructure project.

For the conceptual stage of a project and for projects with smaller budgets, ISI has created a self-assessment checklist. It comprises a series of yes-or-no questions as well as a graph of the sustainability principles used (see Figure 1).
The second stage includes a more thorough and objective rating of the project. It comprises a tool for the preconstruction phase; and tools for the construction, operations, and maintenance phases that are under development. In this stage, a professional trained in the use of the Envision rating system, known as an Envision Sustainability Professional (ENV SP), is required to be an integral part of the project team. Throughout the course of the project the ENV SP guides the team to achieve its sustainability goals, coordinates with other team members to document the project’s sustainability achievements, registers the project through the ISI for recognition, and corresponds with the ISI until recognition is received.

Stages 3 and 4 are rating tools for complex, multi-stage projects and support tools for optimization and, according to the ISI, are under development.

### 3.2 Registration, Verification, and Recognition

The registration and verification process begins when the ENV SP registers the project through the ISI website, pays the registration fee, and downloads the necessary documentation to substantiate the level of achievement for each credit. A third-party Verifier, or a team of Verifiers (depending on the size and complexity of the project), is assigned to the project. The Verifier holds an hour-long teleconference with the ENV SP and project team to review the project and verification process. The Verifier is available during the assessment process for questions on Envision as it relates to documentation for the project and interpreting levels of achievement within the credits.

When the assessment by the ENV SP has been completed and all the necessary documentation has been uploaded, the project team enters the verification stage when they notify ISI and pay the verification fee based on the constructed value of the project.
(between 0.02% - 0.4% of the engineer’s estimate depending on size and complexity). The assigned Verifier will begin to assess the submitted documentation. Upon completion of the Verifier’s assessment, notes and comments will be provided to the project team. The Verifier states what level of achievement can be substantiated for each credit and what further information is required (if any) to substantiate the desired level. The interim score is given and the ISI is notified.

The next step is authentication in which an ISI Authenticator confirms the Verifier’s interim score. If the Authenticator’s score differs from the Verifier’s, a notice is sent to the project team asking for further documentation. Once this process is complete, the Authenticator notifies all the parties involved of the project score. The project team can accept the score or file an appeal.

Recognition is the final step. The level of achievement depends on the total percentage of points attained, as well as the percentage of points attained in each category.

Figure 2. ISI Verification Process

3.3 Results and Discussion

This section reports the results of the analysis using Envision to determine strengths and weaknesses of the project in terms of sustainability. After each Envision category, suggestions for attaining more points within that category are provided. These are provided to highlight strategies of the Envision guidance manual.

The Envision rating tool contains five categories: quality of life, leadership, resource allocation, natural world, and climate and risk. Each category is divided into subcategories to address the project’s pathway and performance contributions: stakeholder engagement, cultural awareness, business sustainability, and environmental stewardship.

Pathway contribution is defined in the Envision Guidance Manual as considering “how the project aligns with overall community needs and enhances quality of life.” The goal for the project team is to integrate the project with existing infrastructure, work with the community to meet their needs, and promote responsible development. This is an important part of the rating system as infrastructure projects will have impacts (positive and negative) on the host and surrounding communities for generations. Making sure the scope of the project addresses the areas outlined above will reduce negative impacts.

Performance contribution is the efficiency with which the project accomplishes its goals by minimizing its impacts to the environment, improving the economy, and improving
the host community. The effectiveness of the project to improve sustainable performance and meet all of the projects intended goals are measured through various parameters including resource and energy conservation.

4.0 CATEGORICAL RESULTS

4.1 Quality of Life

The Quality of Life category assesses the impact of the dolphin berth improvement project on the well-being of the Everett community, its parent community. Among the metrics of the category is the compatibility of the project with community goals and its benefits in terms of sustainable business growth and development, local skills and capabilities, and enhancing public spaces. The category also examines individual wellbeing through effects such as noise reduction, the minimization of light pollution, and the promotion of alternative modes of transportation.

The Port, which consistently and constantly engages its community, informed the community about this project through the Port website, semi-annual neighborhood meetings, project permit processes and in public meetings of the Port Commission. Due to the small size of other projects the Port conducts, additional and more active methods of community outreach as referenced earlier are not warranted.

4.1.1 Category Breakdown

The dolphin berth improvement project achieved 18.7 percent of the total applicable points for Quality of Life. Nine of the 13 credits are applicable. This category is divided into three subsections: community, wellbeing, and purpose. The project scored 23.3 percent in community, 10.0 percent in wellbeing, and 21.4 percent of the applicable subcategory points in purpose (see Figure 3).

The Port’s two percent policy represented the highest level of achievement, superior, which came from credit QL3.3 – Enhance Public Space. Since 1988, two percent of every engineer’s estimate of Port capital improvement projects in the shoreline zone has been allocated to waterfront improvement projects and programs. So far, this policy has accounted for almost $4 million in enhancements to public access and public space – 31 percent of the Port’s public access funding. This work also helps create jobs and supports the local work force.
An enhanced or improved rating was achieved in all other credits except for QL2.2-Minimize Noise and Vibration and QL2.6 – Improved Site Accessibility, Safety, and Way Finding, where no added value was given because the scope of the project does not address these issues. In addition, no noise and vibration study has examined the noise levels of Port operations in surrounding neighborhoods.

4.1.2 Improvements
While the Port provides the community a transparent and open planning process for capital improvement projects, Envision awards points that go beyond permit requirements as well as municipal, state and federal regulations. These efforts may entail supplemental studies concerning noise, air quality, or purchasing environmentally friendly equipment, where applicable, yet all in support of the Quality of Life theme.

4.2 Leadership
The Leadership category assesses the extent to which project management collaborated within and with the regional system of infrastructure, incorporated stakeholder involvement, and developed a sustainability management system. The category assesses the sustainability commitments that have been made by the owner and project team and proposes taking a long-term view of the project throughout development to achieve higher levels of sustainability. The category also encourages setting sustainable goals early on in planning.

4.2.1 Category Breakdown
The dolphin berth improvement project achieved 18.4 percent of the applicable points for Leadership. The Leadership category is broken down into three subcategories: 18.2 percent of the planning, 18.8 percent of the management, and 18.3 percent of the collaboration subcategory points were achieved (see Figure 4). Two credits in this category, LD2.1 Pursue By-Product Synergy Options and LD3.2 Address Conflicting Regulations and Policies, did not apply. Large portions of the materials specified (i.e., concrete and steel) cannot be made with by-products available in the area and there were no conflicting regulations with the project. Recycled concrete was considered for use as a portion of the concrete aggregate; however, the material available in the area is not of a structural grade and is in low supply due to high demand for local roadway projects.

The highest level of achievement, enhanced, came from credits LD1.1 Provide Effective Leadership and Management, LD1.4 – Provide for Stakeholder Involvement, LD2.2 –
Enhance Infrastructure Integration, and LD3.3 Extend Useful Life. An improved rating was achieved in all other credits. The Port has publicly committed itself to sustainability. These commitments are seen in the robust Port environmental management system, wide-ranging community outreach programs, and longstanding Moody’s excellent bond rating. The Port tracks performance across all areas of sustainability yearly and reports the results triennially. The Port conserved resources for the dolphin berth improvement project by integrating it with an existing facility, which also increases operations efficiency. Although the project will be included in the Port’s monitoring and maintenance plan, long-term monitoring is not planned.

4.2.2 Improvements
To increase the project’s score in the Leadership category, the Port could look to reporting sustainability measures annually and creating long-term commissioning plans for projects. These actions will help the Port track and quantify its sustainability efforts with the goals of determining if a project is achieving its design goals throughout its life and looking for inefficiencies in electrical and mechanical systems.

4.3 Resource Allocation
The Resource Allocation category assesses the commitment of the owner and the project team to reducing consumption (in the form of net embodied energy) throughout the life cycle of the project. This reduction can be accomplished by (1) specifying regional and recycled materials to reduce the transportation of materials; (2) reducing the need to take excavated materials off site; (3) supporting sustainable procurement practices; (4) reducing energy consumption and using renewable energy; and (5) monitoring water and energy use.

High impact synergies were envisioned by requiring the use of flyash and slag in concrete mixes. The benefits of these materials are increased durability of reinforced concrete, an increase in the content of recycled material, and increasing reinforced concrete’s Solar Reflexivity Index (SRI). The substitution of these post-industrial byproducts improves concrete’s durability in the marine environment because the particles of slag and flyash are smaller than cement and decrease porosity. These substances extend service life because they act as interlocking agents to increase permeability, in turn preventing seawater from reaching the reinforcing steel and thus reducing corrosion. Potential increases in temperature at the surface of the platform are also mitigated because slag and flyash are lighter in color than concrete and reflect light and heat better.

The Port also looks for by-product synergies through its dredge operations. Instead of dumping as a first choice for dredge materials, the Port first uses them to expand wildlife habitat at Jetty Island, then finds projects within the lower Snohomish River corridor that may have a beneficial use for the material, with the remainder dumped at an approved offshore dump site. The Port has received recognition for this program, which is viewed as a model synergy for other port authorities.
4.3.1 Category Breakdown

The dolphin berth improvement project achieved 18.1 percent of the applicable points for Resource Allocation. RA1.5-Divert Waste from Landfills and RA2.2-Use Renewable did not apply because the operation of the project will not generate a significant waste stream and, with the exception of repairs due to damage, the constructed works are designed to be fairly maintenance-free for their design life. This category is broken down into three subcategories. Although 44.9 percent of the applicable points were achieved in Materials, no points were achieved in the Water and Energy subcategories (see Figure 5).

The highest level of achievement, conserving, came from three credits: RA1.3-Use Recycled Material, RA1.4-Use Regional Material, and RA1.6-Reduce Excavated Material Taken Off-Site. The project is reusing much of an existing wharf originally used as a break bulk facility, and this reuse contributes significantly to the recycled and regional material content. The project team also specified a minimum of five percent recycled materials and 30 percent locally sourced materials for new components. The project also avoids excavation because it is reusing an existing structure.

An improved rating may be achieved in credit RA1.7-Provide for Deconstruction and Recycling, because most construction uses recyclable material (i.e., timber, steel, rubber, and reinforced concrete). Explicit plans for deconstructing the structure were not created.

The remaining applicable credits did not earn points. These credits require the use of a life cycle analysis (LCA), creating a sustainable procurement program, reducing energy and water consumption, using renewable energy, and creating long-term commissioning plans for the facility.

4.3.2 Improvements

To achieve higher levels, the Port could conduct an LCA to quantify the amount of energy used and emissions for the design life of the project. Much of the information from the Air Emissions Inventory could be used as a basis for the LCA. Additional information on the energy used to bring construction materials to the project site should be included as well. In addition, conducting an LCA would achieve points in the Climate and Risk category.
To further increase the rating of the dolphin berth improvement project, the Port could institute sustainable procurement practices during construction. Additionally, the Port could find ways to incorporate long-term systems commissioning, and monitoring, energy and water systems.

4.4 Natural World
The Natural World category assesses the impacts of the dolphin berth improvement project on the ecosystems of the site and the region. Specifically, the category promotes stormwater management and the avoidance of groundwater contamination and the preservation and restoration of the natural biodiversity of the site. The category proposes that the project team consider positive synergies between the project and natural ecosystem and minimizing negative impacts.

4.4.1 Category Breakdown
The dolphin berth improvement project achieved nearly 41 percent of the applicable points for Natural World. Five credits in this category do not apply (NW1.2-Preserve Wetlands and Surface Water, NW1.3-Preserve Prime Farmland, NW1.4-Avoid Adverse Geology, NW1.6 Avoid Unsuitable Development on Steep Slopes, NW2.2-Reduce Pesticides and Fertilizer Impacts, and NW3.2 Control Invasive Species). These credits do not apply because the project is not near a state designated wetland or shoreline, was not previously landscaped, nor is it located on prime farmland or steep slopes. Natural World is broken down into three subcategories; of the applicable points, the project could achieve 48.6 percent in Biodiversity, 20.5 percent in Land and Water, and 50.0 percent in Siting (see Figure 6).

The highest level of achievement, conserved, came from credits NW1.7-Preserve Greenfields and NW3.4-Maintain Wetland and Surface Water Functions. The project is developed on an existing developed site (greyfield); therefore, many of the requirements in these credits are met. By minimal development on a greyfield, the existing ecosystems are maintained.

All remaining applicable credits received levels of achievement ranging from improved to superior. These points are credited for building on a previously developed site and for the Port’s bioswale, a low impact development system that captures and treats 100 percent of the site’s stormwater runoff. The Port is also required to avoid
development on prime habitat through the Washington State Environmental Policy Act (SEPA), thereby meeting some of the criteria for this category.

4.4.2 Improvements
As a seaport, development in a body of water is inherent. Envision could look to provide some clarity in this category to address Port business. Credit should be given for understanding the surrounding ecosystem and developing responsible improvement strategies, not just for avoiding development in a body of water.

To continue to perform well in this category on future projects, the Port should continue to look for opportunities to repurpose and utilize previously developed sites.

4.5 Climate and Risk
The Climate and Risk category measures the reduction of emissions by the dolphin berth improvement project through the use of a life cycle assessment. The category also addresses the short-term hazards and long-term climate threats the team has studied, if any, and how those studies affect the development of the project. Envision emphasizes assessing the complete life cycle of a project and rewards efforts to include measures of resiliency in design. These measures would be based on studies that the owner or project team performed which may not be required by regulations.

As a member of the Puget Sound Maritime Air Forum (PSMAF), the Port has successfully implemented initiatives to reduce air emissions. The PSMAF is a voluntary association of maritime organizations, air agencies, and environmental and public health agencies. The purpose of the forum is to quantify and reduce air emissions from maritime activities. This includes all levels of transportation of goods and passengers, as well as operations. The Port’s specific response to the reduction of air emissions includes using ultra low sulfur diesel-powered fleet vehicles as well as electric and hybrid vehicles.

4.5.1 Category Breakdown
36.1 percent of the applicable points for the Climate and Risk category were achieved. All credits in the category apply to the project. The category has two subcategories; of these, 53.7 percent of Resilience may be achieved, but none of the credits for Emissions can be achieved, primarily because the Port does not meet California emissions standards nor has a life cycle assessment (LCA) been performed.

4.5.2 Improvements
The Port could increase its score in the Climate and Risk category by performing LCA (also applicable to Resource Allocation). Points may further be achieved by implementing a Port wide plan to address results found in regional climate change and
natural disaster risk assessments, such as aiming to meet the goals of the most stringent air quality standards in the nation, the California Ambient Air Standards and the Southern Coast Air Quality Management District Rules and Regulations.

Results from the 2011 Puget Sound Air Emissions Inventory showed the Port has reduced emission levels based on a per 10,000 tons of cargo metric, in numerous parameters, since 2005.

While the Port meets national air emission standards, Envision awards points to infrastructure projects that go beyond the benchmarks.

5.0 ENVISION SCORE

If the dolphin berth improvement project was verified by the ISI it would achieve 26.2 percent (174 of 664) of the total applicable points. Points achieved in each Envision category are shown in Figure 8. Natural World scored the highest number of points (55) and the highest percentage of applicable points (41%), while Resource Allocation attained the lowest percentage of points at 18.1%. The sustainable performance of the dolphin berth improvement project would achieve the bronze level of recognition as rated with Envision. The minimum requirement to attain recognition by ISI is to achieve 20 percent of the total applicable points. The minimum requirements for each recognition level are shown in Table 1.

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Figure 8. Results by Category
6.0 CONCLUSION
As a rating tool for sustainable infrastructure, Envision sets the bar high for projects in order for our nation to support growth sustainably. While the ecological footprint of residents of the United States is the largest per capita in the world, its economy is the largest in the world and drives much of the world’s trade. The United States must model sustainable development and reduce its environmental impacts while retaining its high quality of life. While the individual impact of each project may be small, taken as a whole, our sustainability endeavors will have large impacts (positive or negative).

Opportunities to improve sustainability should be addressed early on in a project. Because in this instance, Envision was used retroactively at the 100 percent design phase, there were not many opportunities to improve the project’s score. However, the project team did take the opportunity to increase the project’s sustainability and Envision score by specifying a minimum percentage of recycled material and regional material in the construction documents. Additional points could also be achieved by conducting a life cycle analysis (LCA). Although it would not have a direct benefit to this project, it would provide an opportunity for the Port to learn how LCA can be applied on future projects during the concept design phase.

For being a small and relatively standard project for the Port, the dolphin berth improvement project scored well according to the Envision rating tool. Although a Bronze was attained, several small steps can be taken on future projects to ensure higher ratings.

7.0 RECOMMENDATIONS FOR ACHIEVING HIGHER LEVELS OF SUSTAINABILITY
A list of recommended strategies follows. They would lead to more sustainable projects, higher Envision levels of achievement, and increased recognition for the Port as a leader in sustainability. The strategies range from minimal to considerable efforts based on perceived time and cost associated with the action. In general, the more effort required to implement a certain action, the greater the benefit.

1. Set sustainability goals at the concept stage of capital improvement projects as well as for master planning. This early recognition of Port goals will bring sustainability to the forefront for all team members to track. It also provides a way for sustainable performance to be tracked through the design process. Goals should be in terms of the triple bottom line (i.e., economy, environment, community). A project lead should be assigned to coordinate the plan and document progress.

2. Improve adaptability for short-term and long-term hazards and climate change, including risk management. Building codes generally set minimum standards intended for occupant safety and to prevent collapse for the maximum considered event (storm, earthquake, etc.). Designing to larger, more frequent events or to higher levels of performance after an occurrence could be investigated. A life cycle cost analysis can show the costs associated with repairing a structure (including operational downtime) for various design strategies (ranging from building to code
standard to higher design levels) over the life of a project. In recent years – most recently in the case of Super Storm Sandy on the East Coast – we have seen the high cost of repairs to structures designed to current codes. In short, investing more money at the beginning of a project could save money over the life of a project.

3. Include LCA at the concept phase of a project and assess strategies to reduce a project’s energy consumption (embodied energy) and air emissions. An LCA is required on many of the credits within Envision. This tool is used to calculate the energy consumed through the entire life cycle of a project. A thorough analysis requires creating an inventory of all the material used, machinery operated, and grid energy sources. An LCA can also be used to determine the total amount of CO2 generated over the life of a project. Because concrete and steel make up large portions of the materials on Port infrastructure projects, the embodied energy of these products should be inventoried. Ships idling at the facility, yard equipment, and lighting make up most of the operating energy consumption.

4. Make a commitment to meet California Air Quality Standards. While the Port meets national air emission standards and has shown documented reductions in air emissions across normalized metrics, Envision awards points to infrastructure projects that go beyond the benchmarks.

5. Use results from regional climate impact and risk assessments to develop port-wide strategies for project development and infrastructure improvement. Long term changes in sea-level and increases in storm intensity and frequency should be investigated on all projects. This will ensure that the facility will remain operational long into the future and require less downtime.

6. Institute sustainable procurement practices for suppliers of construction materials and during operations. This strategy will show that the Port is a leader in sustainable development by requiring companies it contracts with to uphold the same sustainable standards.

7. Incorporate long-term systems commissioning and monitoring of energy and water systems through revisions to inspection and maintenance programs. Periodic inspections of facilities could include commissioning of mechanical and electrical systems. The inspection could also include a report on how the facility is performing versus the design intent. For example, the assessment could include efficiency of operations, frequency and magnitude of repairs, energy use, and water use. Sub-meters on energy and water systems could also be installed. These actions would provide more accurate reporting on where energy is used and provide more information on performance, thereby allowing more informed decisions for correction.
8. Support cold ironing to reduce energy use. Collaborate with tenants to retrofit ships with cold ironing technology or other strategies to reduce fuel consumption while ships are moored at the Port. The primary power serving the cold ironing stations should come from renewable sustainable sources.

9. Report sustainability measures annually. In an effort to reduce costs, the Port could consider creating a standard report format and publishing reports online. Sustainability measures should be tracked systematically.

### 8.0 SUGGESTED IMPROVEMENTS TO ENVISION

While Envision does provide some customization from project to project, further refinements should be considered. The following is recommended for futures revisions to Envision.

1. Better definitions or standards for determining industry norms for energy consumption. Currently, industry norms are defined as “current industry regulatory standards for a particular activity” in the Guidance Manual. Although this may be difficult as Envision applies to many different types of infrastructure projects, standards are necessary to ensure consistency across all projects. Because regulations vary from state to state, a simple solution may be to state, in the Envision Manual, which regulatory standards are to be met. This relates to credits LD3.3, RA1.1, RA1.5, RA2.1, RA2.3, and RA3.2.

2. Address development in bodies of water more directly as it relates to seaports in credit NW1.2 – Protect Wetlands and Surface Water. Seaports inherently develop infrastructure in bodies of water and along shorelines to take advantage of the most energy efficient means to move cargo and goods around the world. Some clarification is needed in this credit as it applies to seaport development.


4. Provide a deeper analysis within the Quality of Life category by looking at the economic impacts a project creates, such as in the number of jobs it supports, instead of only looking at how many it creates.
9.0 REFERENCES


American Society of Civil Engineers. 2010. Sustainability Guidelines for the Structural Engineer.


