Hiawatha Golf Course Area Water Management Alternatives Assessment

ISI Envision™ Sustainability Framework Comparative Screening

Prepared for
Minneapolis Park and Recreation Board, City of Minneapolis, &
Minnehaha Creek Watershed District

7/14/2017

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Technical Memorandum
MPRB Hiawatha Golf Course Alternatives Assessment Project
ISI Envision™ Sustainability Framework Comparative Screening

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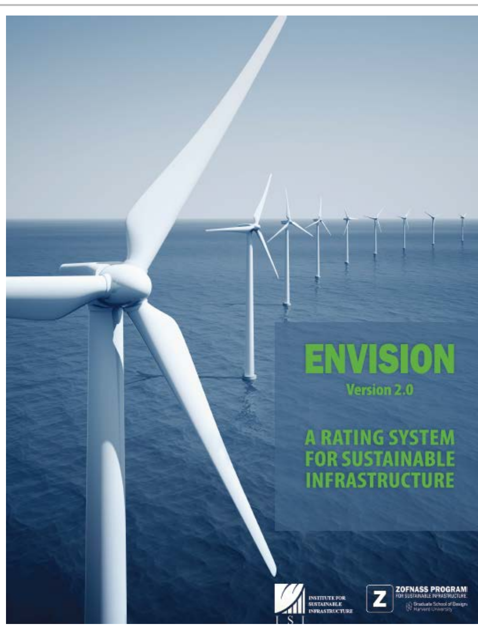

INSTITUTE FOR SUSTAINABLE INFRASTRUCTURE
ISI

ZOFNASS PROGRAM
FOR SUSTAINABLE INFRASTRUCTURE
Graduate School of Design
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Envision™ was developed in joint collaboration between the Zofnass Program for Sustainable Infrastructure at the Harvard University Graduate School of Design and the Institute for Sustainable Infrastructure.

APWA ASCE ACEC

The Institute for Sustainable Infrastructure is a not-for-profit education and research organization founded by the American Public Works Association, the American Council of Engineering Companies and the American Society of Civil Engineers.

1.0 Background and Summary

The Barr Engineering team (Barr) has been assisting the Minneapolis Park and Recreation Board (MPRB) and the City of Minneapolis (City) on the evaluation of the surface, storm, and groundwater management issues related to the Hiawatha Golf Course area. As part of this project, the MPRB has directed Barr to perform a detailed assessment of two alternatives for the Hiawatha Golf Course area, selected by MPRB, City, and Minnehaha Creek Watershed District (MCWD) staff. This project is not a complete master plan for the Hiawatha Golf Course area, but rather a high level comparative assessment of two alternative visions for the area based on water management solutions that will help the MPRB select the future direction of and set the stage for master planning, budgeting, permitting, and ultimately, design.

Because the issues in the Hiawatha Golf Course area are primarily related to groundwater and surface water management, the MPRB, City and MCWD selected two alternatives based on differing water management approaches for the area and is documented in the Hiawatha Golf Course Area – Water Management Alternatives memo dated 6/21/2017. Alternative A maintains the area as an 18-hole golf course (with existing pumping rates) while Alternative B considers a reduced-pumping approach and modifications to water management in the golf course area (see Table 1).

Table 1: Alternatives Summary

Alternative	Description of Components
Alternative A	Existing Conditions (18-hole golf course, existing pumping rate) with an open channel along the northern and eastern edge of the golf course
Alternative B	Reduced-pumping alternative with a direct gravity connection to Lake Hiawatha, an open channel and realignment of Minnehaha Creek through the golf course area, development of wetlands & open water, and a change in the recreational use of the park area

As part of the alternatives assessment, the Barr team has also performed an impact assessment tto help quantify the differences between Alternative A and Alternative B, considering the following:

- Surface water and groundwater impacts
- Ecological implications
- Recreation and economic concepts
- Traffic and parking impacts
- Applicable regulations
- Cultural resources review

This impact assessment is summarized in the Hiawatha Golf Course Area – Impact Assessment memo dated 7/14/2017.

The information compiled in the impact assessment memo for the two alternatives was used to further inform the review of each alternative through the sustainability lens as well as the benefit-cost assessment for the two alternatives that attempts to quantify the triple bottom line (social, economic, and ecological costs and benefits) of each alternative.

This memorandum summarizes the review of each of the two water management alternatives for the Hiawatha Golf Course area based on the sustainability screening performed for each.

The MPRB and City of Minneapolis both have long-standing goals and plan elements intended to pursue long-term sustainability. A sustainability screening is presented for proposed alternatives for the future of the Hiawatha Golf Course area. The team utilized the independent third-party Envision® sustainability framework created by Institute for Sustainable Infrastructure (ISI), the American Public Works Association (APWA), American Society of Civil Engineers (ASCE), American Council of Engineering Companies (ACEC) and the Harvard University Zofnass Program for Sustainable Infrastructure. The framework applies to infrastructure outside of the building envelope.

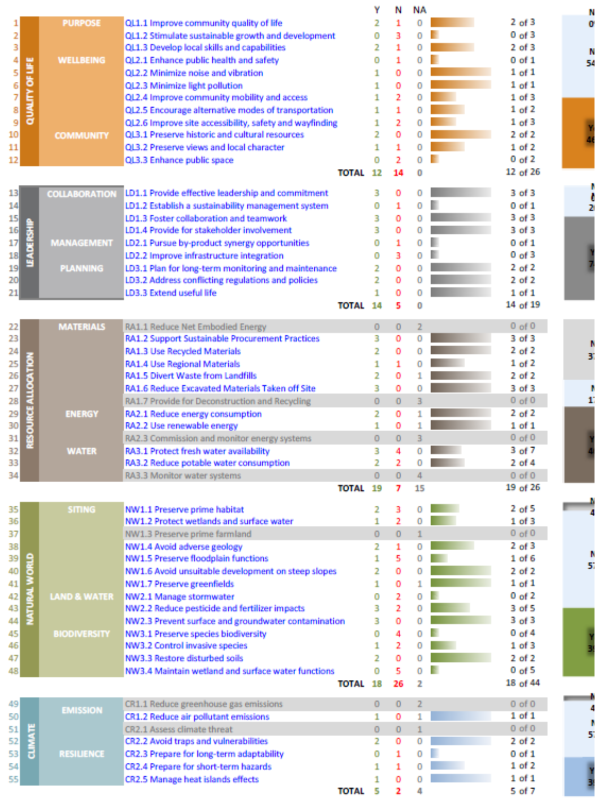
The screening-level assessment is not intended to identify a project alternative “winner” and “loser”. It is intended to:

- serve as a surrogate evaluation for the long-term value each alternative might bring to the community and the public.
- identify possible advantages and disadvantages each alternative may present for balancing various social, environmental and economic needs.
- identify future considerations for enhancing sustainability of a chosen alternative during future master planning and design efforts.

According to ISI, The Envision® "*sustainable infrastructure rating system has been created to evaluate, grade and give recognition to infrastructure projects that provide progress and contributions for a sustainable future. Its purpose is to foster a necessary and dramatic improvement in the performance and resiliency of physical infrastructure across the full economic, social, and environmental dimensions of sustainability. It is designed to help users identify ways in which sustainable approaches can be used to plan, design, construct and operate infrastructure projects. The goal is to improve the sustainable performance of infrastructure projects in terms of not only the technical performance but also from a social, environmental and economic perspective.*"

The Envision screening tool breaks down the questions asked for each alternative into five categories including:

- Quality of Life
- Leadership
- Resource Allocation
- Natural World
- Climate and Risk



				Y	N	NA	
1	QUALITY OF LIFE	PURPOSE	QL1.1 Improve community quality of life	2	1	0	2 of 3
2			QL1.2 Stimulate sustainable growth and development	0	3	0	0 of 3
3			QL1.3 Develop local skills and capabilities	2	1	0	2 of 3
4		WELLBEING	QL2.1 Enhance public health and safety	0	1	0	0 of 1
5			QL2.2 Minimize noise and vibration	1	0	0	1 of 1
6			QL2.3 Minimize light pollution	1	0	0	1 of 1
7			QL2.4 Improve community mobility and access	1	2	0	1 of 3
8			QL2.5 Encourage alternative modes of transportation	1	1	0	1 of 2
9			QL2.6 Improve site accessibility, safety and wayfinding	1	2	0	1 of 3
10		COMMUNITY	QL3.1 Preserve historic and cultural resources	2	0	0	2 of 2
11			QL3.2 Preserve views and local character	1	1	0	1 of 2
12			QL3.3 Enhance public space	0	2	0	0 of 2
			TOTAL	12	14	0	12 of 26
13	LEADERSHIP	COLLABORATION	LD1.1 Provide effective leadership and commitment	3	0	0	3 of 3
14			LD1.2 Establish a sustainability management system	0	1	0	0 of 1
15			LD1.3 Foster collaboration and teamwork	3	0	0	3 of 3
16			LD1.4 Provide for stakeholder involvement	3	0	0	3 of 3
17		MANAGEMENT	LD2.1 Pursue by-product synergy opportunities	0	1	0	0 of 1
18			LD2.2 Improve infrastructure integration	0	3	0	0 of 3
19		PLANNING	LD3.1 Plan for long-term monitoring and maintenance	2	0	0	2 of 2
20			LD3.2 Address conflicting regulations and policies	2	0	0	2 of 2
21			LD3.3 Extend useful life	1	0	0	1 of 1
			TOTAL	14	5	0	14 of 19
22	RESOURCE ALLOCATION	MATERIALS	RA1.1 Reduce Net Embodied Energy	0	0	2	0 of 0
23			RA1.2 Support Sustainable Procurement Practices	3	0	0	3 of 3
24			RA1.3 Use Recycled Materials	2	0	0	2 of 2
25			RA1.4 Use Regional Materials	1	1	0	1 of 2
26			RA1.5 Divert Waste from Landfills	2	0	1	2 of 2
27			RA1.6 Reduce Excavated Materials Taken off Site	3	0	0	3 of 3
28			RA1.7 Provide for Deconstruction and Recycling	0	0	3	0 of 0
29		ENERGY	RA2.1 Reduce energy consumption	2	0	1	2 of 2
30			RA2.2 Use renewable energy	1	0	1	1 of 1
31			RA2.3 Commission and monitor energy systems	0	0	3	0 of 0
32		WATER	RA3.1 Protect fresh water availability	3	4	0	3 of 7
33			RA3.2 Reduce potable water consumption	2	2	0	2 of 4
34			RA3.3 Monitor water systems	0	0	4	0 of 0
			TOTAL	19	7	15	19 of 26
35	NATURAL WORLD	SITING	NW1.1 Preserve prime habitat	2	3	0	2 of 5
36			NW1.2 Protect wetlands and surface water	1	2	0	1 of 3
37			NW1.3 Preserve prime farmland	0	0	1	0 of 0
38			NW1.4 Avoid adverse geology	2	1	0	2 of 3
39			NW1.5 Preserve floodplain functions	1	5	0	1 of 6
40			NW1.6 Avoid unsuitable development on steep slopes	2	0	0	2 of 2
41			NW1.7 Preserve greenfields	1	0	1	1 of 1
42		LAND & WATER	NW2.1 Manage stormwater	0	2	0	0 of 2
43			NW2.2 Reduce pesticide and fertilizer impacts	3	2	0	3 of 5
44			NW2.3 Prevent surface and groundwater contamination	3	0	0	3 of 3
45		BIODIVERSITY	NW3.1 Preserve species biodiversity	0	4	0	0 of 4
46			NW3.2 Control invasive species	1	2	0	1 of 3
47			NW3.3 Restore disturbed soils	2	0	0	2 of 2
48			NW3.4 Maintain wetland and surface water functions	0	5	0	0 of 5
			TOTAL	18	26	2	18 of 44
49	CLIMATE	EMISSION	CR1.1 Reduce greenhouse gas emissions	0	0	2	0 of 0
50			CR1.2 Reduce air pollutant emissions	1	0	1	1 of 1
51		RESILIENCE	CR2.1 Assess climate threat	0	0	1	0 of 0
52			CR2.2 Avoid traps and vulnerabilities	2	0	0	2 of 2
53			CR2.3 Prepare for long-term adaptability	0	1	0	0 of 1
54			CR2.4 Prepare for short-term hazards	1	1	0	1 of 2
55			CR2.5 Manage heat islands effects	1	0	0	1 of 1
			TOTAL	5	2	4	5 of 7

Figure 1 - Example Envision Checklist

The process used to screen the alternatives was collaborative. Working sessions with the Barr team, MPRB, City of Minneapolis, and Minnehaha Creek Watershed District (MCWD) staff were held to discuss two alternatives, in terms of key performance measures from the Envision framework. Following the working session, comments from the team were incorporated into the screening assessment.

The Barr team used ISI's spreadsheet checklist tool to perform a comparative screening-level assessment: comparing Alternative A (Alt. A) and Alternative B (Alt. B). Figure 1 shows an example of a scoring checklist that is part of the framework toolbox. As the team evaluated each measure, a log of notes and considerations were weighed to inform the scoring. Questions for each alternative were answered as "Yes", "No" or "Not Applicable (N/A)". A score for each alternative was then calculated, based on the number of "Yes" answers. Additional scoring methods using the Envision™ framework could be considered in the future as project definition increases through the master planning and design development process.

Figure 2 presents a summary of the comparative results by Envision credit category:

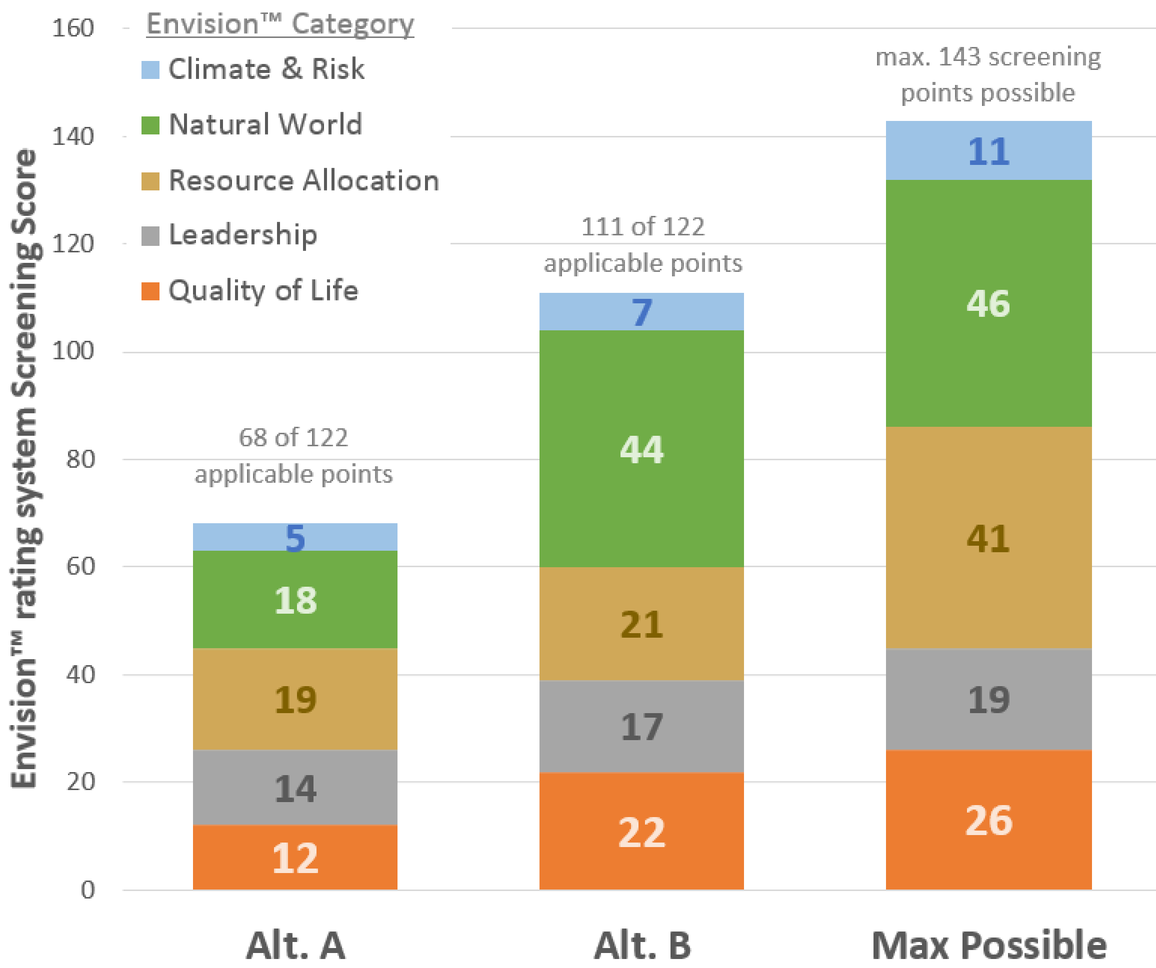


Figure 2 – Summary of Envision Screening for Alt. A and Alt. B,
*based on conceptual project formulation available at this time

The assessment identified Envision® screening scores of 68 points for Alternative A and 111 points for Alternative B, out of 122 applicable points. A total of 143 points is possible if all items are applicable. However, because of the conceptual nature of the alternatives, not all screening questions were able to be answered.

A higher screening score indicates that the project alternative might be more advantageous, from a long-term sustainability perspective as defined by the Envision® framework. Alternative B appears to present more long-term advantages than Alternative A. The categories Quality of Life and Natural World appear to factor significantly into the long-term project sustainability. This is largely due to the conversion of fee-access public space to freely-accessible public space with more users and diverse uses, and the conversion of high-maintenance golf course turf to naturalized and restored landscapes and wetlands that provide treatment of stormwater and improved water quality.

The remainder of this memo further discusses each of the five Envision® categories, considerations for comparing Envision® credits, and a summary of key take-aways and future considerations for each of the five (5) categories shown in Figure 2 above. The checklist scoring summaries are attached to the end of this report.

2.0 Envision Category 1 of 5: Quality of Life

As described by ISI, "*Quality of Life addresses a project's impact on surrounding communities, from the health and wellbeing of individuals to the wellbeing of the larger social fabric as a whole. These impacts may be physical, economic, or social. Quality of Life particularly focuses on assessing whether infrastructure projects are in line with community goals, incorporated into existing community networks, and will benefit the community long-term. For that purpose, community involvement should be sought by infrastructure owners. Community members (both users and non-users) affected by the project should be considered important stakeholders in the decision-making process (during design as well as during operations). The category is further divided into three subcategories: Purpose, Wellbeing, and Community that make up 13 credits as seen in the figure at the right.*

Assess the project's impact on functional aspects of the community such as growth, development, job creation, and the general improvement of quality of life. Positive results from infrastructure projects can include community education, outreach, knowledge creation, and worker training

As integral parts of the community sustainable infrastructure projects should address individual comfort, health, and mobility. Attention is also given to encouraging alternative modes of transportation and incorporating the project into the larger community mobility network. Further, infrastructure owners are encouraged to ensure equal access (availability and quality) to all; exclusionary practices should be avoided.

It is important to ensure the project respects and maintains or improves its surroundings through context-sensitive design."

Category Credits:

QUALITY OF LIFE
13 Credits

1 PURPOSE

QL1.1 Improve Community Quality of Life
QL1.2 Stimulate Sustainable Growth and Development
QL1.3 Develop Local Skills and Capabilities

2 WELLBEING

QL2.1 Enhance Public Health and Safety
QL2.2 Minimize Noise and Vibration
QL2.3 Minimize Light Pollution
QL2.4 Improve Community Mobility and Access
QL2.5 Encourage Alternative Modes of Transportation
QL2.6 Improve Accessibility, Safety & Wayfinding

3 COMMUNITY

QL3.1 Preserve Historic and Cultural Resources
QL3.2 Preserve Views and Local Character
QL3.3 Enhance Public Space

QL0.0 Innovate or Exceed Credit Requirements

Quality of Life

Summary of key take-aways:

- The stakeholder engagement and public process equally informs Alt. A and Alt. B.
- Alt. B presents advantages for multimodal trail connections and improved public accessibility to a site that is fenced off from the public under current conditions.
- Alt. A builds on the site's historical character as a golf facility, is quasi-private (fee-access), and serves a narrow user group (31,700 rounds per year in 2010-2013).
- Alt. B builds on the site's pre-development ecological character, creates public space for a diverse mix of users (estimated to be over 500,000 visits per year) and multiple uses. This option attempts to partly restore the site to the land cover and ecological conditions present before the dredging of Lake Hiawatha and construction of the golf course.

Opportunities to Further Enhance Sustainability:

- Consider how the project may provide opportunities to build local skills and capabilities with new jobs, on-site education, both during construction and facility operation.
- Consider how the project may minimize noise, and evening light pollution to the neighborhood.
- Consider how to best address parking and traffic concerns voiced by stakeholders.

QL 1.1 Improve Community Quality of Life

Assessment Questions:
Are the relevant community needs, goals and issues being addressed in the project?
Are the potentially negative impacts of the project on the host and nearby communities been reduced or eliminated?
Has the project design received broad community endorsement, including community leaders and stakeholder groups?

Alt. A	**Alt. B**
Fewer visits and users per year for the golf facilities. It is a narrow user group of golfers that played 31,700 rounds per year in 2010-2013 at a rate of 3.9 rounds per user per year for the golf course. Improved clubhouse could attract more users.	More visits and users per year, greatly expanded diverse user group.
Serves recreational golf and winter cross-country skiing needs of the community.	Potential to attract more diverse users due to potentially varied activities and recreational opportunities including paddling, multi-use trails, parklands, games, picnics and hosting events.
This option is a continuation of previous practices, which would be viewed favorably by the golfer user group. Some stakeholders expressed the importance of continuing this history for users, school teams, etc.	Opportunity to "reinvigorate the host and nearby communities", which is likely to be viewed favorably by new users and the public, as voiced by stakeholder input received during the public process.
Has polarized endorsement with support from golf supporters. The public has expressed need for more public spaces with more diverse uses at the site.	Broad community endorsement for this alternative is unclear at this stage. Without a golf component, we would not anticipate endorsement from the part of the community that wants to see golf here.
	Attempts to address needs voiced by the community that the golf course does not address (i.e. public space, public recreation, trail connections, ecological sensitivity, etc…)
Both alternatives: The project team is still gaining endorsement from stakeholders	
Both alternatives involve the assessment of community needs as part of the design process.	
Both alternatives: Through this public stakeholder engagement and design process, we are increasing attention to the community's needs and goals.	

QL 1.2 Stimulate Sustainable Growth and Development

Assessment Questions:
Will the project contribute significantly to local employment?
Will the project make a significant increase in local productivity?
Will the project make the community more attractive to people and businesses?

Alt. A	**Alt. B**
Contributions to local employment is unknown, but could be greater due to increased activity at the new clubhouse and event facilities. Short-term design and construction jobs may be seen in association with course updates.	Contributions to local employment is unknown, but could be greater than Alt. A due to increased activity at the clubhouse and event facilities. Golf course jobs could be lost or transferred to another location. Short-term design, construction jobs may be seen in association with site changes.
Through course updates and clubhouse renovations, Alt. A may become more attractive to people. Additional other business opportunities unlikely.	Could result in additional MPRB enterprise business opportunities (Restaurant, Brewery, Event Center, Recreation, etc.). It could also attract additional park users.
Both alternatives do not improve local productivity. No major transportation modes/routes will be created.	

QL 1.3 Develop Local Skills and Capabilities

Assessment Questions:
Does the project team intend to hire and train a substantial number of local workers?
Does the project team intend to use a substantial number of local suppliers and specialty firms?
Will the project make a substantial improvement in local capacity and competitiveness through local employment, subcontracting and education programs?

- Development of additional local employee skills/capabilities and the use of additional local suppliers has not been addressed to date for either Alt. A or Alt. B.

QL 2.1 Enhance Public Health and Safety

Assessment Questions:
Does the owner and the project team intend to identify, assess and institute new standards to address additional risks and exposures created by the application of new technologies, materials, equipment and/or methodologies?

Alt. A	Alt. B
Health risks will likely not be reduced. Updated machinery or better pesticide/herbicide applications may reduce health risks, but these steps have not been identified as part of the project yet.	Health and Safety risks associated with flooding damage may be improved. Increasing flood storage capacity within the park area can mitigate residential and surrounding area flooding.
	Has the potential to improve water quality by reducing runoff pollution to a much larger extent than Alt. A.
In its current condition, the site is fenced off to prevent pedestrians from being struck by golf balls.	Could offer benefits to mitigate urban heat island effect with more user access to public spaces that have surface water, shade, wetland and tree plantings, depending on the final design.

QL 2.2 Minimize Noise and Vibration

Assessment Questions:
Will the project reduce noise and vibration to levels substantially below local permissible levels during construction and operation?

- Noise impacts were not investigated, but will be considered in the next phase.

QL 2.3 Minimize Light Pollution

Assessment Questions:
Will the project be designed to reduce excessive lighting, prevent light spillage and preserve or restore the night sky?

- Light Pollution has not been investigated to date and is not estimated to be a significant differentiator between Alt. A and Alt. B.

QL 2.4 Improve Community Mobility and Access

Assessment Questions:
Will the project provide good, safe access to adjacent facilities, amenities and transportation hubs?
Will the project design take into consideration the expected traffic flows and volumes in and around the project site to improve overall mobility and efficiency?

Has the project team coordinated the design with other infrastructure assets to reduce traffic congestion, and improve walkability and livability?

Alt. A	Alt. B
Does not improve community mobility and access. A fence remains as a barrier around the site, preventing public access. Results in the continued impediment of mobility through the site and around the lake.	Could substantially improve connections and accessibility between adjacent parkland, commercial, around the lake and to residential areas with new public trails weaving through the site. Could connect east and west with walking and biking trails, non-motorized boating opportunities. This option includes additional amenities on public property.
Both alternatives include consideration of the impacts to traffic and mobility. If either alternative increases the number of users, the impact on parking and traffic may need to be balanced to avoid negative impacts to the surrounding neighborhood. A preliminary assessment of traffic and parking needs was performed and will be considered in more detail in the next phase.	

QL 2.5 Encourage Alternative Modes of Transportation

Assessment Questions:
Will the project be within walking distance of accessible multi-modal transportation?
Through its design, will the project encourage the use of transit and/or non-motorized transportation?

Alt. A	Alt. B
The use of alternative transportation is less likely because golfers need to transport clubs, equipment and bags with them.	Getting to the site using non-motorized or public transportation may be more likely given a larger number of diverse users and uses.
	Would encourage the use of non-motorized transportation if a multi-use pedestrian trail connected the neighborhood to Minnehaha Creek, Nokomis, or Hiawatha Lake Park activity center.
	May increase use of recreational water transportation (destination along the creek).
Both alternatives are within walking distance of public transportation. Both alternatives present possible increase in the number of parking spaces required.	

QL 2.6 Improve Accessibility, Safety and Wayfinding

Assessment Questions:
Will the project contain the appropriate signage for safety and wayfinding in and around the constructed works?
Will the project address safety and accessibility in and around the constructed works for users and emergency personnel?
Will the project extend accessibility and intuitive signage to protect nearby sensitive sites or neighborhoods?

Alt. A	**Alt. B**
Extending accessibility and signage into nearby neighborhoods is unlikely. Connectivity is similar to existing conditions.	The opportunity exists to greatly enhance wayfinding to the park system with new connectivity.
Both scenarios will/do have appropriate safety and wayfinding signage.	

QL 3.1 Preserve Historic and Cultural Resources

Assessment Questions:
Will the project minimize negative impacts on historic and cultural resources?
Will the project be designed so that it fully preserves and/or restores historic/cultural resources on or near the project site?

Alt. A	**Alt. B**
Preserves current golf identity. Takes a short-term view of the site's history and identity, which was important to some stakeholders (golfers, school golf teams).	Seeks to restore ecological identity (restoring the historic creek alignment and other water resources) that were present prior to the dredging and filling performed to create the golf course. Takes a long-term view of the site's history and identity.
	Could negatively affect current cultural and historic golf related resources.
	Could potentially preserve some aspects of the original clubhouse and golf identity (some not necessary all).
Both alternatives restore historic cultural resources depending on the time frame referenced (current golf character vs. previous ecological character).	

QL 3.2 Preserve Views and Local Character

Assessment Questions:
Will the project be designed in a way that preserves views and local character?
Will the project be designed to improve local character, views or the natural landscape through preservation and/or restorative actions?

Alt. A	**Alt. B**
Provides a fenced-off green space in a densely developed urban area. The views and green space at the site are available for those that pay the fee to access the site.	Improves views and local character by restoring natural landscapes across the available green space and making those features publicly accessible for no fee.
Both alternatives preserve acreage of existing green space views and open space character.	

QL 3.3 Enhance Public Space

Assessment Questions:
Will the project make meaningful enhancements to public space?
Will the project result in a substantial restoration to public space?

Alt. A	**Alt. B**
Remains a fee-access space on public property for a narrow set of users (golfers).	Converts the space to free public access with more uses for more users, with improved accessibility.
Will not result in meaningful or substantial enhancements to public space. Flood mitigation techniques will likely not improve or enhance the public space as it relates to golf.	Would result in substantial restoration of public space.
Enhancements to the clubhouse may result in more use year round.	Opportunities for numerous landscape design, festival area and small plaza features. Final programming TBD.
Both alternatives enhance clubhouse, which may result in more use year round.	

3.0 Envision Category 2 of 5: Leadership

As described by ISI, "*Successful sustainable projects require a new way of thinking about how projects come to life. Project teams are most successful if they communicate and collaborate early on, involve a wide variety of people in creating ideas for the project, and understand the long-term, holistic view of the project and its life cycle. This section encourages and rewards these actions under the view that together with traditional sustainability actions, such as reducing energy and water use, effective and collaborative leadership produces a truly sustainable project that contributes positively to the world around it. This section is divided into the three sub-sections of Collaboration, Management, and Planning that make up 10 credits as seen in the figure at the right.*

Category Credits:

Sustainable projects must include input from a wide variety of stakeholders to fully understand synergies, savings, and opportunities for innovation.

A broader, comprehensive understanding of the project can allow the team to see and pursue synergies between systems, either within the project or among larger infrastructure systems. This requires a new way of managing and understanding the project as a whole, but can save money, increase sustainability, expand the useful life of the project, and protect against future problems.

Taking a long-term view of the project can also greatly increase the sustainability of the project. Understanding planning issues such as the regulatory environment in which the project is being pursued and the future growth trends in the area can lead to a project that avoids pitfalls and plans effectively for its own future."

Leadership

Summary of key take-aways:

- The MPRB and City have implemented a fair, objective leadership approach to compare and evaluate alternative uses of the site. This includes using a sustainability lens as a filter for the alternatives.
- The public partners (MPRB, City, MCWD) are equally engaged in evaluating all alternatives and engaging the public and stakeholder agencies (MPCA, USACE, MnDNR) for feedback.
- A hallmark of enhancing sustainability is implementing projects that are "solution multipliers", where resources invested solve multiple problems simultaneously. Alt. B is on track to do just that.
- Continuation of groundwater pumping, as required with Alt. A, is less sustainable with consideration of the entire system as a whole (ground water, water quality, infrastructure upkeep given costs vs revenue sources on site, etc.). Pumping at higher Alt. A rates during times of drought would have negative consequences on the site's water balance. Alt. B reduces pumping and promotes the long-term sustainability of the water resources in the area.
- Alt. B is more viewed more favorably by regulatory stakeholders, in particular the MnDNR.

Opportunities to Further Enhance Sustainability:

- Address long-term operation and maintenance (O&M) funding source(s) in the context of MPRB budgeting and funding (e.g. General Fund maintenance, Enterprise Fund maintenance, etc.)

LD1.1 Provide Effective Leadership and Commitment

Assessment Questions:
Has the project team issued public statements stating their commitment to sustainability?
Is the project team's commitment to sustainability backed up by examples of actions taken or to be taken?
Do these commitments and actions demonstrate sufficiently that sustainability is a core value of the project team?

Alt. A	**Alt. B**
Both alternatives use City and MPRB sustainability goals as a lens for determining community value and feasibility. The final alternative design would need to balance the environmental (pumping, landscape, water resources, etc.), social (equity, community recreational & neighborhood needs, etc.), and economic (MPRB enterprise revenue, long-term O&M) to get support from project partners involved.	

LD 1.2 Establish a Sustainability Management System

Assessment Questions:
Does the project team intend to establish a sound, workable sustainability management system that meets the requirements of the project?

Alt. A	**Alt. B**
The efforts to establish and follow a sustainability management system is only in the early stages of consideration for both alternatives. This could increase in importance if sustainable procurement strategies and tracking of local purchases is desired.	

LD 1.3 Foster Collaboration and Teamwork

Assessment Questions:
Are the project owner and the project team intending to take a systems view of the project, considering the performance relationship of this project to other community infrastructure elements?
Will the project owner and the project team establish a collaborative relationship on the project to achieve higher levels of sustainable performance?
Will the project owner and the project team institute a whole systems design and delivery process with the objective of maximizing sustainable performance?

Alt. A	**Alt. B**
Both alternatives involve collaboration and teamwork to be sustainable. Project formulation, collaboration, and teamwork has been equivalent for both alternatives.	

LD 1.4 Provide for Stakeholder Involvement

Assessment Questions:
Will key stakeholders in the project be identified and lines of communication established?
Does the project team plan to engage with stakeholders and solicit stakeholder feedback?
Will the project team establish a strong stakeholder involvement process designed to involve the public meaningfully in project decision-making?

Alt. A	**Alt. B**
The team has identified and involved key stakeholders. Continued engagement and involvement with stakeholders is anticipated for both alternatives. Stakeholder engagement has been equivalent for both alternatives.	

LD 2.1 Pursue By-Product Synergy Opportunities

Assessment Questions:
Will the project team establish a program to locate, assess, and make use of unwanted by-products and materials on the project?

Alt. A	**Alt. B**
Both alternatives would benefit from leveraging by-product re-use and synergy opportunities. Opportunities may exist for both alternatives for clubhouse modifications/reconstruction. For example, material salvage and recycle, water reuse, wastewater reuse, on-site organics processing, etc.	

LD 2.2 Improve Infrastructure Integration

Assessment Questions:
Will the project team seek to optimize sustainable performance at the infrastructure component level?
Will the project team seek to optimize sustainable performance by designing the project as a system integrated with other local and regional infrastructure?
Will the project be planned and designed so that its operation and functions are fully integrated with all infrastructure elements in the community?

Alt. A	**Alt. B**
Would likely utilize sustainable components within the project for clubhouse construction	Will integrate into the community and ecological systems as a whole to perform

and improved golf course O&M. The functions of the golf course, stormwater system and flood risk reduction are not integrated, but separate.	more sustainably long-term. Would likely utilize sustainable components within the project for clubhouse construction and parkland O&M. The plan seeks to integrate flood storage, stormwater conveyance, natural landscape, and public space.
Continued groundwater pumping long-term is less sustainable when looking at the entire system as a whole (ground water, water quality, infrastructure upkeep given costs vs revenues, etc.).	

LD 3.1 Plan For Long-term Maintenance and Monitoring

Assessment Questions:
Will the project have a plan for long term monitoring and maintenance?
Will that plan be sufficiently comprehensive, covering all aspects of long-term monitoring and maintenance?

Alt. A	Alt. B
Has an existing O&M plan and dedicated financial resources.	Will have an O&M plan, but the source of dedicated financial resources for O&M is still under discussion.
The MPRB intends that both projects will implement a long-term monitoring and maintenance plan.	

LD 3.2 Address Conflicting Regulations and Policies

Assessment Questions:
Will an assessment of applicable regulations, policies and standards be done, identifying those that may run counter to project sustainable performance goals, objectives and targets?
Do the owner and the project team intend to approach decision-makers to resolve conflicts?

Alt. A	Alt. B
Both alternatives will undergo a collaborative policy and regulatory review by City of Minneapolis, MPRB, MCWD. Additional stakeholders include MnDNR, MPCA, USACE, etc.	
Both alternatives must address the regulations that apply to pumping groundwater and surface water. The process has already challenged traditional approaches and philosophies related to the issues surrounding pumping for both alternatives.	
	Seeks to create a future site condition that addresses the competing regulations and policies and solve multiple challenges of

	flooding, ecological concerns, and the public's needs. A hallmark of enhancing sustainability is implementing projects that are "solution multipliers," where invested resources solve multiple problems simultaneously. Alt. B is on track to do just that.

LD 3.3 Extend Useful Life

Assessment Questions:
Will the project be designed in ways that extend substantially the useful life of the project?

Alt. A	**Alt. B**
Will likely involve elements that would extend the project's life. The golf course would continue to be a golf course with some site renovations to improve drainage, build upon the existing clubhouse site, and restore small areas of wetlands and native plant communities.	Will likely involve strategies that extend the project's life more than other alternatives. For example, once the native plant communities are established, with proper maintenance, they may persist long term.
The course would still be vulnerable to costly damage from large precipitation and flooding events.	Designing to reduce damage resulting from large precipitation and flooding events, creating sustainable habitat, and attending to the community needs would extend the life of this alternative.
	Less reliance on the long-term operation of the groundwater pumping station at current capacity.

4.0 Envision Category 3 of 5: Resource Allocation

According to ISI, "*Resources are the assets that are needed to build infrastructure (construction) and keep it running (operations). This category is broadly concerned with the quantity, source, and characteristics of these resources and their impacts on the overall sustainability of the project. Resources addressed in this rating system include physical materials, both those that are consumed and that leave the project, energy for construction, operation, and maintenance, and water use. Each of these materials is finite in its source and should be treated as an asset to use respectfully. Materials, Energy, and Water comprise the three subcategories of Resource Allocation that make up 14 credits as seen in the figure at the right.*

Minimizing the total amount of material used should be a primary consideration for infrastructure projects. Minimizing material use reduces the amount of natural resources that must be extracted and processed, as well as the energy that goes into producing and transporting these materials. Reducing material use must be balanced with safety, stability, and durability. The source of materials matters too.

Reducing overall energy use is crucial, particularly from non-renewable fossil-fuel sources. This energy source is already becoming scarce, and sustainable infrastructure projects should not over-consume a finite energy source. The use of renewable sources of energy is encouraged as a means to minimize fossil fuel consumption.

With a changing climate and increasing population, future water security is uncertain. Therefore it is critical infrastructure projects reduce overall water use, particularly potable water use."

Category Credits:

Resource Allocation

Summary of key take-aways:

- Reduce, reuse and recycle should be implemented not just during construction, but also during the facilities' operation and maintenance.
- Alt. B naturalization of the site presents the opportunity to use fewer resources than a maintenance-intensive golf course.
- Both alternatives' clubhouse modification/reconstruction is an opportunity to better implement resource efficiency and reduce waste.

Opportunities to Further Enhance Sustainability:

- Consider how the investment of resources to implement Alt. B weighs against possible long-term resource conservation strategies for Alt. B. Will the "down payment" be earned back?
- Consider how the proposed facilities and clubhouse will address resource conservation, potable water conservation, water reuse, wastewater reuse, energy conservation, etc.
- Are any sustainability performance metrics or net-zero (water, carbon, energy, waste) solutions under consideration? For example, do any of the sustainability/building rating systems such as LEED, B3, Living Building Challenge play any role in setting performance metrics for the clubhouse building envelope? Does Envision, LEED-ND, or SITES play any role in setting performance metrics for the infrastructure outside of the building envelope?
- Consider how material specifications and sustainable procurement play into construction as well as long-term facility O&M.
- Consider sourcing of renewable electricity such as on-site solar PV plus battery storage, solar thermal, combined heat and power (CHP), Xcel WindSource, Xcel Renewable Connect, third party community solar, ground-source heat pumps, etc. Consider what length of commitment and/or payback period is acceptable for a MPRB investment in a renewable source (15, 20, 25 years etc.).

RA1.1 Reduce Net Embodied Energy

Assessment Questions:
Does the project team plan to conduct an assessment of the embodied energy of key materials over the project life?
Will the project achieve a significant reduction in net embodied energy over the life of the project?

Alt. A	**Alt. B**
An embodied energy estimate has not been performed for either alternative. A life cycle assessment (LCA) that considers energy use for the extraction, manufacture, transport, construction, operation and end-of-life would be necessary for its estimation. For example, factors that contribute to higher embodied energy consumption (all energy consumed to produce and deliver a product) include use of metals, electricity, fuel, and long-term energy; Other factors that contribute to higher energy consumption include relative durability of materials used on site, extensiveness of site work, etc. The use of natural systems in lieu of resource intensive man-made materials that are mined and manufactured is a key method to reducing the project's energy consumption. It is worth noting that a key benefit preserving historic buildings is they require far less energy than do new construction. It takes decades for most new buildings (even "green" buildings) to "work off" and conserve energy invested during its construction (for example, The *Greenest Building: Quantifying the Environmental Value of Building Reuse by the National Trust for Historic Preservation's Green Lab* estimates that it takes 10 to 80 years for a newly constructed building (one that is 30 percent more efficient than an average-performing existing building) to overcome, through efficient operations, the energy use and greenhouse gas emissions invested in its construction.	

RA 1.2 Support Sustainable Procurement Practice

Assessment Questions:
Will the project team establish a preference for using manufacturers, suppliers and service companies that have strong sustainable policies and practices?
Will the project team establish a sound and viable sustainable procurement program?
Does the project team intend to source a significant proportion of project materials, equipment, supplies and services from these companies?

Alt. A	**Alt. B**
Opportunity exists to review current procurement strategies for the golf course and clubhouse to identify local, lower impact products and suppliers.	Opportunity exists to plan procurement strategies for the park, clubhouse and facilities and identify local, lower impact products and suppliers. For example, materials and suppliers for events hosted on

	the site might procure for local, lower impact suppliers where possible.
Procurement and preferences for sustainable materials for either alternative is unknown at this time. The clubhouse renovation/reconstruction is an opportunity for both alternatives.	

RA 1.3 Use Recycled Materials

Assessment Questions:
Will the project team consider the appropriate reuse of existing structures and materials and incorporated them into the project?
Will the project team specify that a significant amount of materials with recycled content be used on the project?

Alt. A	**Alt. B**
Opportunity exists to review current recycling strategies for the golf course and clubhouse. This applies to both the clubhouse reconstruction project and long-term O&M.	Opportunity exists to plan recycling strategies for the park, clubhouse and facilities and identify local, lower impact products and suppliers that use recycled content. This applies to both the reconstruction project and long-term O&M.
Both alternatives consider the use of recycled materials. The clubhouse renovation/reconstruction is an opportunity for both Alt. A and Alt. B.	

RA 1.4 Use Regional Materials

Assessment Questions:
Will the project team work to identify local/regional sources of materials?
Will the project use a significant amount of locally sourced materials?

Alt. A	**Alt. B**
Opportunity exists to specify locally sourced materials for the park, clubhouse and facilities. This applies to both the reconstruction project and long-term O&M.	

RA 1.5 Divert Waste from Landfills

Assessment Questions:
Will the project team identify potential recycling and reuse destinations for construction and demolition waste generated on site?
Will the project team develop an operations waste management plan to decrease and divert project waste from landfills and incinerators during construction and operation?
Will the project divert a significant amount of project waste from landfills?

Alt. A	Alt. B
Both alternatives could divert equally waste from landfills. The exact amount of materials diverted from landfills is currently unknown.	
Both alternatives will identify potential recycle and re-use opportunities for materials related to demolition and waste. The clubhouse renovation/reconstruction is an opportunity for both alternatives.	

RA 1.6 Reduce Excavated Materials Taken Off Site

Assessment Questions:
Will the project be designed to balance cut and fill to reduce the amount of excavated material taken off site?
When necessary, will the project team taken steps to identify local sources/receivers of excavated material?
Will the project reuse a significant amount of suitable excavated material onsite?

Alt. A	Alt. B
Course renovations to incorporate the open channel at the northwest corner of the site could be performed to balance cut and fill on site.	Regrading and accommodation of the required flood storage on site could be performed to balance cut and fill on site. One disadvantage of Alt. B might be if any excavated material (cut for creating open water) needs to be disposed of offsite.
Both alternatives would need additional design to balance cut and fill quantities on site, if feasible.	

RA 1.7 Provide for Deconstruction and Recycling

Assessment Questions:
Will the project team assess whether materials specified can be easily recycled or reused after the useful life of the project has ended?
Will the project be designed so that a significant amount of project materials can be easily separated for recycling or readily reused at the end of the project's useful life?
Will the project team incorporate methods for increasing the likelihood of materials recycling when the project is operating?

Alt. A	Alt. B
Both alternatives have similar approaches to facility deconstruction and recycling. Both options assume the clubhouse is reconstructed.	

The amount of materials on-site that could be successfully deconstructed and sorted for recycling is unknown. Candidates include on-site concrete, reinforcing, bituminous pavement and composting organic matter/plants. Future clubhouse design could target this item as a performance goal.

RA 2.1 Reduce Energy Consumption

Assessment Questions:
Will the project team conduct reviews to identify options for reducing energy consumption during operations and maintenance of the constructed works?
Will the project team conducted feasibility studies and cost analyses to determine the most effective methods for energy reduction and incorporated them into the design?
Is the project expected to achieve significant reductions in energy consumption?

Alt. A	**Alt. B**
Continues pumping of groundwater and energy consumption for pumping.	Reduces groundwater pumping and reduces energy consumption associated with pumping.
Electrical load is likely to be similar to existing conditions.	Load could be less (due to less pumping), or could be greater than existing conditions with additional site facilities and power use. Much depends on how the design is executed and how the facilities are operated/maintained.
The clubhouse renovation/reconstruction is a daylighting, HVAC energy efficiency opportunity for both alternatives, and could consider how seasonal operations affect annual energy consumption patterns.	
Both alternatives consider options for reducing energy consumption.	

RA 2.2 Use Renewable Energy

Assessment Questions:
Will the owner and project team identify and analyze options to meet operational energy needs through renewable energy?
Will the project meet a significant amount of its energy needs through renewable energy?

Alt. A	**Alt. B**
Both alternatives treat equally the use/generation of renewable power and should be addressed during design phase.	
Both alternatives will assess the feasibility of incorporating renewable energy for any clubhouse renovation/reconstruction.	

RA 2.3 Commission and Monitor Energy Systems

Assessment Questions:
Does the owner and project team intend to conduct an independent commissioning of the project's energy and mechanical systems?
Will the project team assemble the necessary information needed to train operations and maintenance workers in a way that facilitates proper training and operations?
Will the design incorporate advanced monitoring systems, such as energy sub-meters, to enable more efficient operations?

Alt. A	**Alt. B**
Both alternatives would have similar energy monitoring systems.	
The clubhouse renovation/reconstruction is an opportunity for both alternatives.	

RA 3.1 Protect Fresh Water Availability

Assessment Questions:
Will the project team assess project water requirements?
Does the project team plan to conduct a comprehensive assessment of the project's long-term impacts on water availability?
Will the project only access water that can be replenished in both quantity and quality?
Will the project consider the impacts of fresh water withdrawal on receiving waters?
Will the project discharge into receiving waters meet quality and quantity requirements for high value aquatic species?
Will the project achieve a net-zero impact on water supply quantity and quality?
Will the project restore the quantity and quality of fresh water surface and groundwater supplies to an undeveloped native ecosystem condition?

Alt. A	**Alt. B**
Involves pumping of groundwater to a lower groundwater and flood elevations. Less aligned with protecting water availability and water quality than Alt. B.	Would involve the creation of a wetland feature that would help protect and promote high value aquatic species and remove runoff pollutants. The quantity of water use associated with this alternative is unknown. Whether or not this alternative could achieve a net-zero impact on water quantity and quality is unknown. This alternative reduces pumping of important groundwater resources.
Both alternatives will assess the water requirements and impacts associated with operation.	

RA 3.2 Reduce Potable Water Consumption

Assessment Questions:
Will the project team conduct planning or design reviews to identify potable water reduction strategies?
Will the project team conduct feasibility and cost analysis to determine the most effective methods for potable water reduction and incorporated them into the design?
Will the project achieve a substantial reduction in potable water consumption?
Will the project result in a net positive generation of water as a result of on-site recycling, purification, or treatment?

Alt. A	**Alt. B**
Uses non-potable water for golf course irrigation.	The increased number of users, bathrooms, and facilities on site could increase demand for potable water use.
For both scenarios, potable water consumption and re-use strategies are unknown at this early stage.	

RA 3.3 Monitor Water Systems

Assessment Questions:
Will the owner and project team conduct an independent commissioning/monitoring of the project's water systems in order to validate the design objectives?
Will the project design incorporate the means to monitor water performance during operations?
Will the project integrate long-term operations and impact monitoring to mitigate negative impacts and improve efficiency?
Will specific strategies be put in place to utilize monitoring and leak detection in order for the project to be more responsive to changing operating conditions?

Alt. A	**Alt. B**
Would require monitoring and reporting of water pumping as well as unknown conditions required by the MnDNR appropriations permit. Long-term strategies to monitor impacts and efficiencies would likely be integrated into Alt. A's design.	Would require an initial evaluation of water system design objectives. Would require monitoring and reporting of water pumping required by the MnDNR appropriations permit.

5.0 Envision Category 4 of 5: Natural World

According to ISI, *"Infrastructure projects have an impact on the natural world around them— the habitats, species, and non-living natural systems. The way a project is located within these systems and what new elements they may introduce into a system can create unwanted impacts. This section addresses how to understand and minimize negative impacts while considering ways in which the infrastructure can interact with natural systems in a synergistic, positive way. These types of interactions and impacts have been divided into the three sub-categories of Siting, Land and Water, and Biodiversity that make up 15 credits as seen in the figure at the right.*

Infrastructure should be sited to avoid direct and indirect impacts on important ecological areas. Projects should avoid areas of high ecosystem value or that serve as a diverse habitat, such as water bodies, wetlands, or temporary waters (vernal pools, etc.).

Infrastructure projects should have minimal impact on existing hydrologic and nutrient cycles. Special care should be taken to avoid the introduction of contaminants whether through stormwater runoff or pesticides and fertilizers. With proper forethought infrastructure can avoid these harmful disruptions.

Infrastructure projects should also minimize negative impacts on natural species and their habitats; on and near the site. Care should be taken to avoid introducing invasive species or inadvertently facilitating their spread. Infrastructure projects should minimize habitat fragmentation and promote habitat connectivity and animal movement. Species of new vegetation should be carefully selected and appropriate for the location. Infrastructure should not adversely impact wetland surface water quality."

Category Credits:

NATURAL WORLD
15 Credits

1 SITING

NW1.1 Preserve Prime Habitat
NW1.2 Preserve Wetlands and Surface Water
NW1.3 Preserve Prime Farmland
NW1.4 Avoid Adverse Geology
NW1.5 Preserve Floodplain Functions
NW1.6 Avoid Unsuitable Development on Steep Slope
NW1.7 Preserve Greenfields

2 LAND+WATER

NW2.1 Manage Stormwater
NW2.2 Reduce Pesticides and Fertilizer Impacts
NW2.3 Prevent Surface and Groundwater Contaminatio

3 BIODIVERSITY

NW3.1 Preserve Species Biodiversity
NW3.2 Control Invasive Species
NW3.3 Restore Disturbed Soils
NW3.4 Maintain Wetland and Surface Water Function

NW0.0 Innovate or Exceed Credit Requirements

Natural World

Summary of key take-aways:

- Alt. B presents the MPRB an opportunity to showcase natural resources on this site.
- Alt. B presents distinct advantages related to habitat restoration, floodplain management, ecosystem services and biodiversity. The potential exists to increase both the quality and scale of natural areas on site, and to use this asset to educate, engage and entertain the public about the natural world.
- Alt. B better addresses stormwater runoff pollution to meet runoff nutrient Total Maximum Daily Load (TMDL) requirements.
- Alt. B better balances groundwater and surface water interaction and reduces the amount of groundwater pumping on site.
- Alt. A could perform better than the existing 18-hole golf course by restoring an open channel and implementing measures to naturalize areas, reduce herbicide and pesticide use, etc.

Opportunities to Further Enhance Sustainability:

- The management approach and funding available for Alt. B is important for establishing a balanced ecological system and preventing incursion by invasives, etc.

NW 1.1 Preserve Prime Habitat

Assessment Questions:
Will the project team take steps to identify and document areas of prime habitat near or on the site?
Will the project avoid development on land that is judged to be prime habitat?
Will the project establish a minimum 300 ft. natural buffer zone around all areas deemed prime habitat?
Will the project significantly increase the area of prime habitat through habitat restoration?
Will the project improve habitat connectivity by linking habitats?

Alt. A	**Alt. B**
Does not reduce the quantity of existing prime habitat, nor will it result in significant creation of new habitat. Increasing the number and diversity of trees and native plants on site will result in some additional habitat. A minimum mapping unit for the MnDNR's land cover classification system is 1.23 acres for natural areas and 2.47 acres for cultural communities (impervious, turf, planted, etc). Contiguous habitat improvement over 1 acre is not likely given the space needs of the golf course.	Would result in the restoration of shoreline and riparian habitat, and the creation of significant areas of wetland, upland, riparian and shoreline habitat.
Limited potential long-term for reforestation.	High potential long-term for reforestation.
	Connecting the proposed wetland and upland habitat to nearby existing habitat patches could be accomplished through shoreline and riparian restoration efforts. Improved habitat along Minnehaha Creek would serve as a corridor for species to move from the proposed wetland, to the Lake Nokomis area, to the south, and/ or to Lake Hiawatha.

NW 1.2 Protect Wetlands and Surface Water

Assessment Questions:
Will the project avoid development on wetlands, shorelines, and waterbodies?
Will the project maintain soil protection zones around all wetlands, shorelines, and waterbodies?
Will the project restore degraded existing buffer zones to a natural state?

Alt. A	Alt. B
Would not result in a significant increase of additional wetland buffers, wetlands, or vegetation soil protection zones.	Would allow for the creation of larger buffer zones around wetlands, shorelines, and creek edges. 50-foot minimum buffer would need to be established to gain credits for this category, which is currently proposed for the re-meander of Minnehaha Creek.

NW 1.3 Preserve Prime Farmland

Assessment Questions:
Will this project avoid development on land designated as prime farmland?

Alt. A	Alt. B
Not applicable to either alternative. There is no existing farmland on the site. Alt. B does however present an opportunity to re-purpose some land for urban agriculture in the future.	

NW 1.4 Avoid Adverse Geology

Assessment Questions:
Will the project team identify and address the impacts of sensitive or adverse geology?
Will the project be designed to safeguard aquifers and to preserve groundwater resources?
Will the project be designed to reduce the risk of damage from adverse geology?

Alt. A	Alt. B
Does not necessarily reduce the long-term risk of damage to the course due to subsidence (soil settlement). Wetland soils have been subsiding and will continue unless otherwise mitigated. This could affect golf conditions and drive maintenance costs.	Reduces the site's vulnerability to needing costly repairs if further settlement occurs. By locating constructed features outside of settlement-prone areas and by replacing golf areas with naturalize landscapes, areas of soil settlement are less likely to create maintenance needs.
Alt. A pumps in excess of the existing MnDNR permit pumping limits.	Alt. B reduces pumping of Stormwater, Creek and Lake seepage and regional groundwater.
Both projects will identify and if necessary address the impacts of the project on any sensitive or adverse geology that may or may not be present.	
The presence of sensitive geology (Karst) has not been identified through initial evaluation. Design considerations that reduce the risk of damage from adverse geology are not applicable to either alternative.	

NW 1.5 Preserve Floodplain Functions

Assessment Questions:
Will the project avoid or limit development within the design frequency floodplain?
Will the project maintain pre-development floodplain infiltration and water quality?
Will the project design incorporate a flood emergency operations and/or evacuation plan?
Will the project maintain or enhance riparian and aquatic habitat, including aquatic habitat connectivity?
Will the project maintain sediment transport?
Does the project team intend to modify or remove infrastructure subject to frequent damage by floods?

Alt. A	**Alt. B**
Utilizes an energy-intensive pumping solution to maintain current flood protection, groundwater levels and floodplain storage levels.	Eliminates high maintenance areas located below 100-year flood levels and reduces reliance on pumping.
	Would enhance riparian and aquatic habitat. Restored habitat throughout 10 year and 100-year floodplain areas are expected.
	Would eliminate the need for berm maintenance and reduce the infrastructure needed to protect property though frequent sustained pumping.
Both alternatives consider the effects of flooding and have strategies to manage/mitigate flooding. The alternatives approach flood risk reduction using different techniques, however.	

NW 1.6 Avoid Unsuitable Development on Steep Slopes

Assessment Questions:
Will the project team use best management practices to manage erosion and prevent landslides?
Will the project team minimize or avoid all development on or disruption to steep slopes?

Alt. A	**Alt. B**
Both alternatives manage erosion to meet standards set by the MPCA, MCWD, City and other applicable regulatory agencies	
Landslide hazards at steep slopes are not a documented risk of either alternative.	

NW 1.7 Preserve Greenfields

Assessment Questions:
Will the project team consider how the project can conserve undeveloped land?
Will a significant amount of the project development be located on previously developed sites?

Alt. A	**Alt. B**
Would likely just involve upgrading existing golf features with additional small areas of wetlands and native plant community restorations. The extent of these improvements is limited by the space required for the playable golf course.	Would redevelop altered landscape and previously developed land (Envision describes “greyfield” as developed or altered landscape).

NW 2.1 Manage Stormwater

Assessment Questions:
Will the project be designed to reduce storm runoff to pre-development conditions?
Will the project be designed to significantly improve water storage capacity?

Alt. A	**Alt. B**
Will not significantly improve water storage capacity. If elevations of greens and fairways were raised to reduce impacts of flooding to the golf course we may expect a reduction in water storage capacity and/or increased settlement.	Will significantly improve water storage capacity.
	Will reduce runoff pollution and to a larger degree help meet the TMDL requirements for this area.
For both alternatives, stormwater management may be designed to meet minimum regulatory design standards for any given storm event. Parts of the system could be designed to mimic predevelopment conditions.	

NW 2.2 Reduce Pesticides and Fertilizer Impacts

Assessment Questions:
Will operational policies be put in place to control and reduce the application of fertilizers and pesticides?
Will the project include runoff controls to minimize contamination of ground and surface water?
Will the project team select landscaping plants to minimize the need for fertilizer or pesticides?

Will the project team select fertilizers and pesticides appropriate for site conditions with low-toxicity, persistence, and bioavailability?
Will the project designed to eliminate the need for pesticides or fertilizers?

Alt. A	Alt. B
The MPRB is implementing strategies to reduce the application frequency and volume of fertilizers and pesticides used on the course by utilizing more effective and targeted applications. Additional training for applicators will help minimize fertilizer and pesticide risks.	Would reduce acreage of highly managed turf and ornamental plantings and replace much of it with open water, habitat restorations and native plant community restorations. Alt. B will include some turf areas also, but far less than Alt. A.
	Herbicide use can still be expected for invasive species management within the proposed wetland and upland areas. As vegetation becomes established the use of herbicides will likely decrease.

NW 2.3 Prevent Surface and Groundwater Contamination

Assessment Questions:
Will the project team conduct or acquire hydrologic delineation studies?
Will spill and leak prevention and response plans and design be incorporated into the design?
Will the project design reduce or eliminate potentially polluting substances from the project?
Will the project team seek to reduce future contamination by cleaning up areas of contamination and instituting land use controls to limit the introduction of future contamination sources?

Alt. A	Alt. B
Does not prevent or eliminate the potential for herbicide and fertilizer migration into ponds which feed into Lake Hiawatha.	Would significantly reduce the potential for groundwater or surface water contamination. Developed golf course areas would be converted into wetlands.
Opportunity exists to trap and collect trash in the new stretch of open channel.	Opportunity exists to trap and collect trash in the new stretch of Minnehaha Creek.
Contamination has not been identified in site soil or groundwater.	

NW 3.1 Preserve Species Biodiversity

Assessment Questions:
Will the project team identify existing habitats on and near the project site?
Will the project protect existing habitats?
Will the project increase the quality or quantity of existing habitat?

Will the project preserve or improve wildlife movement corridors?

Alt. A	Alt. B
Will likely preserve existing habitat but not increase habitat area.	Involves the development of new shoreline, riparian, wetland and upland habitats.
	Minnehaha Creek serves as a wildlife corridor. This alternative involves re-aligning the creek to its original course. Wildlife movement can be improved by constructing more natural stream bank slopes and revegetating the creek with native plants.
The implementation of both alternatives would identify existing habitats.	

NW 3.2 Control Invasive Species

Assessment Questions:
Will the project team specify locally appropriate and non-invasive plants on the site?
Will the project team implement a comprehensive management plan to identify and control or eliminate invasive species?
Will the project team implement a comprehensive management plan to prevent or mitigate the future encroachment of invasive species?

Alt. A	Alt. B
Invasive species management would likely continue to be limited to maintain existing golf course play. Existing invasive species are mostly relegated to water edges and out of play areas. This will likely continue without additional resources and staff.	Will require a comprehensive invasive species management plan to eliminate exiting invasive species (broadleaf Cattail, reed canary grass, smooth brome, thistle, etc.) and prevent the establishment of these species after construction. Invasive species control is essential if biodiversity and habitat is to be improved.
	Management of invasive species for this alternative would depend on O&M Plan and dedicated O&M funding.

NW 3.3 Restore Disturbed Soils

Assessment Questions:
Will the project restore 100% of soils disturbed during construction?
Will the project restore 100% of soils disturbed by previous development?

Alt. A	Alt. B

Both alternatives will restore disturbed soils during construction.

NW 3.4 Maintain Wetland and Surface Water Functions

Assessment Questions:
Will the project maintain or enhance hydrologic connection?
Will the project maintain or enhance water quality?
Will the project maintain or enhance habitat?
Will the project maintain or restore sediment transport?
Will wetlands and surface water be maintained or restored to a fully functioning aquatic and riparian ecosystem?

Alt. A	**Alt. B**
Will only slightly improve ecosystem functions with new small areas of wetlands, open channel and native plant community restorations.	Will enhance all ecosystem functions listed within this category. New large areas of wetlands, open water and native plant community restorations are proposed. Reduced pumping encourages restoration of more naturalized hydrology on the site.
For Alt. A habitat and sediment transport functions will be maintained (not made worse).	By removing berms and reducing pumping Alt. B will restore the hydrologic connection between Minnehaha Creek, Lake Hiawatha, and the proposed wetland.
Continued pumping to maintain golf facilities for Alt. A will have a continued negative impact on hydrologic connections and water quality for Lake Hiawatha and Minnehaha Creek.	Restoring the hydrologic connection throughout the site will create more acres of enhanced habitat.

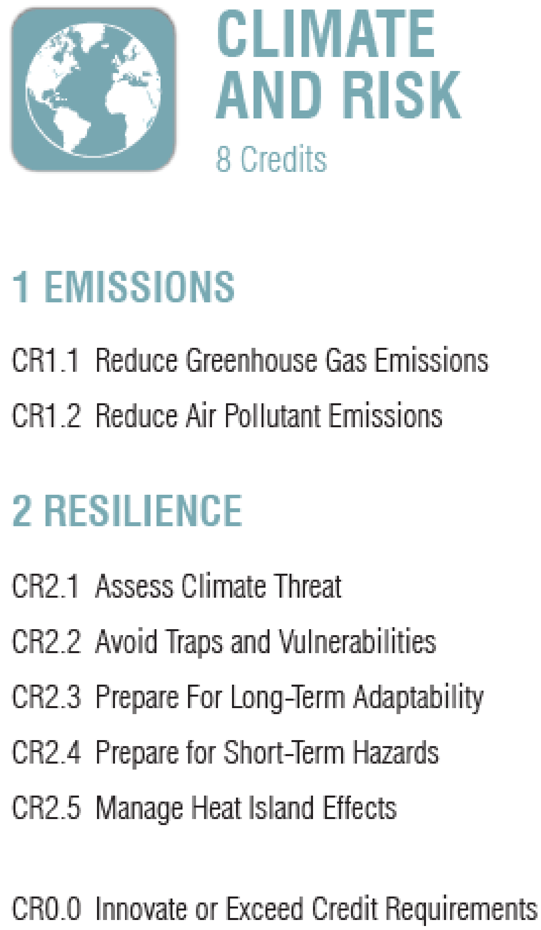
6.0 Envision Category 5 of 5: Climate and Risk

According to ISI, "*The general scope of Climate and Risk is two-fold; to minimize emissions that may contribute to increased short and long-term risks and to ensure infrastructure projects are resilient to short-term hazards or altered long-term future conditions. The Climate and Risk category is divided into two sub-categories: Emissions and Resilience that make up 8 credits as seen in the figure at the right.*

The goal of this subcategory is the understanding and reduction of dangerous emissions — both greenhouse gas emissions as well as other dangerous pollutants — during all stages of a project's life cycle. These emissions can increase both short and long-term risk to the project. Minimizing this risk helps to protect against future problems and increase the life cycle of the project. While reducing greenhouse gas emissions may not have a direct impact on the consequences to the particular project, it can help to reduce overall global risk and has contributions far beyond the site borders of the project.

Resilience includes the ability to withstand short-term risks, such as flooding or fires, and the ability to adapt to changing long-term conditions, such as changes in weather patterns, sea level rise, or changes in climate. Understanding the types of risks and probability of risks allows the project team to deliver and informed project design that anticipates and withstands or adapts to these risks, minimizing its overall vulnerability. Increased adaptability and decreased vulnerability ensures a longer useful life and ensures that the project will be able to meet the future needs of the community."

Category Credits:



Climate and Risk

Summary of key take-aways:

- Both Alt. A and Alt. B were evaluated using impact assessments related to large precipitation event scenarios and flood risk mitigation.
- Alt. B presents advantages to build future resilience against flooding by reducing groundwater pumping and naturalizing the space to better manage water levels on the site.
- Alt. B presents advantages to avoid pumping groundwater during times of drought.
- Alt. B presents advantages with avoiding irrigation large turf areas during times of drought.
- Alt. A presents advantages by continuing the existing site use and avoiding large-scale reconstruction of the site and associated investment of greenhouse gas emissions.
- Alt. A presents disadvantages related to electricity and energy consumption for pumping groundwater and continued maintenance activities for turf areas of the golf course.

Opportunities to Further Enhance Sustainability:

- Consider how the proposed project might be exposed to:
  - …hazards (extreme precipitation and flooding, drought, high winds, heat waves, winter minimum temperature increase & ice storms, etc.)
  - …that create risks (flooded basements, aquifer depletion, grid electricity interruption, loss of revenue for winter events, risk of injuries on ice, etc.)
  - … because vulnerabilities might exist (reliance on unsustainable fuels, communities of children, elderly, the sick, possible budget volatility, lack of "rainy day" funds, drought planning, mitigating risk of injury on ice, invasive pests, public health, etc.).
  - …unless there is an action plan.
- Does this project and site create opportunities to build resilience against such vulnerabilities?

CR1.1 Reduce Greenhouse Gas Emissions

Assessment Questions:
Will a life-cycle carbon assessment be conducted on the project?
Based on the life-cycle carbon assessment, will the project be designed in a way that substantially reduces greenhouse gas emissions?

Alt. A	**Alt. B**
A greenhouse gas (GHG) inventory has not been performed for either alternative. A life cycle assessment (LCA) that considers GHG emissions for the extraction, manufacture, transport, construction, operation and end-of-life would be necessary to estimate this. For example, factors that contribute to higher GHG emissions include use of metals, electricity, fossil fuel, potable water use, long-term energy use, extensiveness of site work, etc. Reducing long-term consumption of fuel, fossil fuel electricity, man-made materials (mined & manufactured), potable water, vehicle miles travelled can all contribute to a lower GHG footprint.	
Long-term electricity use for pumping generates greenhouse gas emissions.	Alt. B has the advantage of reduced long-term electricity use for pumping and associated greenhouse gas emissions.
	Long- term vehicle emissions (VMT) for travel to/from the park could increase for Alt. B. due to the increased number of users.
	GHG emissions related to construction could be higher for Alt. B., depending on the complexity and scale of reconstruction activity.
The clubhouse facility renovation/reconstruction is an opportunity to reduce greenhouse gas emissions.	

CR 1.2 Reduce Air Pollutant Emissions

Assessment Questions:
Will the project be designed in a way that substantially reduces dust and odors on the site?
Will the project be designed in a way that substantially exceeds the National Ambient Air Quality Standards (NAAQS) for the six criteria pollutants?

Alt. A	**Alt. B**
Ongoing O&M for the golf course is responsible for air pollution, when considering the life cycle impacts of fuel, fertilizer and electricity consumption due to pumping.	Long- term emissions due to vehicle miles travelled (VMT) for travel to/from the park could increase for Alt. B. due to the increased number of users.
	Air emission related to construction could be higher for Alt. B., depending on the complexity and scale of reconstruction activity.

Wetland quality and odors could be factors for both Alt. A and Alt. B.
The clubhouse facility renovation/reconstruction is an opportunity to reduce air pollutant emissions.

CR 2.1 Assess Climate Threat

Assessment Questions:
Will the project team develop a Climate Impact Assessment and Adaptation Plan?

Alt. A	**Alt. B**
Both Alt. A and Alt. B were evaluated using impact assessments related to large precipitation event scenarios. Strategies to mitigate risk are proposed for both.	
Both Alt. A and Alt. B would benefit from an assessment of hazards, risks and vulnerabilities related to climate in addition to extreme precipitation. For example, drought, high winds, heat waves, winter minimum temperature increase & ice storms, etc.	

CR 2.2 Avoid Traps and Vulnerabilities

Assessment Questions:
Will a comprehensive review be conducted to identify the potential risks and vulnerabilities that would be created or made worse by the project?
Will the owner or the project team alter the design to reduce or eliminate these risks and vulnerabilities?

Alt. A	**Alt. B**
The user group for Alt. A is primarily golfers and any new users of a renovated clubhouse.	The user group for Alt. B is likely to be far more diverse, and will include more users. They will use the site for more recreational activities at more times during the year. This community of users presents a different vulnerability profile than is expected for Alt. A.
	Alt. B should assess potential for invasive species migration due to climate change and human impacts. Alt. B will attempt to avoid the trap of under-planning for necessary landscape maintenance during establishment.
Assess vulnerabilities related to winter activities for either scenario (winter event planning). Year round activities – how does winter freeze thaw contribute to risks associated with year	

round activity on site? Does uncertainty with winter snow and ice conditions affect long-term revenue planning for winter events?
The future development of a vulnerability assessment and adaptation plan for either scenario is unknown. Risk may exist with extreme precipitation, drought, changes to winter weather patterns, public health and pest risks, electricity. A plan to avoid traps and build resilience against these risks could be valuable as design development proceeds.
Vulnerability to flood risk is well-investigated and flood risk mitigation strategies are well understood for both Alt. A and Alt. B.

CR 2.3 Prepare for Long-Term Adaptability

Assessment Questions:
Will the project be designed to accommodate a changing operating environment throughout the project life cycle?

Alt. A	**Alt. B**
Alt. A does not accommodate changing hydrologic scenarios. In a large storm event, flooding damage similar to what occurred in 2014, or worse, could occur again.	Alt. B is to be designed to be resilient against landscape damage from larger storm events without significant pumping or emergency measures. This reduces pressure to fund rapid-response repair.
Alt. A is susceptible to drought and golf course flooding (pumping for irrigation or pumping to reduce risk to properties). Continued pressure to fund rapid-response repair.	Alt. B restored plant communities may be more adapted to changing (warming) climate and more tolerant to inundation and drought.
	The flexibility of the naturalized landscape to respond to the range of possible future changes to climate will be advantageous.
	The flexibility of the site uses and the diversity of site users could make the park quite adaptable to future changes, provided adaptive management continues to evaluate and adjust in the years ahead.
Both Alternatives involve impact assessments related to a large storm event scenario.	

CR 2.4 Prepare for Short-Term Hazards

Assessment Questions:
Will a hazard analysis be conducted covering the likely natural and human-induced hazards in the project area?
Will the project be designed so that is it is able to recover quickly and cost-effectively from short-term hazard events?

<table>
<tr><th>Alt. A</th><th>Alt. B</th></tr>
<tr><td>Alt. A does not accommodate changing hydrologic scenarios. In a large storm event, we could see flooding damage similar to what occurred in 2014, or worse. Continued pressure to fund rapid-response repair.</td><td>Alt. B could be designed so the landscape is more resilient against larger storm events without significant pumping or emergency measures. This reduces pressure to fund rapid-response repair.</td></tr>
<tr><td>Alt. A is susceptible to drought and flooding (pumping for irrigation or pumping to reduce risk to properties).</td><td></td></tr>
<tr><td colspan="2">Both Alt. A and Alt. B could take measures to create an emergency “rainy day fund” to help deal with repair or improvement needs at short notice.</td></tr>
<tr><td colspan="2">Both Alternatives involve impact assessments related to a large storm event scenario.</td></tr>
<tr><td colspan="2">Both Scenarios take into account short term hazards on some level. Further analysis would be necessary to compare the performance level of each alternative.</td></tr>
</table>

CR 2.5 Manage Heat Island Effects

Assessment Questions:
Will the project be designed to reduce heat island effects by reducing the percentage of low solar reflectance index (SRI) surfaces?

<table>
<tr><th>Alt. A</th><th>Alt. B</th></tr>
<tr><td></td><td>Alt. B may create more public outdoor spaces in shade and water available for users to spend time in during hot spells.</td></tr>
<tr><td colspan="2">The potential for a cooling center on site is equal for both Alt. A and Alt. B considering the clubhouse renovation is part of both.</td></tr>
<tr><td colspan="2">Both alternatives could slightly increase the area of paved surfaces on site (parking areas and trails). Both alternatives result in a majority of the site being covered with low SRI vegetation.</td></tr>
</table>

7.0 Attachments – Envision Screening Worksheets for Alternative A and Alternative B

ISI Envision Framework

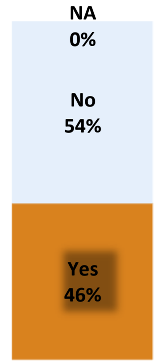
		Intent of the Credit	Metric
	QUALITY OF LIFE Community and People		
QL1.1	Improve community quality of life	Improve the net quality of life of all communities affected by the project and mitigate negative impacts to communities.	Metric: Measures taken to assess community needs and improve quality of life while minimizing negative impacts.
QL1.2	Stimulate sustainable growth and development	Support and stimulate sustainable growth and development, including improvements in job growth, capacity building, productivity, business attractiveness and livability.	Metric: Assessment of the project's impact on the community's sustainable economic growth and development.
QL1.3	Develop local skills and capabilities	Expand the knowledge, skills and capacity of the community workforce to improve their ability to grow and develop.	Metric: The extent to which the project will improve local employment levels, skills mix and capabilities.
QL2.1	Enhance public health and safety	Take into account the health and safety implications of using new materials, technologies or methodologies above and beyond meeting regulatory requirements.	Metric: Efforts to exceed normal health and safety requirements, taking into account additional risks in the application of new technologies, materials and methodologies.
QL2.2	Minimize noise and vibration	Minimize noise and vibration generated during construction and in the operation of the completed project to maintain and improve community livability.	Metric: The extent to which noise and vibration will be reduced during construction and operation.
QL2.3	Minimize light pollution	Prevent excessive glare, light at night, and light directed skyward to conserve energy and reduce obtrusive lighting and excessive glare.	Metric: Lighting meets minimum standards for safety but does not spill over into areas beyond site boundaries, nor does it create obtrusive and disruptive glare.
QL2.4	Improve community mobility and access	Locate, design and construct the project in a way that eases traffic congestion, improves mobility and access, does not promote urban sprawl, and otherwise improves community livability.	Metric: Extent to which the project improves access and walkability, reductions in commute times, traverse times to existing facilities and transportation. Improved user safety considering all modes, e.g., personal vehicle, commercial vehicle, transit and bike/pedestrian.
QL2.5	Encourage alternative modes of transportation	Improve accessibility to non-motorized transportation and public transit. Promote alternative transportation and reduce congestion.	Metric: The degree to which the project has increased walkability, use of public transit, non-motorized transit.
QL2.6	Improve site accessibility, safety and wayfinding	Improve user accessibility, safety, and wayfinding of the site and surrounding areas.	Metric: Clarity, simplicity, readability and broad-population reliability in wayfinding, user benefit and safety.
QL3.1	Preserve historic and cultural resources	Preserve or restore significant historical and cultural sites and related resources to preserve and enhance community cultural resources.	Metric: Summary of steps taken to identify, preserve, or restore cultural resources.
QL3.2	Preserve views and local character	Design the project in a way that maintains the local character of the community and does not have negative impacts on community views.	Metric: Thoroughness of efforts to identify important community views and aspects of local landscape, including communities, and incorporate them into the project design.
QL3.3	Enhance public space	Improve existing public space including parks, plazas, recreational facilities, or wildlife refuges to enhance community livability.	Metric: Plans and commitments to preserve, conserve, enhance and/or restore the defining elements of the public space.
	LEADERSHIP Leadership, collaboration, outreach		
LD1.1	Provide effective leadership and commitment	Provide effective leadership and commitment to achieve project sustainability goals.	Metric: Demonstration of meaningful commitment of the project owner and the project team to the principles of sustainability and sustainable performance improvement.
LD1.2	Establish a sustainability management system	Create a project management system that can manage the scope, scale and complexity of a project seeking to improve sustainable performance.	Metric: The organizational policies, authorities, mechanisms, and business processes that have been put in place and the judgment that they are sufficient for the scope, scale, and complexity of the project.
LD1.3	Foster collaboration and teamwork	Eliminate conflicting design elements, and optimize system by using integrated design and delivery methodologies and collaborative processes.	Metric: The extent of collaboration within the project team and the degree to which project delivery processes incorporate whole systems design and delivery approaches.
LD1.4	Provide for stakeholder involvement	Establish sound and meaningful programs for stakeholder identification, engagement and involvement in project decision making.	Metric: The extent to which project stakeholders are identified and engaged in project decision making. Satisfaction of stakeholders and decision makers in the involvement process.
LD2.1	Pursue by-product synergy opportunities	Reduce waste, improve project performance and reduce project costs by identifying and pursuing opportunities to use unwanted by-products or discarded materials and resources from nearby operations.	Metric: The extent to which the project team identified project materials needs and sought out nearby facilities with by-product resources that could meet those needs and capture synergy opportunities.
LD2.2	Improve infrastructure integration	Design the project to take into account the operational relationships among other elements of community infrastructure which results in an overall improvement in infrastructure efficiency and effectiveness.	Metric: The extent to which the design of the delivered works integrates with existing and planned community infrastructure and results in a net improvement in efficiency and effectiveness.
LD3.1	Plan for long-term monitoring and maintenance	Put in place plans and sufficient resources to ensure as far as practical that ecological protection, mitigation and enhancement measures are incorporated in the project and can be carried out.	Metric: Comprehensiveness and detail of long-term monitoring and maintenance plans and commitment of resources to fund the activities.
LD3.2	Address conflicting regulations and policies	Work with officials to Identify and address laws, standards, regulations or policies that may unintentionally create barriers to implementing sustainable infrastructure.	Metric: Efforts to identify and change laws, standards, regulations and/or policies that may unintentionally run counter to sustainability goals, objectives, and practices.
LD3.3	Extend useful life	Extend a project's useful life by designing a completed project that is more durable, flexible, and resilient.	Metric: The degree to which the project team incorporates full life cycle thinking to improve the durability, flexibility, and resilience of the project.
	RESOURCE ALLOCATION Renewable and sustainable resources		
RA1.1	Reduce net embodied energy	Conserve energy by reducing the net embodied energy of project materials over the project life.	Metric: Percentage reduction in net embodied energy from a life cycle energy assessment.
RA1.2	Support sustainable procurement practices	Obtain materials and equipment from manufacturers and suppliers who implement sustainable practices.	Metric: Percentage of materials sourced from manufacturers that meet sustainable practices requirements.
RA1.3	Use recycled materials	Reduce the use of virgin materials and avoid sending useful materials to landfills by specifying reused materials, including structures, and material with recycled content.	Metric: Percentage of project materials that are reused or recycled.
RA1.4	Use regional materials	Minimize transportation costs and impacts and retain regional benefits through specifying local sources.	Metric: Percentage of project materials by type and weight or volume sourced within the required distance.
RA1.5	Divert waste from landfills	Reduce waste and divert waste streams away from disposal to recycling and reuse.	Metric: Percentage of total waste diverted from disposal.
RA1.6	Reduce excavated materials taken off site	Minimize the movement of soils and other excavated materials off site to reduce transportation and environmental impacts.	Metric: Percentage of excavated material retained on site.

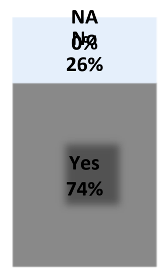
RA1.7	Provide for deconstruction and recycling	Encourage future recycling, up-cycling, and reuse by designing for ease and efficiency in project disassembly or deconstruction at the end of its useful life.	Metric: Percentage of components that can be easily separated for disassembly or deconstruction.
RA2.1	Reduce energy consumption	Conserve energy by reducing overall operation and maintenance energy consumption throughout the project life cycle.	Metric: Percentage of energy reduction achieved.
RA2.2	Use renewable energy	Meet energy needs through renewable energy sources.	Metric: Extent to which renewable energy resources are incorporated into the design, construction, and operation.
RA2.3	Commission and monitor energy systems	Ensure efficient functioning and extend useful life by specifying the commissioning and monitoring of the performance of energy systems.	Metric: Third party commissioning of electrical and mechanical systems and documentation of system monitoring equipment in the design.
RA3.1	Protect fresh water availability	Reduce the negative net impact on fresh water availability, quantity and quality.	Metric: The extent to which the project uses fresh water resources without replenishing those resources at its source.
RA3.2	Reduce potable water consumption	Reduce overall potable water consumption and encourage the use of greywater, recycled water, and stormwater to meet water needs.	Metric: Percentage of water reduction.
RA3.3	Monitor water systems	Implement programs to monitor water systems performance during operations and their impacts on receiving waters.	Metric: Documentation of system in the design.
	NATURAL WORLD Siting/routing, land, water, biodiversity		
NW1.1	Preserve prime habitat	Avoid placing the project – and the site compound/temporary works – on land that has been identified as of high ecological value or as having species of high value.	Metric: Avoidance of high ecological value sites and establishment of protective buffer zones.
NW1.2	Protect wetlands and surface water	Protect, buffer, enhance and restore areas designated as wetlands, shorelines, and waterbodies by providing natural buffer zones, vegetation and soil protection zones.	Metric: Size of natural buffer zone established around all wetlands, shorelines, and waterbodies.
NW1.3	Preserve prime farmland	Identify and protect soils designated as prime farmland, unique farmland, or farmland of statewide importance.	Metric: Percentage of prime farmland avoided during development.
NW1.4	Avoid adverse geology	Avoid development in adverse geologic formations and safeguard aquifers to reduce natural hazards risk and preserve high quality groundwater resources.	Metric: Degree to which natural hazards and sensitive aquifers are avoided and geologic functions maintained.
NW1.5	Preserve floodplain functions	Preserve floodplain functions by limiting development and development impacts to maintain water management capacities and capabilities.	Metric: Efforts to avoid floodplains or maintain predevelopment floodplain functions.
NW1.6	Avoid unsuitable development on steep slopes	Protect steep slopes and hillsides from inappropriate and unsuitable development in order to avoid exposures and risks from erosion and landslides, and other natural hazards.	Metric: The degree to which development on steep slopes is avoided or to which erosion control and other measures are used to protect the constructed works and other downslope structures.
NW1.7	Preserve greenfields	Conserve undeveloped land by locating projects on previously developed greyfield sites and/or sites classified as brownfields.	Metric: Percentage of site that is a greyfield or the use and cleanup of a site classified as a brownfield.
NW2.1	Manage stormwater	Minimize the impact of infrastructure on stormwater runoff quantity and quality.	Metric: Infiltration and evapotranspiration capacity of the site and return to pre-development capacities.
NW2.2	Reduce pesticide and fertilizer impacts	Reduce non-point source pollution by reducing the quantity, toxicity, bioavailability and persistence of pesticides and fertilizers, or by eliminating the need for the use of these materials.	Metric: Efforts made to reduce the quantity, toxicity, bioavailability, and persistence of pesticides and fertilizers used on site, including the selection of plant species and the use of integrated pest management techniques.
NW2.3	Prevent surface and groundwater contamination	Preserve fresh water resources by incorporating measures to prevent pollutants from contaminating surface and groundwater and monitor impacts over operations.	Metric: Designs, plans, and programs instituted to prevent and monitor surface and groundwater contamination.
NW3.1	Preserve species biodiversity	Protect biodiversity by preserving and restoring species and habitats.	Metric: Degree of habitat protection.
NW3.2	Control invasive species	Use appropriate non-invasive species and control or eliminate existing invasive species.	Metric: Degree to which invasive species have been reduced or eliminated.
NW3.3	Restore disturbed soils	Restore soils disturbed during construction and previous development to bring back ecological and hydrological functions.	Metric: Percentage of disturbed soils restored.
NW3.4	Maintain wetland and surface water functions	Maintain and restore the ecosystem functions of streams, wetlands, waterbodies and their riparian areas.	Metric: Number of functions maintained and restored.
	CLIMATE AND RISK Emissions, hazards, resilience		
CR1.1	Reduce greenhouse gas emissions	Conduct a comprehensive life-cycle carbon analysis and use this assessment to reduce the anticipated amount of net greenhouse gas emissions during the life cycle of the project, reducing project contribution to climate change.	Metric: Life-cycle net carbon dioxide equivalent (CO_2e) emissions.
CR1.2	Reduce air pollutant emissions	Reduce the emission of six criteria pollutants; particulate matter (including dust), ground level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, lead, and noxious odors.	Metric: Measurements of air pollutants as compared to standards used.
CR2.1	Assess climate threat	Develop a comprehensive Climate Impact Assessment and Adaptation Plan.	Metric: Summary of steps taken to prepare for climate variation and natural hazards.
CR2.2	Avoid traps and vulnerabilities	Avoid traps and vulnerabilities that could create high, long-term costs and risks for the affected communities.	Metric: The extent of the assessment of potential long-term traps, vulnerabilities, and risks due to long-term changes such as climate change and the degree to which these were addressed in the project design and in community design criteria.
CR2.3	Prepare for long-term adaptability	Prepare infrastructure systems to be resilient to the consequences of long-term climate change, perform adequately under altered climate conditions, or adapt to other long-term change scenarios.	Metric: The degree to which the project has been designed for long-term resilience and adaptation.
CR2.4	Prepare for short-term hazards	Increase resilience and long-term recovery prospects of the project and site from natural and man-made short-term hazards.	Metric: Steps taken to improve protection measures beyond existing regulations.
CR2.5	Manage heat island effects	Minimize surfaces with a low solar reflectance index (SRI) to reduce localized heat accumulation and manage microclimates.	Metric: Percentage of site area that meets SRI Criteria.

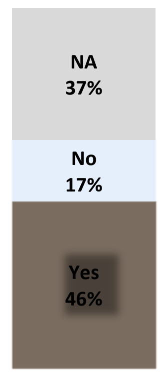
Alt. A 5/11/2017 - DRAFT

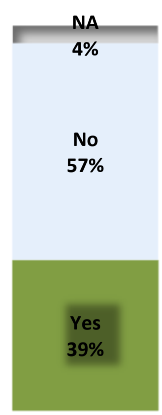
Envision™ Checklist

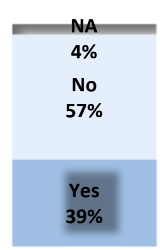
				Y	N	NA	
1	QUALITY OF LIFE	PURPOSE	QL1.1 Improve community quality of life	2	1	0	2 of 3
2			QL1.2 Stimulate sustainable growth and development	0	3	0	0 of 3
3			QL1.3 Develop local skills and capabilities	2	1	0	2 of 3
4		WELLBEING	QL2.1 Enhance public health and safety	0	1	0	0 of 1
5			QL2.2 Minimize noise and vibration	1	0	0	1 of 1
6			QL2.3 Minimize light pollution	1	0	0	1 of 1
7			QL2.4 Improve community mobility and access	1	2	0	1 of 3
8			QL2.5 Encourage alternative modes of transportation	1	1	0	1 of 2
9			QL2.6 Improve site accessibility, safety and wayfinding	1	2	0	1 of 3
10		COMMUNITY	QL3.1 Preserve historic and cultural resources	2	0	0	2 of 2
11			QL3.2 Preserve views and local character	1	1	0	1 of 2
12			QL3.3 Enhance public space	0	2	0	0 of 2
			TOTAL	**12**	**14**	**0**	12 of 26
13	LEADERSHIP	COLLABORATION	LD1.1 Provide effective leadership and commitment	3	0	0	3 of 3
14			LD1.2 Establish a sustainability management system	0	1	0	0 of 1
15			LD1.3 Foster collaboration and teamwork	3	0	0	3 of 3
16			LD1.4 Provide for stakeholder involvement	3	0	0	3 of 3
17		MANAGEMENT	LD2.1 Pursue by-product synergy opportunities	0	1	0	0 of 1
18			LD2.2 Improve infrastructure integration	0	3	0	0 of 3
19		PLANNING	LD3.1 Plan for long-term monitoring and maintenance	2	0	0	2 of 2
20			LD3.2 Address conflicting regulations and policies	2	0	0	2 of 2
21			LD3.3 Extend useful life	1	0	0	1 of 1
			TOTAL	**14**	**5**	**0**	14 of 19
22	RESOURCE ALLOCATION	MATERIALS	RA1.1 Reduce Net Embodied Energy	0	0	2	0 of 0
23			RA1.2 Support Sustainable Procurement Practices	3	0	0	3 of 3
24			RA1.3 Use Recycled Materials	2	0	0	2 of 2
25			RA1.4 Use Regional Materials	1	1	0	1 of 2
26			RA1.5 Divert Waste from Landfills	2	0	1	2 of 2
27			RA1.6 Reduce Excavated Materials Taken off Site	3	0	0	3 of 3
28			RA1.7 Provide for Deconstruction and Recycling	0	0	3	0 of 0
29		ENERGY	RA2.1 Reduce energy consumption	2	0	1	2 of 2
30			RA2.2 Use renewable energy	1	0	1	1 of 1
31			RA2.3 Commission and monitor energy systems	0	0	3	0 of 0
32		WATER	RA3.1 Protect fresh water availability	3	4	0	3 of 7
33			RA3.2 Reduce potable water consumption	2	2	0	2 of 4
34			RA3.3 Monitor water systems	0	0	4	0 of 0
			TOTAL	**19**	**7**	**15**	19 of 26
35	NATURAL WORLD	SITING	NW1.1 Preserve prime habitat	2	3	0	2 of 5
36			NW1.2 Protect wetlands and surface water	1	2	0	1 of 3
37			NW1.3 Preserve prime farmland	0	0	1	0 of 0
38			NW1.4 Avoid adverse geology	2	1	0	2 of 3
39			NW1.5 Preserve floodplain functions	1	5	0	1 of 6
40			NW1.6 Avoid unsuitable development on steep slopes	2	0	0	2 of 2
41			NW1.7 Preserve greenfields	1	0	1	1 of 1
42		LAND & WATER	NW2.1 Manage stormwater	0	2	0	0 of 2
43			NW2.2 Reduce pesticide and fertilizer impacts	3	2	0	3 of 5
44			NW2.3 Prevent surface and groundwater contamination	3	0	0	3 of 3
45		BIODIVERSITY	NW3.1 Preserve species biodiversity	0	4	0	0 of 4
46			NW3.2 Control invasive species	1	2	0	1 of 3
47			NW3.3 Restore disturbed soils	2	0	0	2 of 2
48			NW3.4 Maintain wetland and surface water functions	0	5	0	0 of 5
			TOTAL	**18**	**26**	**2**	18 of 44
49	CLIMATE	EMISSION	CR1.1 Reduce greenhouse gas emissions	0	0	2	0 of 0
50			CR1.2 Reduce air pollutant emissions	1	0	1	1 of 1
51			CR2.1 Assess climate threat	0	0	1	0 of 0
52			CR2.2 Avoid traps and vulnerabilities	2	0	0	2 of 2
53		RESILIENCE	CR2.3 Prepare for long-term adaptability	0	1	0	0 of 1
54			CR2.4 Prepare for short-term hazards	1	1	0	1 of 2
55			CR2.5 Manage heat islands effects	1	0	0	1 of 1
			TOTAL	**5**	**2**	**4**	5 of 7











Alt. B 5/11/2017 - DRAFT

Envision™ Checklist

#	Category	Subcategory	Credit	Y	N	NA	Score
1	QUALITY OF LIFE	PURPOSE	QL1.1 Improve community quality of life	3	0	0	3 of 3
2			QL1.2 Stimulate sustainable growth and development	2	1	0	2 of 3
3			QL1.3 Develop local skills and capabilities	2	1	0	2 of 3
4		WELLBEING	QL2.1 Enhance public health and safety	0	1	0	0 of 1
5			QL2.2 Minimize noise and vibration	1	0	0	1 of 1
6			QL2.3 Minimize light pollution	1	0	0	1 of 1
7			QL2.4 Improve community mobility and access	3	0	0	3 of 3
8			QL2.5 Encourage alternative modes of transportation	2	0	0	2 of 2
9			QL2.6 Improve site accessibility, safety and wayfinding	3	0	0	3 of 3
10		COMMUNITY	QL3.1 Preserve historic and cultural resources	1	1	0	1 of 2
11			QL3.2 Preserve views and local character	2	0	0	2 of 2
12			QL3.3 Enhance public space	2	0	0	2 of 2
			TOTAL	**22**	**4**	**0**	22 of 26
13	LEADERSHIP	COLLABORATION	LD1.1 Provide effective leadership and commitment	3	0	0	3 of 3
14			LD1.2 Establish a sustainability management system	0	1	0	0 of 1
15			LD1.3 Foster collaboration and teamwork	3	0	0	3 of 3
16			LD1.4 Provide for stakeholder involvement	3	0	0	3 of 3
17		MANAGEMENT	LD2.1 Pursue by-product synergy opportunities	0	1	0	0 of 1
18			LD2.2 Improve infrastructure integration	3	0	0	3 of 3
19		PLANNING	LD3.1 Plan for long-term monitoring and maintenance	2	0	0	2 of 2
20			LD3.2 Address conflicting regulations and policies	2	0	0	2 of 2
21			LD3.3 Extend useful life	1	0	0	1 of 1
			TOTAL	**17**	**2**	**0**	17 of 19
22	RESOURCE ALLOCATION	MATERIALS	RA1.1 Reduce Net Embodied Energy	0	0	2	0 of 0
23			RA1.2 Support Sustainable Procurement Practices	3	0	0	3 of 3
24			RA1.3 Use Recycled Materials	2	0	0	2 of 2
25			RA1.4 Use Regional Materials	1	1	0	1 of 2
26			RA1.5 Divert Waste from Landfills	2	0	1	2 of 2
27			RA1.6 Reduce Excavated Materials Taken off Site	3	0	0	3 of 3
28			RA1.7 Provide for Deconstruction and Recycling	0	0	3	0 of 0
29		ENERGY	RA2.1 Reduce energy consumption	2	0	1	2 of 2
30			RA2.2 Use renewable energy	1	0	1	1 of 1
31			RA2.3 Commission and monitor energy systems	0	0	3	0 of 0
32		WATER	RA3.1 Protect fresh water availability	5	2	0	5 of 7
33			RA3.2 Reduce potable water consumption	2	2	0	2 of 4
34			RA3.3 Monitor water systems	0	0	4	0 of 0
			TOTAL	**21**	**5**	**15**	21 of 26
35	NATURAL WORLD	SITING	NW1.1 Preserve prime habitat	5	0	0	5 of 5
36			NW1.2 Protect wetlands and surface water	3	0	0	3 of 3
37			NW1.3 Preserve prime farmland	0	0	1	0 of 0
38			NW1.4 Avoid adverse geology	3	0	0	3 of 3
39			NW1.5 Preserve floodplain functions	6	0	0	6 of 6
40			NW1.6 Avoid unsuitable development on steep slopes	2	0	0	2 of 2
41			NW1.7 Preserve greenfields	1	0	1	1 of 1
42		LAND & WATER	NW2.1 Manage stormwater	2	0	0	2 of 2
43			NW2.2 Reduce pesticide and fertilizer impacts	5	0	0	5 of 5
44			NW2.3 Prevent surface and groundwater contamination	3	0	0	3 of 3
45		BIODIVERSITY	NW3.1 Preserve species biodiversity	4	0	0	4 of 4
46			NW3.2 Control invasive species	3	0	0	3 of 3
47			NW3.3 Restore disturbed soils	2	0	0	2 of 2
48			NW3.4 Maintain wetland and surface water functions	5	0	0	5 of 5
			TOTAL	**44**	**0**	**2**	44 of 44
49	CLIMATE	EMISSION	CR1.1 Reduce greenhouse gas emissions	0	0	2	0 of 0
50			CR1.2 Reduce air pollutant emissions	1	0	1	1 of 1
51		RESILIENCE	CR2.1 Assess climate threat	0	0	1	0 of 0
52			CR2.2 Avoid traps and vulnerabilities	2	0	0	2 of 2
53			CR2.3 Prepare for long-term adaptability	1	0	0	1 of 1
54			CR2.4 Prepare for short-term hazards	2	0	0	2 of 2
55			CR2.5 Manage heat islands effects	1	0	0	1 of 1
			TOTAL	**7**	**0**	**4**	7 of 7