SMALL SWALE

Natural Area Management Plan

11 April 2024

PREPARED BY

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&

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Small Swale Natural Area Management Plan: Amendments

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Amend:

Section of Document	Current Content	Correct Content
Appendix B (Biophysical Baseline Environmental Summary), Section 3.1.9 "Species of interest to Indigenous communities" (page 152/228)	"Plains wormwood (*Artemesia campestris*) used as a ceremonial plant and burned for incense."	"*Artemesia*" should be spelled "*Artemisia*".
Appendix F (Observed Wildlife Species in the Small Swale), page F-1 to F-3.	American robin conservation status is listed as S4B / Special Concern / Threatened	Conservation status should be corrected to S5B, SUN
	Brown-headed cowbird conservation status is listed as S4B / Special Concern / Special Concern	Conservation status should be corrected to S5B, SUN
	House wren conservation status is listed as S3B / Threatened / Threatened	Conservation status should be corrected to S5B
	Warbling vireo conservation status is listed as S3B / Special Concern / Special Concern	Conservation status should be corrected to S5B
	Bendire's thrasher is included in the table	The entry for Bendire's thrasher should be deleted. Brown thrasher is correct and is already listed in the table.

CONTRIBUTORS

The Natural Area Management Plan was prepared by WSP Canada and the City of Saskatoon. This partnership was supported by the generous contribution of countless stakeholders and citizens. We would like to thank the many people who contributed their time, expertise, and passion to protect this prized natural feature.

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EXECUTIVE SUMMARY

LEGISLATIVE CONTEXT

The Small Swale is subject to the policies and regulations of the City of Saskatoon (City). The highest-order planning documents for the City include the *Official Community Plan No. 9700* (OCP; City of Saskatoon 2020a), and the accompanying *Zoning Bylaw No. 8770* (City of Saskatoon, 2023a). The site is a major wetland complex and as such is protected by the Wetland Policy (C09-041).

ECOLOGICAL CONTEXT

Key highlights from the review of ecological data includes:

- The site consists of 6.6 ha (7.7%) Native Dominated Grassland, 21.8 ha (25.6%) Native Dominated Tame Grassland, 6.4 ha (7.5%) Tame Grassland, and 25.1 ha (29.5%) Wetlands.
- Six flora SOMC are confirmed on site ranging from S1 to S3 in sensitivity ratings. Crowfoot violet and rough fescue are flora SOMC also identified as species of restoration interest.
- Seven fauna SOMC are confirmed on site with the northern leopard frog also being a species of conservation interest. Furthermore, five Culturally Significant species have been recorded.
- Eleven noxious and nuisance weed species were documented to occur on site.
- Wildlife movement is mostly unrestricted in and around the site, with the most prominent barriers being the existing transportation corridors west (South Grid Road) and north (McOrmond Drive). Potential barriers to wildlife movement include the future adjacent developments and the future Saskatoon Freeway.

HUMAN CONTEXT

- The site has a high heritage sensitivity with the Riddell Paleontological Site is located within southern portion of the site.
- Current uses of the site include such uses as the Snow Storage Facility, materials handling, and agriculture.
- Future developments are expected to be constructed adjacent to the site.

CONSERVATION PLAN

- Five Targets, both Conservation and Human Well-Being Targets, with 12 sub-targets total were identified for the site:
- Each Conservation Target received between two and seven Key Ecological Attributes (KEA) and corresponding Indicators to rank the health status of each (Section 5.2.1 – Conservation and Human Well-Being Targets; **Table 5-5**)
- An attempt of rating the restoration feasibility for one grassland site and the Snow Storage Facility was completed. However, the required baseline data is incomplete meaning a restoration feasibility result could not be determined at this point. The framework was included to show the value of the tool for future applications.
- Direct Threats (both Conventional and Climate), Indirect Threats, and Opportunities were identified. Along with the Targets, these were compiled in a Situation Analysis to show the relationship between the various factors and pressures on the site.
- An Action Plan was developed to define the Goals, Strategies, Actions, and Objectives.
- Results Chains were developed to illustrate the theory of change on how each of the Strategies will impact a Direct Threat and help to achieve a goal.

HUMAN USE

The following factors were considered to guide the development of future human use of the site:

- Programming of the site in terms of design for human use and balance of conservation.
- Management zones to guide the spatial programming of the site.
- A list of permitted and restricted uses was developed to support Human Well-Being Targets.

- Infrastructure to support permitted uses are highlighted and include such features as a circulation routes, gathering areas, and signage.
- Prohibited uses were identified to provide guidance on which uses of the site should not be permitted.
- Community Stewardship opportunities were identified to engage with the public.
- Safety of the site was considered using the City of Saskatoon's Crime Prevention Through Environmental Design (CPTED) policies as a guide.

LEGISLATIVE RECOMMENDATIONS

Future development proposals including concept plans shall consider and align with the information included in this and any associated planning reports and studies including but not limited to the University Heights Sector Plan.

IMPLEMENTATION

- Guidance for implementation of the Action Plan was developed to support the management of the site and the achievement of the Targets.
- A Monitoring Plan was developed to track the implementation of the Actions and Strategies, and monitor progress of the Objectives, and Goals.
- A template for an Operational Plan has been provided to track the responsibility and costs associated with implementation of the Strategies.

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ACRONYMS

- **CMP**: Conservation Measures Partnership
- **COSEWIC**: Committee on the Status of Endangered Wildlife In Canada
- **CPTED**: Crime Prevention Through Environmental Design
- **DUC**: Ducks Unlimited Canada
- **EDI**: Environmental Dynamics Inc
- **ERW**: Ecological Recovery Wheel
- **FUD**: Future Urban Development
- **GHG**: Greenhouse Gas
- **K08**: Saskatoon Plain
- **KEA**: Key Ecological Attribute
- **HRIA**: Heritage Resources Impact Assessment
- **LSA**: Local Study Area
- **MVA**: Meewasin Valley Authority
- **MVRMP**: Meewasin Valley-wide Resource Management Plan
- **NAI**: Natural Areas Inventory
- **NAMP**: Natural Area Management Plan
- **OCP**: Official Community Plan
- **PSA**: Project Study Area
- **RM**: Rural Municipality
- **ROW**: Right-Of-Way
- **RSA**: Regional Study Area
- **SKCDC**: Saskatchewan Conservation Data Centre
- **SOMC**: Species of Management Concern
- **UHN**: University Height Neighbourhood
- **VA**: Viability Assessment

GLOSSARY

- **Agricultural lands**: Land area that is either arable, under permanent crops, or under permanent pastures.
- **Aspen groves**: A group of trembling aspen trees that are interconnected clonal colonies. The connection occurs through a shared root system, resulting in genetically identical trees.
- **Aspen Parkland** :A broad transition zone between the Prairies and Boreal Plains ecozones in the east and north, and it marks the transition from grasslands to mountains in the west.
- **Biodiversity**: The richness and variety of living organisms and habitats within an ecosystem.
- **Catchments**: Area that are the surrounding landscapes of wetlands that drain into and contribute water to a specific wetland.
- **Class I Wetland**: ephemeral waterbody – Low lying land where water is present 1-3 weeks in early spring. Water drains quickly due to porous soils not long after the snowmelt. Plant communities are adapted to grow in moist soils (definition adapted from Stewart and Kantrud, 1971).
- **Class II Wetland**: temporary wetland – Low lying land that holds water between 2-6 weeks after the snowmelt, and a couple days after heavy rain. Plant communities are adapted to grow in moist soils (definition adapted from Stewart and Kantrud, 1971).
- **Class III Wetland**: seasonal wetland – Low lying land that holds surface water for extended periods in spring through mid-summer. Soils show hydric indicators including mottles. Plant communities are adapted to grow in flooded conditions (definition adapted from Stewart and Kantrud, 1971).
- **Class IV Wetland**: semi-permanent wetland – Low lying land that maintains surface water from April to September. Soils show hydric indicators including mottles and gleying. Plant communities are adapted to grow in deeper flooded conditions (definition adapted from Stewart and Kantrud, 1971).
- **Class V Wetland**: Permanent wetland – Low lying area that maintains water surface in most years. Soils show hydric indicators including mottles and gleying. Plant communities are adapted to grow in deeper flooded conditions, with the center being unvegetated and comprised of only water (definition adapted from Stewart and Kantrud, 1971).
- **Conservation**: The sustainable use, protection, and management of natural areas and assets to prevent decline or loss.
- **Corridor:** A band of vegetation, usually older forest, that serves to connect distinct patches on the landscape.
- **Disturbed lands**: Land or region where the natural environment has been altered, disrupted, or damaged by human activities. Examples are logging, mining, agriculture, construction, or other processes that disrupt the original ecological balance.
- **Ecodistrict**: A part of an ecoregion characterized by distinctive assemblages of relief, geology, landforms and soils, vegetation, water, fauna, and land use.
- **Ecological features**: A specific component of an ecosystem that plays a distinct role in the environment. Examples are organisms, habitat, or waterbodies.
- **Ecological processes**: Actions or events that shape ecosystems such as disturbances, predation, competition, nutrient and element cycling such as carbon sequestration.
- **Ecology**: The scientific study of interactions between living organisms and their environment.
- **Ecological systems**: A biological community consisting of all the living organisms (including humans) in a particular area and the nonliving components, such as air, water, and mineral soil, with which the organisms interact. It is also referred to as an ecosystem.
- **Ecoregions**: A subdivision of an ecozone, normally mapped at 1:250000 scale and characterized by distinctive large order landforms or assemblages of regional landforms as expressed by vegetation, soils, water, and sometimes human activity.
- **Ecosystem services**: The array of benefits provided by green infrastructure.

- **Ecozone**: A large area (i.e., usually mapped at 1:1000000 scale) that represents broad features of relatively uniform climate, geology, soils, landforms, vegetation and human activity.
- **Exotic Species**: Organisms that have been introduced to an area that lies outside their natural range, often by human activities. As these species are not native to an area, they have the potential to outcompete native species, disrupt ecosystems, and cause ecological imbalances.
- **Fauna**: A general term for all forms of animal life characteristic of a region, period or special environment.
- **Flora**: A general term for all forms of plant life characteristic of a region, period or special environment.
- **Forage**: Grasses, herbs, and small shrubs that can be used as feed for livestock or wildlife.
- **Forests**: A complex community of plants and animals in which trees are the most conspicuous members and where the tree crown density is greater than 10%.
- **Fragmentation**: The process whereby large habitats or natural areas are broken into smaller patches and isolated from each other, often because of development and land use change.
- **Functional connectivity**: The degree to which a landscape promotes or interferes with the movement of wildlife and vegetation between habitats.
- **Grasslands**: Ecosystems dominated by native grasses and forbs, and which may contain some shrub and tree communities.
- **Greater Small Swale**: Extends beyond the site boundaries north to the South Saskatchewan River.
- **Green infrastructure**: A system of natural, enhanced, and engineered assets that provide municipal and ecosystem services by protecting, restoring, or emulating nature.
- **Green network**: When green infrastructure is designed holistically, it becomes an interconnected Green Network that enhances the urban environment and improves quality of life.
- **Green spaces**: A land that is partly or completely covered with trees, shrubs, grass or other vegetation. This includes urban parks, trails and community farms or gardens including roof top gardens.
- **Habitat**: The environment in which a population or individual lives; includes not only the place where a species is found, but also the particular characteristics of the place (for example, climate or the availability of suitable food and shelter) that make it especially well suited to meet the life cycle needs of that species.
- **Habitat restoration**: The process of restoring the functional aspects of a given ecosystem to a semblance of its pre-disturbed state.
- **Heritage features**: Element, site, structure, object, or aspect of cultural, historical, or natural significance that is considered valuable and worth preserving due to its importance to a particular community, region, or society. Examples are historic buildings, archaeological sites, cultural traditions, or other assets that contribute to the understanding and appreciation of a shred heritage or identity.
- **Hydrology**: Science that deals with the waters above and below the land surfaces of the earth, their occurrence, circulation, and distribution, both in time and space, their biological, chemical, and physical properties, their reaction with their environment, including their relation to living beings.
- **Impacted soils**: Soil that has been adversely affected, contaminated, or altered due to introduction of pollutants typically because of human activities.
- **Indicator**: A measurable entity that is used to assess the status and the trend of a Key Ecological Attribute (e.g., hectare, population size) (definition adapted from The Nature Conservancy, n.d.).
- **Indicator rating**: The ranges of variation in an indicator that define and distinguish very good, good, fair, and poor rating categories to provide a consistent and objective basis for assessing the status of the indicator (definition adapted from The Nature Conservancy, n.d.).
- **Indigenous Peoples**: A collective name for the original peoples of Canada. There are three distinct groups: First Nations, Métis, and Inuit.
- **Inter-connectivity**: The connectedness of two ore more defined aeras.
- **Intra-connectivity**: The connectedness of one defined area.
- **Invasive species**: A species that is non-native to an ecosystem and whose presence causes or is likely to cause harm to economic, environmental, or human health.

- **Key Ecological Attribute (KEA)**: A structure, composition, interaction, or biotic and abiotic processes that enable the target to persist through influence on the target's size, condition, and landscape context. It is fundamental component of the target's life history, habitat, community interaction, or physical processes (e.g., number of species of management concern, extent of invasive species).
- **Land Cover**: Refers to the surface cover on the ground, whether vegetation, urban infrastructure, water, bare soil or other.
- **Landscape**: An expanse of natural or human-made scenery, comprising landforms, made features that, taken together, form a composite.
- **Mixed-grass Prairie**: A diverse grassland community that incorporates short- and tall-grass species. It is the most extensive prairie subtype and occupies the dry interior plains of Alberta, Saskatchewan, and Manitoba.
- **Mixed stands**: A mixed stand is defined as one in which no single species comprises more than 80 percent of the stocking.
- **Modified grasslands**: Grasslands that have been intentionally altered or managed by human activities, such as mowing, grazing, or planting, to serve specific purposes like agriculture, recreation, or wildlife habitat enhancement.
- **Moist Mixed Grassland**: This ecoregion comprises the northern extension of open grasslands in the Interior Plains of Canada and is closely correlated with semiarid moisture conditions and Dark Brown Chernozemic soils.
- **NAMP Team**: Group of technical experts which contributed to the development of the NAMP.
- **Native Dominated Grassland**: Land that contains a relatively even mix or patchwork of native (grass, forb, and shrub) and introduced grass species.
- **Native grasslands**: A landscape unit where the vegetation is dominated by grasses, grass like plants, and/or forbs (>50 per cent).
- **Native grassland species**: Dominated indigenous grass species in a natural-occurring ecosystem.
- **Native species**: Species that occurs naturally in an area.
- **Native vegetation**: The assemblage of native plants in a specific place or region that have adapted to environmental (e.g., edaphic) and biological (e.g., presence of other plants) conditions. Plants or plant populations that have developed in and are adapted to a particular climatic or soil zone.
- **Natural areas**: An area containing natural assets that work together to provide ecosystem services (e.g., habitats, nutrient cycling, water purification, climate regulation, carbon sequestration) and social benefits (e.g., recreational, aesthetic, cultural).
- **Natural assets**: Ecological resources that are native to the Saskatoon region including the South Saskatchewan River, grasslands, woodlands, wetlands, and soil systems. These sites often contain important cultural and archaeological features.
- **Natural feature**: A distinct and prominent aspect of the natural environment, such as a geographical landmark, landform, or body of water.
- **Natural parks**: Area of environmental, historical, cultural, recreational, and aesthetic values. Ecosystems and natural features can be used for education of ecological and environmental awareness as well as recreational purposes.
- **Non-native vegetation**: Introduced species in an area.
- **Noxious weed**: Any plant that is designated by order of the minister as a noxious weed and includes the seeds or any other part of that plant that may grow to produce another plant.
- **Nuisance weed**: Any plant that is designated by order of the minister as a nuisance weed and includes the seeds or any other part of that plant that may grow to produce another plant.
- **Physical Connectivity**: The physical distance between landscape elements.
- **Prairie**: Prairies are enormous stretches of flat grassland with moderate temperatures, moderate rainfall, and few trees. Prairies are usually interspersed by low-lying wetland ecosystems.
- **Prairie Pothole Region**: An extensive area of the northern Great Plains that is characterized by numerous, small, shallow wetlands, known as potholes. These depressions were formed by glacial activity during the last ice age, creating a mosaic of grasslands and wetlands.

- **Prohibited Weed**: means any plant that is designated by order of the minister as a prohibited weed and includes the seeds or any other part of that plant that may grow to produce another plant.
- **Rangeland Health Assessments**: A compilation and analysis of all data and information available for an allotment or group of allotments that describes the current rangeland health conditions and identifies changes or trends in rangeland health over time.
- **Reference ecosystem**: An undisturbed version of the ecosystem that is to be restored. The attributes and successional phase of the reference ecosystem is to be similar to the restoration project site (definition adapted from The Nature Conservancy, n.d.).
- **Shrublands**: A vegetation that is dominated by shrubs or short statured trees, generally < 5 m tall, often in a single canopy layer.
- **Site**: anything within the property lines as provided by the City of Saskatoon.
- **Species composition**: The number of different species present in an ecosystem, as well as the relative abundance of each of those species.
- **Species of Management Concern**: SOMC are defined for the purpose of the NAMP as flora or fauna species that meet any of the following criteria: tracked provincially by the Saskatchewan Conservation Data Centre (SKCDC; S3 or lower); species protected by the Saskatchewan *Wildlife Act* and *Regulations*; designated by Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as Endangered, Threatened, or Special Concern; federally protected under Schedule 1 of the *Species at Risk Act* (SARA) and/or all other sensitive species and guilds included in the Saskatchewan Activity Restriction Guidelines (ARG) for Sensitive Species (MEnv, 2017).
- **Swale complex**: A network of interconnected swales, which are shallow vegetated depressions or channels that manage water drainage and erosion. Swales play a crucial role in ecosystem functioning by serving as habitat, supporting biodiversity, and contributing to water filtration and retention.
- **Tame Grassland**: Land that has a higher number of introduced species than native species because of encroachment or direct seeding.
- **Topography**: The collective physical features of a geographic area, such as those represented on a map, especially the relief and contours of the land.
- **Trail system**: Trail system may consist of trails for hiking, biking, equestrians, interpretation, administration, or a combination thereof. It also includes trail amenities such as signs (informative, interpretive, or regulatory), parking, benches, picnic tables, viewing platforms, and backcountry camps.
- **Undesirable Species**: species not designated under the Saskatchewan *Weed Control Act* (e.g., reed canary grass [*Phalaris arundinacea]*, Kentucky bluegrass *[Poa pratensis]*).
- **Vegetation**: Ground cover provided by plants.
- **Waterbody**: Term used to describe a significant body of water, such as a river, lake, ocean, or any other distinct water feature.
- **Wetland**: Land having water at, near, or above the land surface; land saturated with water long enough to promote aquatic processes as indicated by saturated or hydric soils, aquatic vegetation, and various kinds of biological activity adapted to a wet environment.
- **Wetland complex**: A combination of individual wetlands and surrounding riparian areas that have complementary functions and greater significance when viewed together rather than individually.

LAND ACKNOWLEDGEMENT

We acknowledge that the Small Swale is located on Treaty 6 Territory and the Traditional Homeland of the Métis. Indigenous people of primarily Cree, Dakota and Saulteaux descent have called the land now known as Saskatoon home for thousands of years. Today, this place is home to Indigenous people from a diversity of cultures and language groups. The City of Saskatoon (City) recognizes the distinct order of government of First Nations and Métis and is committed to maintaining strong relationships through meaningful dialogue with Indigenous communities and organizations. Strengthening cooperation and mutual support by working in partnership with Indigenous communities toward respective community goals and objectives is vital to fostering more inclusive communities.

1 INTRODUCTION

To assist with the management and protection of a portion of the Small Swale (the site) that resides within the city limits, a Natural Area Management Plan (NAMP; the project) was developed by the City of Saskatoon (the City) and WSP Canada Inc. (WSP), with the input of various stakeholders. Collectively the contributors are referred to as the NAMP team, a group of technical experts.

The Small Swale (**Figure 1-1**) has been identified as an important feature which has the potential to provide high ecosystem services. Prior to the development of the NAMP, a formal level of service had not yet been established for the site, which left the area open to the risk of degradation and incompatible land uses. The City is developing a NAMP as a means of proactively managing the use and protection of this natural feature, which will become increasingly important as Saskatoon continues to grow. This work is part of the City's "Pathways for an Integrated Green Network: An Implementation Plan for Saskatoon's Green Infrastructure Strategy" (Green Pathways, City of Saskatoon, 2020a). Through Green Pathways, the City is developing a Natural Areas Program (City of Saskatoon, 2020b), which works to protect, restore, and manage natural areas in Saskatoon's green network.

This NAMP respects the work previously completed by the Meewasin Valley Authority (MVA) in the Meewasin Valley-wide Resource Management Plan (MVRMP; MVA, 2017), and should be considered as a site-specific application of Meewasin's recommendations for the portion of the Small Swale residing within the City limits.

Figure 1-1: Small Swale - North of McOrmond Drive

1.1 SCOPE

1.1.1 PROJECT SITE

The site (**Appendix A: Figure 1**) is part of a natural area known as the Small Swale which covers an area of 85 ha northeast of Saskatoon. It is a part of the greater swale complex which includes the Small Swale, Northeast Swale and West Swale. The Small Swale and the greater swale complex extend just beyond the City of Saskatoon boundary, oriented north towards the South Saskatchewan River.

The site is wetland complex dominated by grasslands with pockets of tree stands and shrubs. It is home to many species, some of which are denoted as species of management concern (SOMC), and it functions as a wildlife movement node to adjacent natural features. Portions of the site have been historically used for the City's snow storage, materials storage, and for agricultural purposes. Current uses of the site include agriculture (haying), the active Central Avenue Snow Storage Facility (City of Saskatoon, 2023a), materials handling, and attenuates storm runoff from McOrmond Drive.

1.1.2 NAMP SCOPE

The scope of the NAMP is to outline the steps to protect, restore, and manage the site, to conserve the ecological and heritage features and provide a connection to nature for current and future generations. It aims to provide guidance for a formal level of service and provides recommendations for future land use and management. The NAMP includes a vision for the site, a baseline summary of the existing conditions, a conservation plan, and an implementation plan.

NAMP NEED & PAST INITIATIVES

Through past initiatives portions of the Small Swale have undergone natural screening processes, mostly recently during the planning and design of the University Heights Neighbourhood No. 3 (UH3 Neighbourhood), presented in a Screening Report completed by Environmental Dynamics Inc in 2021. Additionally, the MVRMP (MVA, 2017) and Habitat Evaluation for the Ministry of Highways in 2020 have evaluated portions of the site. However, the portion residing within the City limits has not been thoroughly evaluated. Currently, the Small Swale is at threat of isolation from the surrounding natural matrix and faces continual decline in biodiversity and general condition based on historical and current uses. If left unguided, proposed developments in proximity to the site may contribute to additional fragmentation and deterioration of ecosystem health, if not planned for accordingly.

The creation of the NAMP will guide the City in sustaining the portion of the Small Swale located within the City limits. The NAMP will identify areas of sensitivity, knowledge gaps, and conservation targets. Carefully laid out terms and recommendations, including monitoring guidance and long-term planning will allow the City to manage the site successfully. The proposed monitoring strategies and long-term guides clearly articulate the management strategies and activities for inventory, restoration, monitoring, and research activities for the future.

The NAMP is intended to be a dynamic document and should be added to as new threats are identified, targets shift, or strategies be considered. This iteration has a ten-year lifecycle, determined by the Open Standards for the Practice of Conservation (2020) as a reasonable timeline to accomplish or revise NAMP objectives.

1.1.3 METHODS

A detailed review of available studies, literature, and assessments relevant to the site was completed to provide a foundational understanding of the biophysical condition of the site. A desktop review was completed to verify and update any existing information found through the literature review, and site visits were conducted to confirm knowledge gaps, as well as to verify findings and record incidental observations.

Engagement with key stakeholders, organizations, and residents throughout the process of the NAMP development informed both the understanding of the site, and the recommendations subsequently put forth. Engagement occurred at strategic points throughout the course of the project, in the form of workshops, open houses, and formal conversations.

The Open Standards for the Practice of Conservation (CMP, 2020) was utilised to guide the development of the NAMP (**Figure 1-2**). The Conservation Standards provided a transparent basis for shared decision-making and collaboration (CMP, 2020). This evidence-based framework was instrumental in the analysis of the existing information, and the development of key recommendations, such as the vision, targets, and action plan.

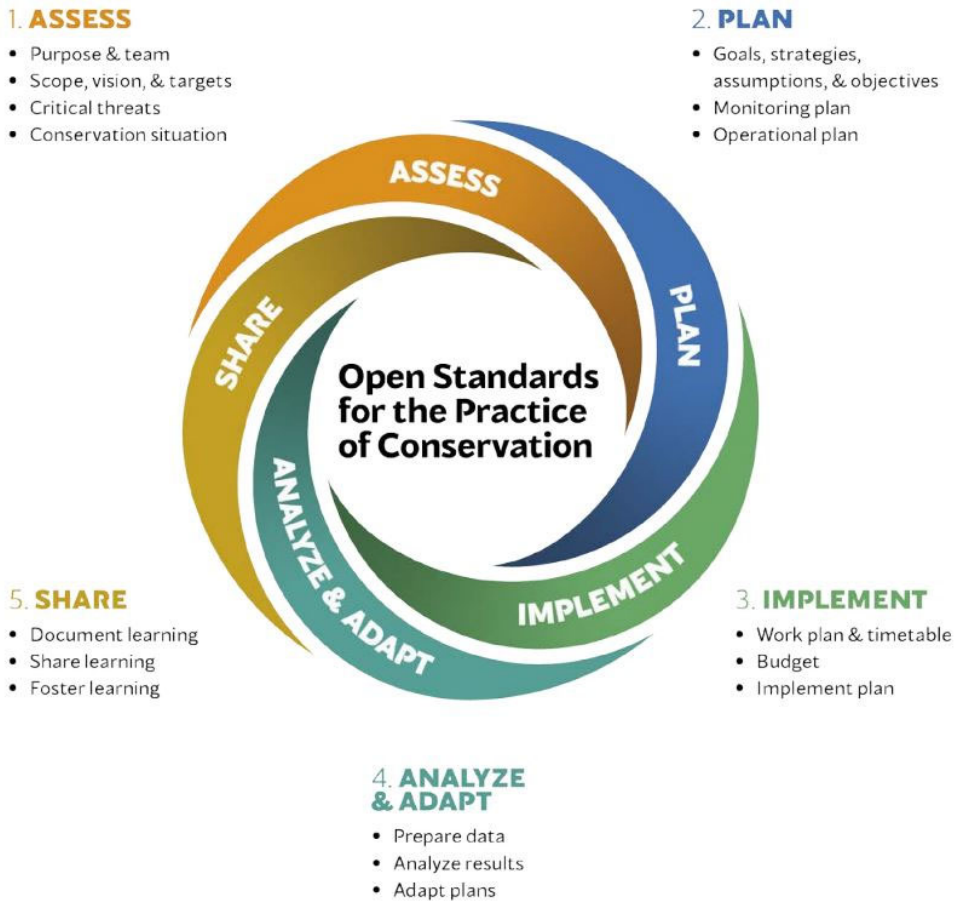

Figure 1-2: Conservation Standards (CMP, 2020).

1.1.4 DATA SOURCES

Key reports that were reviewed for the NAMP included:

- University Heights Neighborhood No. 3 Natural Area Screening Report (EDI – Environmental Dynamics Inc., 2021).
- Natural Capital Asset Valuation; Pilot Project (City of Saskatoon, 2020).
- Northeast Swale Resource Management Plan (MVA, 2013).
- Valley-wide Resource Management Plan (MVA, 2017).
- Natural Areas Inventory for the City of Saskatoon (MVA, 2019).
- Natural Asset Inventory Dashboard, 2021 (Green Analytics, 2021).
- Meewasin-Valley-Wide-Monitoring Framework (MVA, 2021).
- Habitat Evaluation of Saskatoon Freeway Through Small and Northeast Swale (MVA, 2020).

Other relevant databases and websites reviewed included:

- The Ecoregions of Saskatchewan (Acton, et al., 1998).
- Saskatchewan Soil Information System (SKSIS) (SKSIS Working Group, 2018).
- Classification of Natural Ponds and Lakes in the Glaciated Prairie Region (Stewart and Kantrud, 1971).
- Saskatchewan Conservation Data Centre (SKCDC) tracked species lists.
- Species at Risk (SAR) public registry (Government of Canada, 2022).
- iMapInvasives (NatureServe, 2022).

1.2 PROJECT LOCATION AND LOCAL CONTEXT

The site is located on the northeast side of Saskatoon, east of the South Saskatchewan River, and is within the University Heights Development Sector (**Appendix A: Figure 1**). The site spans portions of the following quarter sections:

- SW-24-37-05-W3M
- SE-24-37-05-W3M
- NW-13-37-05-W3M
- SW-13-37-05-W3M
- SE-14-37-95-W3M

Currently, the site is bisected in the north by McOrmond Drive, confined by Central Avenue towards the east, and bounded by South Grid Road (Old Central Avenue) towards the west. South Grid Road separates the southernmost portion of the site from the Riddell Palaeontological Site.

The surrounding area is comprised of agricultural lands, natural areas, and residential neighbourhoods. The greater Small Swale extends north past the future Saskatchewan Freeway. The closest residential neighbourhoods are Aspen Ridge (2 km east), Evergreen (1 km southeast), and Silverspring (1.5 km south). UHN No.3 is expected to be constructed directly east of the site. The closest natural areas are the Northeast Swale to the east, Peggy McKercher Conservation Area to the west, and Peturrson's Ravine to the south. These areas are all connected to the South Saskatchewan River. In addition, Wanuskewin Heritage Park, a National Historic Site, is located northeast of the site on the west bank of the South Saskatchewan River.

1.2.1 OWNERSHIP

The site and much of the surrounding lands are owned by the City of Saskatoon (see **Figure 1-3**). The closest privately owned lands are located directly across from South Grid Road (north of Peggy McKercher Conservation Area), the Saskatoon Wildlife Federation to the east (across from Central Avenue), and a private property between Agra Road and Central Avenue. The entirety of the site falls within the City of Saskatoon limits. A portion south of McOrmond Drive falls within the Meewasin Valley Authority.

A Right-Of-Way (ROW) is oriented north-to-south to accommodate the Buried SaskTel Cable and is 36m in width. An overhead power line is present south of McOrmond Drive and travels north-to-south; however, there is currently no registered agreement with SaskPower. A 5m wide ROW has been assumed as recommended by SaskPower.

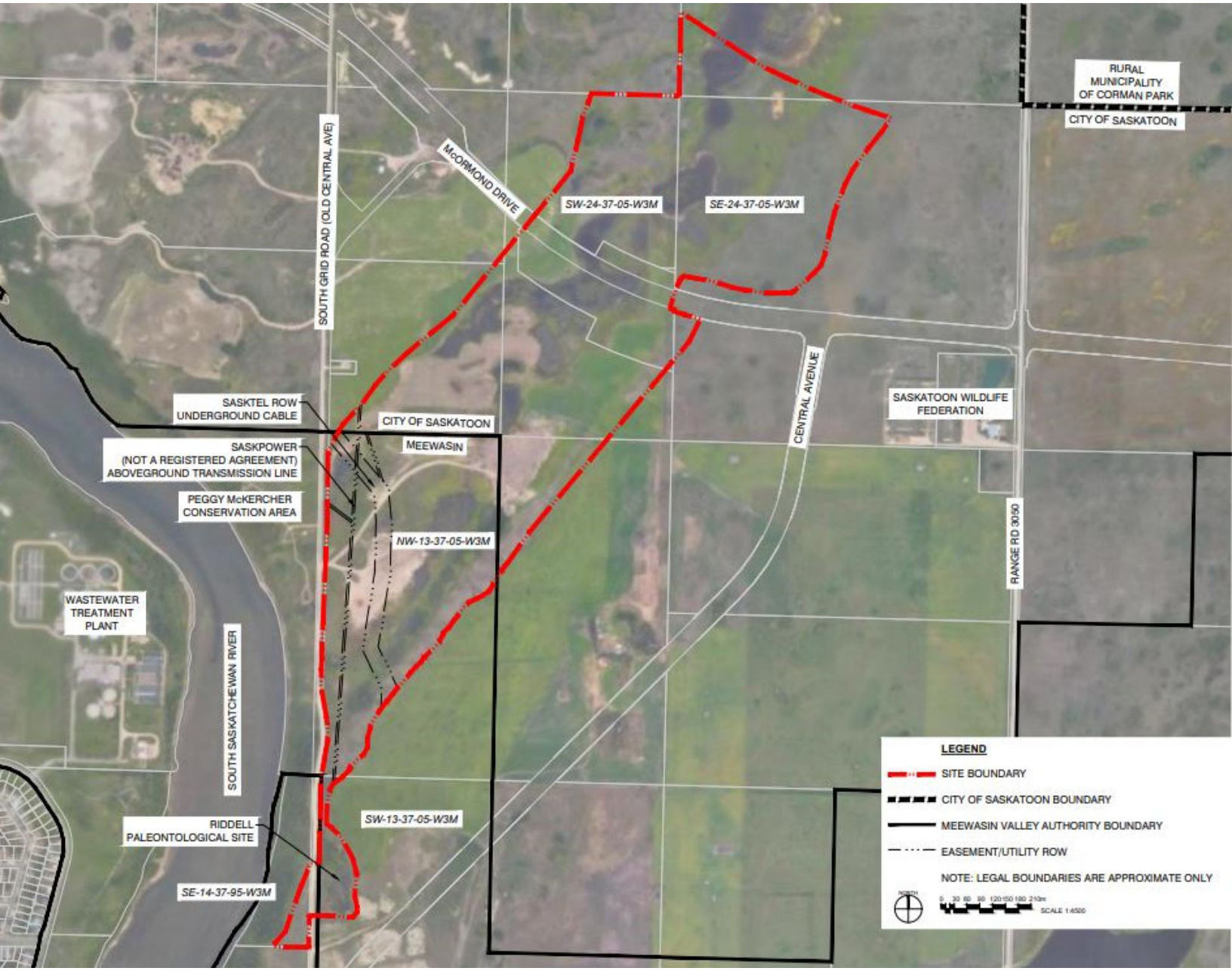

Figure 1-3 Project Location & Ownership

1.3 VISION

A vibrant mosaic of native grasslands and wetlands.
A home and corridor for wildlife.
Where nature and history are celebrated.

Figure 1-4: Vision for Small Swale

1.4 RIGHTSHOLDERS, LAND MANAGERS, PARTNERS, AND STAKEHOLDERS

The NAMP represents a collaboration between the City of Saskatoon, the NAMP team, and certain stakeholders. Stakeholders were identified by the City of Saskatoon, some of which were engaged to provide initial feedback on the NAMP. A list of the rightsholders and stakeholders is provided in the table below, including their interest in the NAMP, and those who were engaged during the development of the NAMP.

Table 1-1: Rightsholders and Stakeholders

Group	INTEREST IN MANAGEMENT PLAN	ENGAGEMENT OF RIGHTSHOLDER/STAKEHOLDER
Indigenous Communities	Education, partnerships, harvesting opportunities, land dedications, ceremonial spaces, culturally significant plant and wildlife species recommendations.	To be engaged in future in coordination with related City projects.
City of Saskatoon (including Sustainability, Planning and Development, Parks, Recreation and Community Development, Saskatoon Water)	Management, maintenance, funding, planning, enforcement, and integration of the site into the larger City plans.	Engaged and provided feedback on the NAMP.
Meewasin Valley Authority	Management, maintenance, funding, planning, enforcement, and integration of the site into the MVRMP (MVA, 2017).	Engaged and provided feedback on the NAMP.
Saskatoon Land	Landowner and developer of the surrounding UH3 Neighbourhood; preparing the UH3 Neighbourhood Concept Plan.	Engaged and provided feedback on the NAMP.
Private Land-Owners & Businesses (including future UH3 Neighbourhood residents)	Implications to restricted land use or infrastructure near the site.	Not engaged.
Saskatoon Swale Watchers	Concern regarding appropriate use of the site, and protection of the natural features.	Engaged and provided feedback on the NAMP.
Native Plant Society of Saskatchewan	Subject matter expert, contributions of botanical data, educational opportunities.	Engaged and provided feedback on the NAMP.
Saskatoon Nature Society	Educational opportunities and partnerships.	Engaged.
Saskatoon Wildlife Federation	Educational opportunities and partnerships.	Engaged.
University of Saskatchewan (Plant Sciences, Indigenous Land Management Institute, Agriculture and Bioresources and the School of Environment and Sustainability, Global Institute for Water Security and the National Hydrology Research Center)	Educational opportunities, partnerships, and research.	Engaged (Plant Sciences).
Wild About Saskatoon	Education, partnerships, planting design (pollinator friendly plants).	Engaged.

2 LEGISLATIVE CONTEXT

2.1 POLICY AND GOVERNANCE CONTEXT

The site is located in and is subject to the policies and regulations of the City of Saskatoon (City). The highest-order planning documents for the City include the Official Community Plan No. 9700 (OCP; City of Saskatoon, 2020c), and the accompanying Zoning Bylaw No. 8770 (City of Saskatoon, 2023c). Relevant policies from the OCP and other applicable standards are identified in section 1.5 - Strategic Drivers.

The swale complex is a natural feature and as such the site area and subsequent study area do not follow the existing parcel boundaries. Following approval of a concept plan for the area, a plan of proposed subdivision will be required to create new parcels for the area in alignment with the boundaries approved through the concept plan process.

A portion of the study area for the small swale management plan is in the Meewasin 'conservation zone'. Meewasin requires development approvals on any improvement valued over $25,000 in accordance with the *Meewasin Valley Authority Act* (Government of Saskatchewan, 1978).

There are two existing municipal utility parcels within the study area as noted below:

- Parcel number 203852662(MU6, ~4.7ha)
- Parcel number 203852651(MU7, ~0.78ha)

Municipal utility parcels are intended for locating public works or public utilities including for example stormwater ponds. Though the purpose of a municipal utility parcel is to accommodate municipal utilities and public works it does not preclude the area from being used for other uses. In accordance with *The Planning and Development Act*, 2007 (Government of Saskatchewan, 2007), a municipal utility parcel may have a secondary function as park space and may be integrated with environmental reserve and/or municipal reserve.

2.2 LAND USE DESIGNATION

Land use designations are a key implementation tool of the City's Official Community Plan. They establish the general use and character of a site or area to help ensure that development takes place in an orderly, rational manner. Land use designations may reaffirm existing development patterns or guide how an area's character and uses may change in the future.

The site and area surrounding are identified as 'Residential', and 'Urban Holding', which are intended to act as interim land uses until a concept plan for the area is approved by Council. The definitions from the City's OCP are included below.

- **Residential:** Land designated as "Residential" has the potential for residential development and community uses compatible within a neighbourhood setting
- **Urban Holding:** Land is designated as "Urban Holding" where the future land use and/or the timing of greenfield development are yet to be established, and where existing uses may continue, and interim uses may be established

These designations are general in nature and the specific land uses and boundaries are intended to be refined through subsequent stages of the established planning process. New land use designations will be identified during the concept planning process for the UH3 Neighbourhood and will require Council approval.

2.3 ZONING

Land within the City of Saskatoon is divided into zoning districts which determine how land may be developed. Each zoning district includes rules for the location and size of buildings, required parking, minimum landscaping requirements, and other regulations.

This site is currently zoned 'Future Urban Development District' (FUD). The purpose of the FUD District is to provide for interim land uses where the future use of land or the timing of development is uncertain. The FUD District is commonly used as an interim zoning district until more information about the future urban development for that area is known.

The City does not have districts for parks and recreation areas, instead, these uses are permitted within various districts including the FUD District. Following the approval of a concept plan for this area appropriate zoning will be identified and applied through the rezoning process.

2.4 ASSOCIATED PLANNING PROCESSES

Development in the City of Saskatoon is regulated by an established process that includes a hierarchy of plans including sector plans and concept plans to refine the vision for development of an area.

The site is located within the University Heights Sector Plan completed in 2013 (City of Saskatoon, 2013b). Sector Plans provide a broad framework for future urban development and include the location and size of future neighbourhoods, employment areas, parks, and significant natural areas. A Sector typically contains 6 – 10 subsequent concept plans which provide greater detail for the area.

The site is identified in the University Heights Sector Plan as an important natural feature. The general boundary of the small swale is illustrated on the land use plan map included in the sector plan and aligns with the boundary of the study area represented in this document.

Within the Sector Plan the site is identified as being “under review”. Several studies and reports have been completed following the adoption of the Sector Plan including the ‘Small Swale Natural Area Screening’, and ‘Meewasin Northeast Policy’. Key recommendations from these reports are included in the section titled ‘Strategic Drivers (Section 1.5)’.

Currently, there is no approved concept plan that includes the site or the areas adjacent.

2.5 POTENTIAL FUTURE ADJACENT DEVELOPMENT

The site is located near the municipal boundary between the City of Saskatoon and the RM of Corman Park. The area outside of the City boundary is regulated by the Rural Municipality of Corman Park and is known as the P4G Planning District. Land located in the district is subject to the policies and regulations identified in the PG4 District Official Community Plan (City of Saskatoon et. al, 2023a) and accompanying Zoning Bylaw (City of Saskatoon et. al, 2023b).

The District Land Use map forming part of the District Official Community Plan is used to establish the general use and character of an area or reaffirm existing land uses in the Rural Municipality. Future land uses in the area near the site are planned to include a combination of the following:

- Green Network Study Area
- Urban Residential Neighbourhood
- Wanuskewin Viewshed

Development would be subject to internal and external consultation and as such there are no immediate implications.

3 ECOLOGICAL CONTEXT

To inform appropriate management goals and objectives, WSP completed a baseline summary of the site (see **Appendix B**). The baseline summary included a review of relevant desktop information assessed at three spatial extents:

1. Project Study Area (PSA): encompasses the extent of the site.
2. Local Study Area (LSA): includes the site plus a 1 km buffer to encompass the minimum setback distances for Sensitive Species (Ministry of Environment, 2017) and Species of Management Concern (SOMC).
3. Regional Study Area (RSA): includes the site plus a 5 km buffer to capture SOMC with larger home ranges.

A subsequent site visit was conducted to fill existing knowledge gaps to better inform any additional baseline data collection and the Conservation Plan.

The following section summarize the ecological context of the site. Refer to **Appendix B** for the complete environmental baseline summary.

3.1 GENERAL ENVIRONMENTAL SETTING

Overall, the site resides in the Prairie Ecozone within two Ecoregions, the Moist Mixed Grassland and Aspen Parkland (MVA, 2013). The Aspen Parkland Ecoregion is predominately composed of aspen groves and fescue grassland (Acton et al., 1998). Whereas the Moist Mixed Grassland is identified by short to mid-grasses in mixed stands (Acton et al., 1998; MVA, 2017).

The site is also located within an area defined as the Prairie Pothole Region of North America (DUC, 2023a). This region of North America was formed through the creation of countless shallow pools left behind during the last ice age. This is a region of importance for ecological function such as water regulation and filtration. It is also among the best breeding grounds for waterfowl in North America (DUC, 2023a).

The Moist Mixed Grassland is considered a subhumid climate, less arid than its neighbouring Mixed Grassland Ecoregion to the south, but warmer and drier than the Aspen Parkland Ecoregion to the north. On average, this ecoregion receives approximately 383 mm of precipitation annually, with 240 mm of that precipitation occurring during the growing season (May through September). The annual average temperature is 2.4°C (Acton et al., 1998). The Moist Mixed Grassland Ecoregion is a vast plain landscape which is intermittently interrupted by scenic valleys and hilly uplands (MVA, 2013).

At the Ecodistrict level, the site occurs entirely within the Saskatoon Plain (K08) Ecodistrict (Acton et al., 1998) and generally consists of pockets of native treed areas and wetlands surrounded by a native prairie/agronomic graminoid matrix (MVA, 2013).

3.2 ASSET INVENTORY AND ECOSYSTEM SERVICES

3.2.1 NATURAL ASSETS

The site consists of 6.6 ha (7.7%) Native Dominated Grassland, 21.8 ha (25.6%) Native Dominated Tame Grassland, 6.4 ha (7.5%) Tame Grassland, and 25.1 ha (29.5%) Wetlands (**Table 3-1**, **Appendix A; Figure 2**).

Categories, Subcategories and Secondary Subcategories were classified using the Natural Areas Inventory (NAI) for the City of Saskatoon prepared by Meewasin (2019).

Table 3-1: Land Cover Types Present in the Site.

CATEGORY[a]	HABITAT TYPE[b]	SUBCATEGORY	SECONDARY SUBCATEGORY	SITE (HA)
Agricultural Lands	Crop Land	Crop Land	n/a	0.3
	Hay Land (Forage)	Tame Forage	n/a	10.5
	Tame Grassland	Tame Forage	n/a	6.4
Natural Assets	Closed Canopy Deciduous Woodland	Forested and Shrubland Systems	Native and Naturalized	2.4
	Open Canopy Deciduous Woodland	Forested and Shrubland Systems	Native and Naturalized	0.8
	Native Dominated Grassland	Grassland Systems	Known Prairie	6.6
	Native Dominated Tame Grassland	Grassland Systems	Known Prairie	21.8
	Wetland	Aquatic Systems	Wetland	25.1
n/a	Disturbed/Developed	n/a	n/a	9.9
	Road	n/a	n/a	1.4
Totals				**85.2**

Note:

a) N/A denotes habitat types not categorized in the Meewasin 2019 Natural Areas Inventory for the City of Saskatoon.

b) "Habitat type" was not utilized in the Natural Areas Inventory

Of important note, EDI (2021) observed that the Native Dominant Grassland landcover hosts a relatively diverse number of native species in an area generally dominated by Kentucky bluegrass (*Poa pratensis*) and smooth brome (*Bromus inermis*) depending on the location in the site. EDI (2021) also noted that the upland grasslands on the edge of the site (LSD 8-24-37-5 W3M) are classified as '*Unhealthy*' following the rangeland health assessment guide (Saskatchewan PCAP Greencover Committee, 2008) based on the presence of non-native species, number of invasive species, general soil instability, and litter reduction. The lowland grassland and the marsh areas (LSD 7-24-37-5 W3M) were classified as '*Healthy*' and '*Healthy with Problems'* respectively (EDI, 2021).

3.2.2 ECOSYSTEM SERVICES

Ecosystem services are the benefits that nature provides. Understanding the specific ecosystem services that the site provides will inform the targets and management objectives of the NAMP. An initial assessment of the ecosystem services provided by the Small Swale was completed through the Natural Capital Asset Valuation (NCAV) Study (City of Saskatoon, 2020b). The NCAV study identified that Small Swale is conservatively estimated to provide $731,200/ha/year in ecosystem services, some of which are summarized below.

Table 3-2: Ecosystem Services of the Small Swale

ECOSYSTEM SERVICE CATEGORY	SERVICE DESCRIPTION
Supporting Services	Habitat provision: a diversity of vegetation and wildlife area present at the Small Swale, including species at risk.
Regulating Services	Carbon sequestration and storage in wetlands and grasslands. Regulation of extreme heat in cities. Flood control: wetlands absorb surface water after extreme weather events. Waste-water treatment: Aids in the removal of toxins like nitrogen, phosphorus, and pesticides. Air quality: Vegetation such as trees supports the removal of pollutants from the atmosphere.
Cultural Services	The Small Swale provides green space for physical exercise, bird or animal watching, and relaxation, which have physical and mental health benefits. The Small Swale provides research and educational opportunities, such as Pollinator Paradise Tours, Jane's Walk Festival, and Bioblitz.
Provisioning Service	Food for livestock.

3.3 TOPOGRAPHY AND SOILS

3.3.1 TOPOGRAPHY

The surficial geology in the Small Swale is shaped by glacial history which has formed the surrounding landscape. The Saskatoon Plain, in which the Small Swale is located, is a level glacial lake with a surficial geology of glaciofluvial kame terrace and an eroded till plain with elevations from 500 to 520 m above sea level (Stantec, 2003). General drainage is towards the South Saskatchewan River. The Small Swale is, thus, a post glacial scar that is a naturally low-lying area.

This area has been bisected by McOrmond Drive. Connectivity between the two features is maintained by a culvert positioned under the road. The lowest lying areas are open water and topography gently slopes to upland habitats. The area south of McOrmond is relatively flat with minor slopes, and moderate slopes along the west side. The Riddell Site has the steepest slopes with the most pronounced depression.

3.3.2 SOILS

According to the Saskatchewan Soil Information Guide (SKSIS, 2018) the site is mainly comprised of two soil associations: the Runway Complex and the Weyburn-Asquith (**Appendix 1; Figure 3**). These are listed as having severe limitations to growing crops, or to the production of native or tame perennial forage either due to insufficient soil water-holding capability, or because of unfavourable topography.

The review of SKSIS (2018) and the Saskatchewan Land Resource Unit (SLRU) (Agriculture and Agri-food Canada 2004; 2009) provided digital soil resource information and was used to identify dominant soil types, texture, salinity, erosion potentials, landform/surface expression, and slope classes **Table 3-3**).

Table 3-3: Soil Map Units and Associated Soil Characteristics within the Small Swale

MAP UNIT	SOIL ASSOCIATION/ COMPLEX	PARENT MATERIAL	DOMINANT/ SUB-DOMINANT SOILS	DOMINANT SURFACE TEXTURE	SUR-FACE EXPRESSION	SLOPE CLASS	SA-LINITY	AGRICULTURAL CAPABILITY
Aq 1	Asquith	Fluvial	Chernozemic	Sandy Loam	Hummocky	2 (0.5-2%)	2	5(6)M 4(4)M
Rw	Runway Complex	Undifferentiated mineral	Various	Various	Ridged	4 (5-10%)	1	5(10)TP
WrAq 1	Weyburn Asquith	Fluvial	Chernozemic	Gravelly Loam	Undulating Dissected	3 (2-5%)	1	4(10)MP
Hw	Hillwash Complex	Various	Various	Various	Hummocky	6 (15-30%)	U	6(10)TE

Impacted soils are expected within the Snow Storage Facility located within the central portion of the site. However, no formal surveys have been completed to date to ascertain the presence or extent of any contamination. It is recommended that EM31 and EM38 and detailed topographical surveys be completed to determine if anomalies are present and to map the specific surficial runoff paths for snow melt and yearly rain runoff from the greater Snow Storage Facility.

Additional locations may be impacted, as a result of a history of anthropogenic influence on the site. This may include the materials storage facility, located south of the Snow Storage Facility.

3.4 WETLANDS AND HYDROLOGY

Based on the literature reviewed and field visit conducted, the site contains 11 wetlands of various classifications in varying degrees of health (**Appendix A; Figure 4**). The wetlands represent 23.4 ha (28%) of the site, with the largest feature being a Class V wetland (17.7 ha) that is bisected by McOrmond (actual wetland complex extent will fluctuate each year depending on wet-dry cycles). Refer to **Table 3-4** for the number and area of each wetland class observed.

Table 3-4: Wetland Classes Present Within the Site

WETLAND CLASS[a]	NUMBER OBSERVED	WETLAND AREA (HA)
Class II Wetland	3	0.4
Class III Wetland	4	4.5
Class IV Wetland	1	0.9
Class V Wetland	3	17.7
Total	11	23.4

Note:

a) Source: Stewart and Kantrud (1971)

To support potential future enhancement/restoration strategies, Native Plant Solutions (2023) has mapped the watersheds sustaining the various wetland observed surrounding the Small Swale. According to the work they completed, two watersheds provide inputs to wetlands located within the site:

- Watershed B: This feature has 103 catchments supporting nine wetlands within the greater Small Swale system and provides hydrological inputs to the wetlands located north of McOrmond Drive within the site
- Watershed C: This feature has four catchments supporting eight wetlands all of which are located in the site, south of McOrmond Drive and northeast of the river

Some of the wetlands located in watershed B and C reside outside of the site boundary but are mentioned here to explain the extent of the catchment areas within the individual watersheds.

The ecological extent of the Small Swale (including the site) is believed to be linked to the Forest Farm Aquifer (Water Security Agency, 2011), which encompasses the Lower Floral Aquifer and the Upper Floral Aquifer (Water Security Agency, 2011). It has been reported that this aquifer has been impacted by various developments at the surface level and currently has an overall vulnerability rating of moderate. It is believed that the wetlands present within the greater Small Swale may be influenced by this aquifer and represent areas of surface expression (e.g., discharge).

3.4.1 FISH AND FISH HABITAT

The site may indirectly influence fish and fish habitat; however, the nature of hydrological linkages is still unknown. Passive deposition of fish eggs to the more hydrologically stable (e.g., semipermanent) wetlands through methods such as mammals and avian species inadvertently moving eggs attached to their bodies (Villazon, 2023), or after passing through their digestive

system (Nuwer, 2020) may occur. However, it is unlikely that they would survive in the current conditions present (e.g., open water areas may freeze to the bottom, and as a result have anoxic conditions overwinter).

Fish and fish habitat in the South Saskatchewan River, may be impacted by contaminants from the Snow Storage Facility as they move through the Small Swale and Peggy McKercher. However, this has not been verified, as no targeted contaminant information has been collected as of this report. Recent research conducted in 2021 by Assistant Professor Markus Brinkmann and his team at the University of Saskatchewan was conducted on the effect of rubber-related compounds in runoff on fish health and survival (University of Saskatchewan's School of Environment and Sustainability, n.d.). Water samples were taken from snow facilities, snowmelt puddles, and outfall sites. Deadly compound 6PPD-quinone and four other bicyclic amines associated with rubber were detected in the samples, decreasing survival rate and health condition for fish in the South Saskatchewan River.

3.5 VEGETATION

The site is comprised of introduced species such as smooth brome *(Bromus inermis)* and Kentucky bluegrass *(Poa pratensis)* and pockets of native grassland species. Rangeland Health Assessments, originally conducted by Stantec in 2013 (a,b) and again in 2019 by EDI (2021), determined the overall rangeland health in the site varies from Unhealthy to Healthy. The Unhealthy grasslands were dominated by nonnative graminoid species; however, they had an abundance of native forbs including blue lettuce *(Lactuca pulchellum)*, common yarrow *(Achillea millefolium)*, dock *(Rumex sp.),* low prairie rose *(Rosa arkansana*), Many-flowered aster (*Symphyotrichum ericoides*), pasture sage *(Artemisia frigida*), prairie sage *(Artemisia ludoviciana),* silverleaf psoralea *(Pediomellum argophyllum)* and wavyleaf thistle *(Cirsium undulatum).* However, the range from 'Healthy' to 'Unhealthy' of the assessed areas was largely attributed to the presence of undesirable graminoid species including smooth brome*),* Kentucky bluegrass and crested wheatgrass *(Agropyron cristatum)*. Given the competitive nature of these graminoids, the condition of the assessed grasslands will continue to decline without management.

Vegetation surrounding wetlands and lower slope positions were reported to be in the best condition with higher biodiversity of native vegetation within the greater Small Swale. The presence of invasive species, along with poor tree and shrub cover, provided wetland vegetation communities the score of Healthy with Problems during Riparian Assessments (EDI, 2021).

3.5.1 NOXIOUS AND NUISANCE WEEDS

EDI documented 11 weed species that were detected during rangeland health assessments conducted in 2021. Of the 11 identified, eight are designated as *Noxious*, and three as *Nuisance* under the Saskatchewan *Weed Control Act* (2010) (**Table** 3-5). Meewasin rates the threat of Invasive Species at High in the Swales, Native Grasslands, and Wetlands, deeming the threat to the entire Swale network present in the Meewasin Valley as Very High (MVA, 2017).

Notable species of concern identified by Meewasin (2019) throughout the greater Swale network, include leafy spurge (*Euphorbia esula*), purple loosestrife (*Lythrum salicaria*), scentless chamomile (*Matricaria perforata*), and common tansy (*Tanacetum vulgare*). There is a likelihood that these species may encroach into the site. These species are aggressive colonizers and may pose a threat to the overall health of the of the various native vegetation communities noted within the site. A review of iMap Invasives (2023) provided spatial locations for four species documented in the area west of the site and can be referenced in **Appendix A -Figure 7**.

Table 3-5: Nuisance and Noxious Weeds Documented Within the Site (2019)[a]

COMMON NAME	SCIENTIFIC NAME	WEED CONTROL ACT (2010) DESIGNATION[b]
Canada thistle	*Cirsium arvense*	Noxious
common dandelion	*Taraxacum officinale*	Nuisance
European buckthorn	*Rhamnus cathartica*	Noxious
field bindweed	*Convolvulus arvensis*	Noxious
nodding thistle	*Carduus nutans*	Noxious

COMMON NAME	SCIENTIFIC NAME	WEED CONTROL ACT (2010) DESIGNATION[b]
kochia	*Kochia scoparia*	Noxious
leafy spurge	*Euphorbia esula*	Noxious
perennial sow-thistle	*Sonchus arvensis*	Noxious
Russian thistle	*Salsola kali*	Noxious
foxtail barley	*Hordeum jubatum*	Nuisance
quack grass	*Agropyron repens*	Nuisance

Note:

a) Source: EDI, 2021.

b) Weed species are defined as Prohibited under Schedule I, Noxious under Schedule II and Nuisance under Schedule III of the Weed Control Act (2010). "Nuisance weed" means any plant that is designated by order of the minister as a nuisance weed and includes the seeds or any other part of that plant that may grow to produce another plant. "Noxious weed" means any plant that is designated by order of the minister as a noxious weed and includes the seeds or any other part of that plant that may grow to produce another plant.

Under the *Weed Control Act* (2010), the City is required to detect and manage populations of prohibited, noxious, and nuisance weeds. Control measures for prohibited, noxious, and nuisance weed infestations include spraying, hand-pulling, grazing, and mowing. See **Table 3-6** below for details on the different weed classes.

Table 3-6: Definitions and Requirements for the different Weed Classes

CLASSIFICATION	DEFINITION	REQUIREMENTS
Prohibited	Prohibited weeds are currently rare or non-existent in Saskatchewan. These species pose a threat to native ecosystems and agricultural crops with aggressive spreading tendencies.	Prohibited weeds must be detected early and eradication measures must be implemented.
Noxious	Noxious weeds are defined as species that have been introduced to the province and have spread.	Noxious weed infestations must be contained with control measures applied as necessary. Isolated infestations of noxious weeds (less than five hectares per quarter section) must be eradicated, whereas established infestations (greater than five hectares per quarter section) must be contained and control measures applied.
Nuisance	Nuisance species that are widely established across the province and are considered "problematic" due to ease of spread. Nuisance weed species can include native species (Blue lettuce [*Lactuca tatarica],* foxtail barley [*Hordeum jubatum]*, and povertyweed [*Iva axillaris*]) (Government of Saskatchewan, 2023).	Nuisance weeds are more widely spread through the province and have become naturalized where the goal of eradication is not feasible.

3.5.2 FLORA SPECIES OF MANAGEMENT CONCERN

Within the site, five SOMC (**Table 3-7, Appendix A; Figure 6**) were categorized as having a high potential of occurring or were confirmed to be present within the site by EDI during their field reconnaissance in 2019 (EDI, 2021). These include plains rough fescue (*Festuca hallii*), wood lily (known locally as Western wood lily [(*Lilium philadelphicum*]), and crowfoot

violet (*Viola pedatifida*) as confirmed species. Crawe's sedge *(Carex crawei)* and few-flowered aster *(Almutaster pauciflorus)* have a high potential to be present. Additional floral SOMC observed by citizen science are listed in **Appendix F**.

Table 3-7: Vegetative SOMC

COMMON NAME	SCIENTIFIC NAME	SKCDC RANK[a]	NOTES
Crawe's sedge	*Carex crawei*	S3	High likelihood, but not confirmed.
crowfoot violet	*Viola pedatifida*	S3	EDI (2019) documented approximately 225 plants within LSD 07-24-37-05.
few-flowered aster	*Almutaster pauciflorus*	S3	Last recorded observation was in 2021 by SKCDC.
plains rough fescue	*Festuca hallii*	S3	Confirmed by EDI in 2021.
Three-lobed beggarticks	*Bidens tripartite*	S1	Documented by the Swale Watchers in 2023, growing in the ditch along Central Ave. Approximately 50 plants.
Western red lily	*Lillum philadelphicum*	S4	Confirmed by EDI in 2021.The Western red lily is Saskatchewan's official floral emblem and a protected species under the Saskatchewan Emblems Act (1988).

Note:
a) Saskatchewan Conservation Data Centre (SKCDC) Tracked Taxa Lists (SKCDC, 2023a,b).
S4 = Apparently Secure; uncommon but not rare.
S3 = Vulnerable / Rare to Uncommon; at moderate risk of extinction or extirpation due to restricted range, relatively few populations, recent and widespread declines, threats, or other factors.
S2 = Imperiled / Very Rare; at high risk of extinction or extirpation due to a very restricted range, very few populations, steep declines, threats, or other factors.
S1 = Critically Imperiled / Extremely Rare; at very high risk of extinction or extirpation due to extreme rarity, very steep declines, high threat level, or other factors.

3.5.3 FLORA SPECIES OF INTEREST TO INDIGENOUS COMMUNITIES

Additional engagement is needed with Indigenous communities prior to preparing content for this section and content must be respectful of any sensitivities with respect to the role and location of important plant species.

3.5.4 FLORA SPECIES OF CONSERVATION OR RESTORATION INTEREST

The prevalence of native grasslands in good condition within the site provides an opportunity to invest in appropriate restoration projects to expand these areas in the future. Based on the available information reviewed, two key species of restoration and conservation interest are crowfoot violet and rough fescue, which have both been confirmed within north-eastern portion of the site (LSD 7-24-37-05 W3M). Seeding rough fescue monoculture is promising in increasing the species count (Desserud and Naeth, 2011). General restoration of grasslands will continue to provide essential habitat of rare plant species such as crowfoot violet (Vujnovic & Wein, 1997).

Species of conservation interest may include SOMC, species which propagate easily and can be collected for local genetics, species known to be host plants for lifestages of insects, or additional factors. For example, crowfoot violets have key associated pollinators including skippers *(Hesperiidae sp)* and bumble bees, *(Bombus sp)* and are propagated easily through seed (Manitoba Museum, 2014). EDI counted a stand of approximately 225 plants, which is a sizeable population that can sustain a managed seed harvest. Alternatively, Plains rough fescue is slow to grow from seed, but does well once established, so a vegetative propagation program (which may include seed collection and propagating live plants in a nursery setting) is much better suited for this species (Slogan, 1997).

3.6 WILDLIFE AND WILDLIFE MOVEMENT

Of the available wildlife information reviewed, 18 SOMC have a high likelihood of being found within the site based on habitat requirements. Targeted wildlife summaries are provided in the following sections. A full list of identified wildlife SOMC is captured in the baseline assessment appended.

3.6.1 MIGRATORY BIRD SPECIES

The most recorded avian species identified frequenting the site during the EDI (2021) surveys included clay-colored sparrow (*Spizella pallida*), red-winged blackbird (*Agelaius pheoniceus*) and Western meadowlark (*Sturnella neglecta*), which are all commonly occurring species within the area. Bird species of management concern, included barn swallow, bank swallow, loggerhead shrike and osprey, were also recorded by EDI (2021) or the SKCDC in 2017 and 2019. In addition to the common avian species noted, a Swainsons hawk stick nest *(Buteo swainsonii)* was documented at the southern edge of the site, bordering the Snow Storage Facility area. It was revisited during field reconnaissance in August 2023 and was deemed active by WSP Biologists. Furthermore, the SKCDC has classified the South Saskatchewan River as a Migratory Bird Concentration Site, and due to its proximity to the site, the river may account for the range of species observations made there.

3.6.2 AMPHIBIAN SPECIES

Three amphibian species have been confirmed to be residents of the site. EDI (2021) observed wood frog (*Lithobates sylvaticus*), boreal chorus frog (*Pseudacris maculata)*, and northern leopard frog (*Lithobates pipiens*). Of these, the northern leopard frog is listed as a tracked species in Saskatchewan, designated Endangered by COSEWIC, and as Special Concern under the *Species at Risk Act.*

3.6.3 MAMMALS

White tailed deer *(Odocolieus virginanus)*, mule deer *(Odocoileus hemionus)*, coyote *(Canis latrans),* raccoon *(Procyon lotor)*, red fox (*Vulpes* vulpes), and American beaver *(Castor canadensis)* all have been confirmed to use the site during a remote camera study conducted within the site (EDI, 2021). For the portion of the site that was included in their study limits, mule deer were the most abundant species observed at 801 detections, followed by white-tailed deer (*Odocoileus virginianus*) at 667, coyote at 70, unknown deer species at 64 and white-tailed jackrabbit (*Lepus townsendii*) at 60.

3.6.4 WILDLIFE MOVEMENT

Overall wildlife passage through the site is mostly unrestricted based on the habitat present and lack of development. However, major barriers such as McOrmond Drive and South Grid Road likely inhibit wildlife movement across the Small Swale. Additionally, even though wildlife passage is currently mostly unrestricted, the upcoming planned development between the Small Swale and the Saskatchewan River will change this. In terms of mammals, the most frequently observed species utilizing the site were deer species and coyote. Deer are generally long-ranging and often move large distances to forage and seek security cover. Coyotes are opportunistic feeders that hunt and scavenge and are adaptable to human disturbance.

Wildlife monitoring completed by EDI (2021) showed that ungulates specifically moved between the Small Swale and the Northeast Swale in an east-west direction. No systematic study of wildlife movement has been carried out, but movement detected on wildlife camera studies, identified two paths that wildlife travelled on. One general movement path appears to initiate in the southeast (LSD 5-13-37-95-W3M) and lead east until it meets the Northeast Swale in the southwest (LSD 5-18-37-04-W3M). The other wildlife path starts at LSD 13-13-37-05-W3M and is oriented towards the southeast towards LSD 12-18-37-04-W3M. To facilitate this movement, EDI (2021) suggested the creation of two linear greenspace or park features along these travel corridors at the time of land use change. With the development of the UH3 Neighbourhood, the identification and planning of generous corridors around the planned subdivision should be considered and implemented in during the neighbourhood planning phase.

Based on the observations to date, it is important that land use changes within the site or the surrounding natural area include methods to maintain connectivity of wildlife habitat through an informed design. Any barriers (e.g., road crossings) planned or existing within the site should consider large and medium-sized mammal movement in addition to maintaining drainage flow to limit disturbance and/or incidental injury or mortality to wildlife utilizing the area post-development.

An Ecological Connectivity Evaluation Framework has been provided in **Appendix E**.

3.6.5 FAUNAL SPECIES OF CONSERVATION INTEREST

Confirmed wildlife SOMC within the site is the northern leopard frog (three locations confirmed by EDI in 2021). The life cycle of this frog relies on three distinct habitat types: deep and permanent waterbodies required for over wintering, a variety of semi-permanent and permanent waterbodies such as wetlands for breeding, and moist upland meadows or grasslands for summer (Environment Canada, 2013). It is important for northern leopard frogs to have access to a corridor between these habitats to successfully complete their life cycle. Therefore, conservation of all three habitat types will lead to the greatest success in sustaining any populations residing within the site.

An additional 16 wildlife SOMC (**Table**) have either been confirmed or have a high potential to be present within the site and efforts should be undertaken to confirm presence or non detection. Additional faunal SOMC observed by citizen science are listed in **Appendix F**.

Table 3-8: Wildlife SOMC Present or Likely to Be Present in the Site

COMMON NAME	SCIENTIFIC NAME	SKCDC RANK[A]	COSEWIC STATUS[B]	SARA STATUS[C]	NOTES
American badger	*Taxidea taxus taxus*	S3S4	Special Concern	Special Concern	Unconfirmed but high likelihood.
Baird's sparrow	*Centronyx bairdii*	S4B	Special Concern	Special Concern	Unconfirmed but high likelihood.
bank swallow	*Riparia riparia*	S4B, S5M	Threatened	Threatened	SKCDC Documented – 2020.
barn swallow	*Hirundo rustica*	S4B	Special Concern	Threatened	Confirmed by EDI 2021.
bobolink	*Dalichonyz oryzivorus*	S5B	Special Concern	-	SKCDC Documented – 2021.
common nighthawk	*Chordeiles minor*	S4B	Special Concern	Special Concern	Unconfirmed but high likelihood.
goldenrod gall fly	*Eurosta solidaginis*	S3	-	-	SKCDC Documented – 2019.
Harris's sparrow	*Zanotrichia querula*	SUB, S5M	Special Concern	Special Concern	SKCDC Documented – 2016.
horned grebe	*Podiceps auratus*	S5B	Special Concern	Special Concern	Unconfirmed but high likelihood.
lesser yellowlegs	*Tringa flavipes*	S4B	Threatened	-	Unconfirmed but high likelihood.
loggerhead shrike	*Lanius ludovicianus excubitorides*	S3B	Threatened	Threatened	SKCDC Documented-2017.
monarch	*Danaus plexippus plexippus*	S2B, SNRM	Endangered	Special Concern	Unconfirmed but high likelihood.
osprey	*Pandion laiaetus*	S3B	-	-	SKCDC Documented-2019.

COMMON NAME	SCIENTIFIC NAME	SKCDC RANK[A]	COSEWIC STATUS[B]	SARA STATUS[C]	NOTES
rusty blackbird	*Euphagus carolinus*	S3B, SUN	Special Concern	Special Concern	SKCDC Documented-2019.
short-eared owl	*Asio flammeus*	S3B, S2N	Threatened	Special Concern	Unconfirmed but high likelihood.
yellow-banded bumble bee	*Bombus terricola*	S4	Special Concern	Special Concern	SKCDC Documented-2021.

Note:

a) Saskatchewan Conservation Data Centre Tracked Taxa Lists (SKCDC, 2023c).
S1 = Critically Imperilled/Extremely Rare; S2 = Imperilled/Very Rare; S3 = Vulnerable/Rare to Uncommon; S4 = Apparently Secure; S5 = Secure/Common; B = for a migratory species, applies to the breeding population in the province; M = for a migratory species, rank applies to the transient (migrant) population; N = for a migratory species, applies to the non-breeding population in the province; U = status is uncertain in Saskatchewan.
COSEWIC = Committee on the Status of Endangered Wildlife in Canada (Government of Canada, 2022); SARA = Species at Risk Act (Government of Canada, 2022); - = not assessed.

3.7 ECOLOGICAL PROCESSES, NATURAL DISTURBANCES AND HAZARDS

The Small Swale is glacial channel scar connected to the South Saskatchewan River and includes native grassland and wetland complexes (City of Saskatoon, 2020b). Glacial scars are erosional landforms that remain when glaciers push aside rocks and debris, which are left behind when the glacier recedes (Klaus et al., 2005). These scars are rare in their occurrence, and tend to be ecologically significant (MVA, 2017). The topography and rock formations in Saskatoon, in general, create environments that support a diversity of rare species. This is due to the landscape having only experienced limited previous disturbances and development.

With extreme weather events on the rise (including floods and storms), wetlands like those found in the site can act as a natural sponge, attenuating surface water run off generated from rainfall and snowmelt (City of Saskatoon, 2020b). Additionally, wetlands as well as grasslands are huge carbon sinks. These ecosystems are able to lock a vast amount of carbon, supporting global climate control (City of Saskatoon, 2020b).

Overall, the naturally occurring features present in the site (i.e., wetlands and native grasslands) are declining rapidly in Saskatchewan and globally (MVA, 2017). Kraus (2016) describes native grasslands as “the world’s most endangered ecosystem”; and Ducks Unlimited Canada – Saskatchewan (2016) states that “in some areas of the province 90 per cent of wetland habitat is gone”. The greatest threats to these vegetative community types and wetlands are the conversion to agriculture or urban development land uses (City of Saskatoon, 2020b; MVA, 2017).

Detailed site-specific information including one-time periodic natural disturbances, such as fires, floods, eroding slopes, or droughts has been identified as a knowledge gap for this iteration of the NAMP.

3.7.1 NATURAL AND ANTHROPOGENIC DISTURBANCES

In areas of concentrated human use, the loss of large wetlands and native grasslands can have additional regional impacts. For example, the site is now an integral part of the green network of the City of Saskatoon (City of Saskatoon, 2022). It also acts as part of a larger corridor for a wide assortment of wildlife to move through the landscape (MVA, 2017). This feature will soon become even more important in the future sustainability of local wildlife use and movement as the City expands, and land uses change (i.e., urban development) to meet the growing demand for housing.

Uninformed urban development within a known wetland catchment usually results in a loss or increase to the receiving waters, which can significantly change their natural hydroperiod leading to the drying out or constant flooding of a wetland. The Small Swale is maintained by three distinct watersheds, uncontrolled urban development in any of these areas could lead

to an introduction of untreated and uncontrolled stormwater into wetlands which reside in the site. This in turn would impact wetland health and erode wetland function. and could lead to a change in overall wetland classification if the hydrological inputs are not carefully managed (Native Plant Solutions, 2023).

The site has been and continues to be subjected to a multitude of human derived hazards, ranging from grazing, gravel operations, the presence of the Snow Storage Facility, stormwater deposition from McOrmond Drive, and current and ongoing urban development.

3.7.2 SNOW STORAGE FACILITY

A portion of the site (portions of the NW 13-37-05 W3M) is currently used as a Snow Storage Facility in the winter and as a materials storage (street sweeping tools, recycled asphalt products, asphalt) in the summer (City of Saskatoon, 2022). The site has been used for snow storage since 1997, while the material storage was added in 2006. Stored snow may contain contaminants, including organic chemicals, dissolved salts, or heavy metals (Transportation Association of Canada, 2013). The collected snow, if contained and subsequently disposed of incorrectly, may pose risks to the release environment (Alberta Environment, 1994). Additionally, large amount of snow can cause soil compaction. Compacted soil impedes vegetation growth in the spring as shoots are unable to penetrate the compacted soil layer (Yukiyoshi et al., 2018).

Historically, the various wetlands located in the Small Swale within, and extending beyond the City limits have been heavily influenced by changing historical land uses such as gravel extraction between 2002-2006, the storage and subsequent discharge of snow melt from 1997 to present day; and the installation of McOrmond Drive in 2016. Each additional land use augmentation has introduced cumulative changes to the local catchment/watersheds associated with the noted wetlands. These activities have influenced the current hydrological regime present (e.g., nature of hydrological cycling, restrictions/release of flow, augmentations to base flow, changes to surface flow inputs/outputs) (WSP, 2023a). Additional details regarding the Snow Storage Facility have been included in **Appendix D**.

3.8 KNOWLEDGE GAPS

During the course of the baseline summary investigation, several areas where additional information will be required to inform the management and decision-making process for upcoming NAMP were identified. The 'knowledge gaps' have been organized by Soils, Vegetation, Aquatics, and Wildlife.

3.8.1 SOIL

- The MVRMP (MVA, 2017) has an objective to work with the City of Saskatoon to develop a restoration plan and begin implementation various strategies to restore the Snow Storage Facility located in the Small Swale by 2027. The current condition of soil present is unknown; however, it can be assumed that there are contaminants (e.g., road salt) which have leached into the soil and possibly the groundwater. An in-depth soil analysis should be conducted to confirm the presence and delineate the extent of any contamination plume prior to undertaking any site reclamation activities.

3.8.2 VEGETATION

- Detailed habitat classification and distribution do not currently exist for the site and should be further investigated to assist with future management objectives. The current scale of information is too coarse to set an appropriate baseline to track change once formal management has been initiated. With the current level of information, it will prove challenging to identify site-specific targets and constraints. For example:
  - Acquiring select historical imagery for the area will aid in boundary delineation for the identified natural assets.
  - Document and map the distribution of current nuisance and noxious weeds to facilitate current and future weed management planning.

- Locate and identify SOMC previously listed or that are potentially in the site (using iNaturalist and local experts) and provide photographic documentation of specimen and surrounding habitat. Some records, as seen in **Table 3-7**, are historical (greater than 10 years old), and habitat may no longer exist to support these species (such as pale moonwort [*Botrychium pladdifum],* which was last observed in 1994)
- Consider undertaking a targeted soil investigation to confirm the soil classifications noted in order to increase the probability of success when developing native restoration/enhancements and identifying areas of elevated erosion risk.
- Consider undertaking detailed species inventories for vegetative features, with a targeted approach for SOMC, as detection will guide decision-making processes for the NAMP.
- Confirm presence and location of species observations provided through citizen science (**Appendix F**)

- Confirmation regarding the continued presence of the temporary Snow Storage Facility and possible contamination resulting from the operation of this facility.

3.8.3 AQUATICS

- Water quality is currently unknown. Consider undertaking a water chemistry analysis (surface and groundwater) to develop a baseline water quality understanding for future use targeting any contamination run on or for the consideration of infrastructure planning and targeted restoration/rehabilitation (as required)
- Consider developing a drainage/climate resiliency plan to inform future trail/park infrastructure placement (if proposed) and expected pre-development run on required to sustain the various natural features present within the site.
- Water balance:
  - Native Plant Solutions (2019) has initiated an understanding of the current (watershed/catchments provide hydrological inputs to the various wetlands located within the PSA. It is understood that additional efforts will be employed in 2023 to further refine wetland condition, wetland edge/delineation, surrounding landscape condition/use, connectivity, and wetland classification. Spatial extents/locations for restoration/enhancement opportunities should be identified. In addition, future post-development possible inlet/outlet locations should be reviewed and verified on site to minimize post-development community changes that may result from appropriately locating future artificial run on/off interfaces. At best, nature inflow/outflow locations should be prioritized over other alternatives.
  - The wetlands located within the site may be influenced by the Forest Farm Aquifer and present areas of surface expression (e.g., discharge). The level of influence this aquifer represents, in addition to refining the interaction with surface water should factor into a hydrological balancing evaluation process that should be developed as directed by the NAMP to inform future development with the noted watersheds. The process, at a minimum, should consider the use of hydraulic-hydrologic computer modelling software (e.g., PC-SWMM) to generate appropriate surface water management volumes that consider seasonal variability to mimic the current dynamic hydrological regime present in a post-development scenario.

3.8.4 WILDLIFE

- Confirm if moderate to high probability species listed are utilizing areas within the site as part of their natural lifecycle as direct management objectives may be required to sustain the confirmed species identified. At this time, the only species confirmed to occur in the site is northern leopard frog.
- Baseline information pertaining to medium- and large-sized terrestrial mammal use is limited in the documentation provided. Consider targeted surveys to develop a baseline understanding of habitat use and seasonal movement in the context of the site boundary. This information is useful when considering infrastructure placement (e.g., trails, roads). See **Appendix D** for more information.

- Only male deer could be identified using remote camera photos and were monitored in summer 2019. Movement patterns from female and young of the year may differ from males. Consider additional remote camera surveys to develop a better understanding of wildlife movement patterns throughout each of the four seasons.
- Wild boar has been detected within the LSA. The Canadian Wild Pig Research Project database should be regularly checked for changes in population distribution and detection.
- Confirm presence and locations of species observations provided through citizen science (**Appendix F**)

4 HUMAN CONTEXT

To gain an understanding of the past, present, and future uses of the Small Swale, a review was conducted to determine the historical and cultural landscape from a human perspective. This information will be used in future sections of the NAMP to create a site-specific Situation Analysis (see Section 5 – Conservation Plan).

4.1 HISTORICAL AND CULTURAL LANDSCAPE

Historical and Cultural significance considers the past human uses of the site, historically significant features, and known cultural significance. A summary of known historical and cultural uses is presented in the following sections, however, further studies and engagement with Indigenous communities are recommended to better understand the cultural and historic significance of the site.

4.1.1 HISTORICAL & CULTURAL SIGNIFICANCE

CONTEXT

The site resides within the greater swale network, which is central to recognized features of human heritage, including the Moose Woods-Batoche Trail, Limestone Quarry and Kilns, and Clark's Crossing (MVA, 2013).

A consideration within Meewasin's 100-year plan is to develop parts of the swale network area into a heritage village and interpretive center (MVA, 2013). The area surrounding the Small Swale contains trail networks that have been used historically and may be significant to Indigenous communities (MVA, 2017).

Directly north of the site lies the Wanuskewin Heritage Park, which is designated as a National Historic Site and is home to Canada's longest running archaeological dig. In 2019, Wanuskewin partnered with Parks Canada to reintroduce bison back to their original prairie grasslands. The aim of the reintroduction is to restore the land back to where animals, grasslands, humans, and spirit are in balance. Wanuskewin is currently seeking designation as a UNESCO world Heritage Site. (Wanuskewin, 2023).

HISTORICAL AND CULTURAL SIGNIFICANCE OF THE SITE

The Small Swale is known to be historically significant, with a strong possibility of holding cultural significance. In June 2023, WSP submitted the PSA (see **Appendix B** for definition of the area) to the Developer's Online Screening Tool website to better understand the potential heritage sensitivities that may be present. According to the screening results, the entire PSA has a high Heritage Sensitivity. Heritage Sensitivity in Saskatchewan refers to quarter sections, if evaluated as sensitive, that require review by the Heritage Conservation Branch of Saskatchewan Parks, Culture, and Sport in form of a HRIA. Certain criteria, including terrain or distance to water, will influence if a quarter section is to be determined as Sensitive. The specific quarter section results are presented in **Table 4-1.**

Table 4-1: Heritage Sensitivity Results by Quarter Section

QUARTER SECTION	SECTION	TOWNSHIP	RANGE	MERIDIAN	HERITAGE SENSITIVE
NE	14	37	05	3	Yes
NW	13	37	05	3	Yes
SE	24	37	05	3	Yes
NE	24	37	05	3	Yes
NW	24	37	05	3	Yes
SW	24	37	05	3	No
NW	30	37	04	3	Yes
SW	30	37	04	3	Yes
SE	25	37	05	3	Yes
NE	25	37	05	3	Yes

RIDDELL PALEONTOLOGICAL SITE

The Riddell Paleontological Site is a prized archaeological site located in the southern portion of the site (portions of the SW 13-37-05 W3M). Information on the Riddell Paleontological Site is derived from the 2021 EDI report, which is based on a paleontological exploration and collection at the Riddell Site from 1976 by Dr. Skwaram-Woolf and a field report that was later prepared by Dr. John Storer (EDI, 2021):

> "During the paleontological exploration program at the Riddell Paleontological Site in 1976, vertebrate fossils, ocherous wood and shells were found. In addition, 19 taxa of large mammals (three of which are extinct) from the late Pleistocene epoch (Late Rancholabrean Age) were discovered in a stratified and cross-bedded sand deposit known as the Riddell Member (Woolf, 1981). Unfortunately, due to the vagueness of past reports, there is no definitive information on what remains of the site; however, to be conservative, [EDI] assumed that intact components of the Riddell Paleontological Site likely exist. Dr. Storer's Field Report recommended that the site be marked with a sign and considered as a future candidate for designation as Provincial Heritage Property" (EDI, 2021).

EDI concluded that the Riddell Paleontological Site be preserved and protected given the unique historical significance of the site, combined with the flora and fauna communities that this site supports (EDI, 2021). It was also recommended that a paleontological Heritage Resources Impact Assessment (pHRIA) be completed to determine the status, size and location of the site and level of disturbance (EDI, 2021). In 2021, a pHRIA was conducted for the Riddell Palaeontological Site by Michael Wildon and Arrow Archeology (2023) under the Saskatchewan Heritage Conservation Branch Permit #20-P003 (Wilson, M.C., 2021).The pHRIA provided recommendations to protect the Riddell Palaeontological Site from future development and disturbance which include forming a buffer and preparation of a palaeontological impact mitigation plan where development is unavoidable.

4.2 PAST, CURRENT, AND FUTURE LAND USES

Past and current land uses have left the site in various stages of ecological health. Understanding the past, current, and future uses of the site is essential to understanding the root causes behind disturbance and threats to the ecological communities.

4.2.1 PAST LAND USES

Métis, First Nations, and early settlers to the area later named Saskatoon used the Moose Woods-Batoche Trail, which extends into the Small Swale, as a route of travel from Moose Jaw, SK. Historically, the greater swale network has shown evidence of attempted limestone quarrying from boulders that were deposited through glacial movement (MVA, 2013). In more recent years, past uses of the site are mostly related to agricultural uses, such as grazing and cultivated cropland. An inactive gravel pit is located within the northern sections of the Project Study Area outside of the site (SE-25-37-05, NE-24-37-05 W3M), which has caused historical disturbance to natural habitat (EDI, 2021). Assumed effects to the project site through past land uses described above are a change to the vegetation communities and associated biodiversity.

4.2.2 CURRENT LAND USES

The site is largely unprogrammed with minimal human-caused improvements, with moderate to heavily degraded disturbance (**Appendix A; Figure 8)**. The northern portion of the site (north of McOrmond Drive) is largely undisturbed and is not currently programmed or actively being used for recreational or other purposes. Apart from the Riddell Palaeontological Site, a large portion of the southern area (south of McOrmond Drive) is disturbed or actively being used for agricultural purposes.

CURRENT ON-SITE USES

Agricultural Uses: The majority of land cover south of McOrmond Drive in SW 24-37-05 and NW 13-37-05 W3M includes a mosaic of previously disturbed lands, which include, but are not limited to cultivated cropland, grazing, and tame grasslands. Approximately 10.8 ha of the site south of McOrmond is currently used for agricultural purposes (e.g., crop land and hay land). The assumed ecological impacts include fragmentation of both uplands, wetlands, and surrounding habitats, change in vegetation cover including declines to biodiversity and introduction of non-native or invasive species, as well as

runoff of pesticides, fertilizers, and volunteer seeds. If grazing is mismanaged, rangeland health of grassland ecosystems may decline.

Materials Handling Yard: Located south of McOrmond Drive, is the municipal material storage associated with the Civic Material Handling Yard. This area is currently used to store soil from excavation projects, gravel, and sand. The assumed ecological impacts include increased pollutants to nearby ecosystems (i.e., dust and debris) which has the potential to further habitat loss through decline in vegetation cover and biodiversity.

Transportation Corridor: The development of McOrmond Drive has resulted in the site being divided into two parts, north and south. The assumed ecological impacts include habitat loss and fragmentation, the introduction and spread of non-native, invasive plant species, increases in traffic with subsequent exposure to plant and wildlife communities, increased debris and pollutants to the ecological landscape including dust, salt, and litter.

Central Avenue Snow Storage Facility: An active Snow Storage Facility is located south of McOrmond Drive and has been in operation since 1997 (Ducks Unlimited Canada, 2023b). The Snow Storage Facility, when operating in the winter, can introduce contaminants to the site that may proceed to the wetlands as runoff in the spring. In the summer, the Snow Storage Facility, acting as a material storage, may bring contaminants in form of recycled asphalt to site.

Stormwater Management: A forebay located south of McOrmond Drive currently acts as a stormwater facility to collect runoff from adjacent lands.

Unused/Unprogrammed Land Use: The site also contains unused, or unprogrammed lands which are composed of the Riddell Palaeontological site, wetlands, native and non-native grasslands, and tree stands.

Recreational Use (Informal): The site is currently unprogrammed; however, visitors occasionally frequent the site to partake in birdwatching, cycling, hiking, biking, and dog walking. These activities are currently discouraged throughout the majority of the site, but enforcement is not currently managed by the City.

Hunting: Reports have been made of hunting occurring within the Small Swale.

Illegal Dumping: Illegal dumping of household waste has been noted to occur, most notably north of McOrmond along the eastern portion of the site.

CURRENT HUMAN IMPROVEMENTS (ON-SITE)

An inventory of the current features, including access routes and infrastructure, has been cataloged and listed below (**Table 4-2**).

Table 4-2: Existing Feature Inventory for the Site

	EXISTING FEATURE	DESCRIPTION
1	Existing Access Route(s)	Access to the site north of McOrmond is currently not formalized but can be accessed by walking through adjacent lands from Range Rd 3050. Access to the site south of McOrmond is currently available from three locations along South Grid Road. The site can be accessed from vehicles at the gated location leading to the existing Snow Storage Facility.
2	Existing Roads & Parking Lots	McOrmond Drive, a five-lane road with a bicycle path, bisects the site from west-to-east. An unnamed gravel road runs through a portion of the site south of McOrmond Drive. This unnamed road is accessible from Central Avenue and provides access to the current Snow Storage Facility. Formal parking lots are not currently located on, or directly adjacent to, the site.
3	Existing Trails & Circulation Routes	Informal, natural surface trails are currently located in the southernmost edge of the site, on the western side of South Grid Road. This trail system runs along the South Saskatchewan River, south towards Peturrson's Ravine. Informal trails appear to currently exist north of McOrmond Drive; however, these trails have not been mapped or verified on site.
4	Existing Site Furniture	The site does not currently have existing site furniture such as benches or tables, or habitat improvement structures.
5	Existing Fences	Fence types include wooden-post-and-wire fence, and chain link fencing. The majority of the site is un-fenced, with the exception of the Riddell Paleontological Site which is encircled by a

EXISTING FEATURE		DESCRIPTION
		wood-post-and-rail fence. Chain-link fencing is located above the culverts on either side of McOrmond Drive.
6	Existing Gates	Multiple gates currently provide access from South Grid Road to various parts of the site south of McOrmond Drive. The most prominent gate is a double swing gate which provides access to the existing Snow Storage Facility.
7	Existing Signage	Seven signs are currently located on-site. These include various bylaw or similar signage, or information for the existing operations on on-site, such as “Snow Storage Site” and “No Dumping of Any Material”. Wayfinding signs or park identification signs do not currently exist.
8	Existing Utilities & Services	A Right-Of-Way (ROW) runs north-to-south to accommodate the Buried SaskTel Cable. An overhead power line runs north-to-south, however there is currently no registered agreement. A 5 m wide ROW has been assumed as recommended by SaskPower.
9	Stormwater Facilities	Stormwater facilities include the culverts with rip-rap on either side of McOrmond Drive, a culvert between the site and Peggy McKercher, and the existing forebay directly south of McOrmond Drive.

SUPPORTING IMAGES OF EXISTING CONDITIONS

Figure 4-1: West of Snow Storage Facility

Figure 4-2: South of Snow Storage Facility

Figure 4-3: Existing Fence in Poor Condition

Figure 4-4: Chain Link Fence at Culvert

Figure 4-5: South of Forebay

Figure 4-6: Illegal Dumping

Figure 4-7: Gate Access from South Grid Road

Figure 4-8: Snow Storage Facility Gate

Figure 4-3: Quiet Zone Sign

Figure 4-10: Snow Storage Facility Sign

Figure 4-11: Culvert

Figure 4-12: Culvert

CURRENT OFF-SITE USES (ADJOINING AND ADJACENT LANDS)

Agricultural Use: Surrounding the site are primarily agricultural lands.

Conservation:

- The **Peggy McKercher Conservation Area** is located to the west on the opposite side of South Grid Road and is managed by Meewasin. This area is a highly desirable location for birdwatching, and includes gravel pathways, and remnants of historic features from past uses (University of Saskatchewan, n.d. a). Peggy McKercher currently supports a formal gravel trail system; however, a connection to the site does not currently exist.
- **Peturrson's Ravine** is located adjacent to the southern boundary of the site on the western side of old Central Avenue. Peturrson's Ravine includes natural surface trails popular with cyclists and hikers. Peturrson's Ravine is currently accessed by means of the existing informal trail system at the southernmost portion of the site.
- The **Northeast Swale** is located near the southern and eastern boundaries of the site and is a highly regarded natural area currently being conserved by Meewasin and the City of Saskatoon (City of Saskatoon, 2023f). The Northeast Swale has an extensive trail system which currently ends at Agra Road to the south of the site. Though a formal connection does not currently exist, the Moosewoods-Batoche Trail currently runs from the Northeast Swale and ends at the site.
- **Meewasin** currently has jurisdiction over portions of the surrounding lands. These lands, such as Peggy McKercher Conservation Area, and the Northeast Swale offer tremendous recreation and conservation benefits, and potential connection opportunities. At this time, Meewasin has expressed interest in expanding their trail system to run the length of South Grid Road. This would have the potential to connect the site to nearby natural assets.

Residential Developments & Private Residences: Located nearby to the west, east, and south of the site. The largest residential developments (Evergreen, Silverspring, and Aspen Ridge) are located to the southeast of the site, with Evergreen and Silverspring being the closest to the southernmost portion of the site.

Wastewater Treatment Plant: The South Saskatchewan River separates the site from the city to the west, with the Wastewater Treatment Plant and multiple residential developments on the opposite side of the river.

Saskatoon Wildlife Federation: Located nearby the site, and is a fixture within the community of Saskatchewan, teaching wildlife safety and respect from a young age, as well as encouraging enthusiasts to develop their skills (Saskatoon Wildlife Federation, 2023).

4.2.3 FUTURE LAND USES

FUTURE ON-SITE USES

Future uses of the land are expected to largely respond to current off-site land uses. As the surrounding adjoining and adjacent lands develop, it is assumed that the Small Swale will face increased human pressure, particularly in the quantity of future visitors. Recommendations to manage these pressures are addressed in Section 5 – Conservation Plan and Section 6 – Human Use.

FUTURE OFF-SITE USES (ADJOINING AND ADJACENT LANDS)

North of McOrmond Drive, the site is abutted by agricultural land. It is anticipated that these lands will be developed as part of the University Heights Development plan in the distant future (20+ years). The site will be bounded by the future Saskatoon Freeway which has been proposed to be built directly north of the site.

South of McOrmond Drive, the site is abutted by agricultural land uses to the west and east. These lands will become part of the future UH3 Neighborhood, which aims to develop a residential community to the east of the site, and a mixed-use industrial area to the west of the site. One of the overarching goals of UH3 Neighbourhood is to build a neighborhood that balances human use with the natural environment (EDI, 2021). As part of the UH3 Neighbourhood development, a stormwater facility may be required within the site to accommodate the increased runoff from the future development. Recommendations for this possibility are included in Section 5 – Conservation Plan.

4.3 DATA GAPS

During the course of the baseline summary investigation, several areas requiring additional information to inform management and decision-making processes were identified.

4.3.1 HISTORICAL AND CULTURAL SIGNIFICANCE

- Understanding the cultural significance of the site from an Indigenous perspective. It is crucial to foster ongoing relationships and further understanding with Indigenous groups who currently, and in the past, have depended on and are tied to the land for their traditional practices and livelihood.
- Locating historically significant features aims to preserve cultural heritage, understand past land uses, and ensure their protection. A combined effort between traditional knowledge (i.e., oral teachings from local community leaders and Elders) and modern technologies (historical records, archaeological surveys, remote sensing) would assist in the identification and further documentation of these features.

4.3.2 CURRENT AND FUTURE HUMAN USE

- Survey of all informal trails, particularly in the southern portion of the site adjacent to the Riddell Paleontological Site
- Legal survey of property lines, easements, right of ways (ROWs), utilities, and any infrastructure

5 CONSERVATION PLAN

5.1 METHODOLOGY

For the purposes of the NAMP the Conservation Plan (CP) shall be defined as a compilation of the Targets (Conservation Targets & Human Well-Being Targets), Critical Threats, Indirect Threats, Opportunities, Goals, Strategies, and Actions, and Objectives. The aim of the CP is to produce a site-specific Action Plan by analysing the available data and producing an actionable and measurable plan for the long-term management of the site.

Development of the CP follows the multi-step methodology prescribed by the Conservation Standards and incorporates elements of the International Principles and Standards for the Practice of Ecological Restoration, 2nd Edition (the Standards; Gann et. al, 2019). As such, the NAMP team first assessed the site by means of the following steps:

1. **Targets**, both Conservation Targets and Human Well-Being Targets, were identified to guide the ultimate aims of what the project intends to conserve. A **Reference Ecosystem** was identified for which to measure future restoration objectives.
2. Targets were then assessed through a **Viability Assessment** of Key Ecological Attributes and their Indicators, and identification of **Restoration Feasibility**.
3. **Direct Threats**, both Conventional Threats and Climate Threats to the Targets were then identified and assessed.
4. **Indirect Threats** and **Opportunities** were identified to understand the driving forces behind the Direct Threats.
5. To visualize the complete situation and forces acting on the site, a **Situation Model** was developed which is a visual representation of the relationship between the Targets, Direct Threats, Indirect Threats, and Opportunities.

The NAMP team then developed a “plan” for the management of the site, which consists of the Goals, Strategies, Actions, and Objectives. Together these form the Action Plan. To achieve this, the following steps were undertaken:

6. **Goals** were identified to represent the ultimate ideal state of each Target.
7. **Strategies** and their assumed results were then identified and compiled into **Results Chains**. The Results Chains indicate the abatement of a Critical Threat and the relationship between the assumptions which lead to achievement of a Goal.
8. For each Strategy, **Actions** were identified to represent the tasks required to be completed as part of each Strategy.
9. **Objectives** were then identified to support each Strategy.
10. Together the Goals, Strategies, Actions, Results, and Objectives form the final **Action Plan** which can be implemented and measured for success.

The CP represents a collaboration between the City of Saskatoon, the NAMP team, and the stakeholders. Stakeholders were identified by the City of Saskatoon and engaged to provide initial thoughts and feedback on each element of the CP. A list of the rightsholders and stakeholders is provided in **Table 1-1** including their interest in the NAMP.

5.2 TARGETS

As the first step in the process, a select list of Targets was identified to inform Goal setting, determining Actions, and measuring effectiveness (CMP, 2020). Two types of Targets were identified: Conservation Targets, and Human Well-Being Targets. Conservation Targets, or biodiversity targets, are site-specific, tangible entities the project is working to conserve; represent and encompass the ultimate aims of the project (CMP, 2020). Human Well-Being Targets focus on those components of human well-being affected by the status of conservation targets and associated ecosystem services (CMP, 2020).

TARGET SELECTION PROCESS

Targets were selected by first engaging with stakeholders (see **Table 5-1**) at workshops composed of select user-groups and interested parties, some of which are listed as stakeholders in **Table 1-1**. Following stakeholder engagement, the initial site-specific Targets were then reviewed by the NAMP team and refined for specificity to the site based on knowledge gained in previous environmental assessments. The following table outlines the initial Targets identified by the stakeholders and the response by the NAMP team during the refinement process.

Table 5-1: Initial Targets & Refinement

TARGETS IDENTIFIED BY STAKEHOLDERS	REFINEMENT BY NAMP TEAM
Grasslands (native and modified)	Grasslands, both native and modified, have been nested as sub-targets under the "Prairie" Conservation Target to best capture the complete upland grassland communities noted on site.
Wetlands	No change.
SOMC (e.g., northern leopard frogs)	SOMC have been incorporated under each of the Conservation Targets with the reasoning that if the habitat is improved it will result in a positive improvement for the targeted SOMC.
Heritage, education, and research	Heritage has been incorporated under the human well-being target of "Historical & Cultural Connection." Education and research are incorporated under "Education & Connection to Nature" which encapsulates research as a sub-target.
Archaeological & paleontological features	Archaeological and palaeontological features have been retained as a target and refined as "Historical & Cultural Connection" which encapsulates both the archaeological and paleontological features of the site.

5.2.1 CONSERVATION & HUMAN WELL-BEING TARGETS

The CP overarching aims are reflected in the chosen Conservation and Human Well-Being Targets. Detailed descriptions of each Target and corresponding sub-targets are provided in **Table 5-2**. Subsequent subsections provide the rationale behind the selection criteria and, where applicable, descriptions of site-specific locations.

Table 5-2: Targets

TARGET TYPE	TARGET	SUB-TARGET
Conservation Target	Prairie	Fescue Prairie
		Mixedgrass Prairie
		Modified Grasslands
		SOMC (Flora & Fauna) & Culturally Significant Species
	Wetlands	Wetlands, Wetland Complex, and Hydrological Systems
		SOMC (Flora & Fauna) & Culturally Significant Species
	Ecological Connectivity	Intra-Connectivity
		Inter-Connectivity
Human Well-Being Target	Historical & Cultural Connection	Riddell Paleontological Site
		Indigenous Connection
	Education & Connection to Nature	Education
		Connection to Nature

5.2.1.1 PRAIRIE – CONSERVATION TARGET

The prairie ecosystem, comprising the upland graminoid-dominant communities constitute a significant spatial extent within the site (approximately 40.8% of the total expanse of the current site boundary). In general, the 'Prairie' ecosystem holds considerable importance by making positive contributions to ecosystem health and cultural connectivity, such as: biodiversity in flora and fauna species, habitat for local species, improved water and air quality, pollinators, pest control, flood mitigation, cultural and historical significance, education and research, and passive recreational values.

It is worth noting that native grasslands are facing rapid decline in Saskatchewan, as highlighted by Meewasin in their 2017 MVRMP and are so imperiled that Kraus (2016) describes them as "the world's most endangered ecosystem." This elevates the native grasslands as a crucial component of the Prairie Conservation Target and will be captured in the Fescue Prairie sub-target.

Prairies benefit from natural disturbances, primarily wildfires and grazing. Fires help to remove dead or decaying plant material, allowing light to penetrate the ground and promoting native plant growth (Parks Canada, n.d). They are critical part of maintaining healthy prairies. Fire suppression and a lack of grazing, over time, leads to a general deterioration of prairie condition.

Four additional sub-targets were also identified as part of the Prairie conservation target in order to capture the diversity and importance of prairie communities as well as distinguish between native grasslands and modified grasslands. These include Fescue Prairie, Mixedgrass Prairie, Modified Grasslands, and SOMC.

FESCUE PRAIRIE

Fescue prairie refers to the community dominated by plains rough fescue, which is a SOMC found in LSD 7-24-37-05 W3M (north-eastern portion of the site). Co-dominant species of this community are awned wheatgrass (*Agropyron subsecundum*), western porcupine grass (*Stipa spartea* var. *curtiseta*), and Hooker's oatgrass (*Helictotrichon hookerii*). With agricultural activities and human urbanization expanding, natural grasslands in Saskatchewan are decreasing rapidly.

Fescue prairie has been reduced to 5% of its original size across Canada (Redmann, n.d.). The remaining patches are havens for wildlife, and rare vegetation species (e.g., crowfoot violet) can thrive Culturally, fescue prairie ecosystems also provide Indigenous communities with the opportunity to gather traditional plant species for medicinal, ceremonial, or consumptive purposes (e.g., plains sage, prairie turnip). As fescue prairie communities become increasingly rare, conservation and restoration become increasingly crucial.

MIXEDGRASS PRAIRIE

Mixedgrass prairie is the largest grassland community in Saskatchewan. It is drier than fescue prairie and dominated by needle-and-thread (*Hesperostipa comata*), blue grama (*Bouteloua gracilis*), and western wheatgrass (*Pascopyrum smithii*). In wet periods, the community is dominated by mid-grasses, while during dry periods of climatic cycles, it is dominated by shorter grasses (Redmann, n.d.). This community is found predominantly in the northwestern portion of the site. Due to fragmentation (e.g., the construction of McOrmond Drive, Central Avenue, and South Grid Road), the western portion of the Mixedgrass prairie grassland community has been disturbed. Human expansion is the driving factor for the reduction of this Prairie sub-Target. Only 25% of this community type original size within Canada remains at present (Redmann, n.d.). The area available in the site likely represents wildlife habitat for SOMC (e.g., barn swallow *[Hirundo rustica]*, bobolink *[Dolichonyx oryzivorus]*) that are heavily dependent on prairies for nesting. Culturally significant plant species (e.g., saskatoon *[Amelanchier alnifolia]*, sweetgrass *[Hierochloe odorata]*) can also be provided by this prairie grassland type.

MODIFIED GRASSLANDS

Modified grasslands are transition zones between native grasslands and tame grasslands and are typically anthropogenically modified areas. With proactive range management, these modified grassland areas can remain in a healthy state without shifting to highly disturbed condition, dominated by weedy species.

The margins of the site are dominated by this Prairie sub-Target (e.g., agricultural fields, roads). Modified grasslands are not as highly valued as native communities, but in a post urban environment can still provide habitat for prairie species, aid in carbon storage, and give opportunities for cultural connection. Preserving modified grasslands and implementing proactive management will not result in these areas becoming native again but will assist with buffering from negative external influences on the sustainability of the Fescue prairie and Mixedgrass prairie areas within the site.

SOMC (FLORA & FAUNA) & CULTURALLY SIGNIFICANT SPECIES

The site provides habitat for a variety of SOMC and culturally significant species. Based on available information from EDI crowfoot violet is found in the northeastern portion of the site. This violet is ranked S3 for Saskatchewan by NatureServe and has key associated pollinators including skippers *(Hesperiidae sp)* and bumble bees, *(Bombus sp.)* (Manitoba Museum, 2014). The attraction of pollinators can aid in the pollination of crops. In the absence of pollinators, canola crop yields fields for example could drop up to 90% (City of Saskatoon, 2020b). It is essential to conserve natural ecosystems within and adjacent to agricultural fields for food security. Preserving SOMCs like crowfoot violet can help in achieving this goal.

The Western red lily is another SOMC identified in the site (LSD 7-24-37-05 W3M). It is the Saskatchewan official flora emblem and protected under the *Saskatchewan Emblems Act* (1988). Besides drawing pollinators into the local area, the Western red lily also provides food for deer and voles, who forage on the leaves and corms respectively (McKinlay & McKinley, 2023).

A few cultural significant species that are valued by the Plains Cree, Saulteaux or Plains Ojibwe, Dakota, and the Nakoda or Assiniboine First Nation cultures may be found in the site. Sweetgrass, for example, is used as ceremonial plant for smudging, art, and basket weaving, while prairie turnips were used a wild food source. Other plants with medicinal and traditional purposes may be present in the site.

A list of known SOMCs and examples of culturally significant species that may reside within the site can be found in Section 3 – Ecological Context.

5.2.1.2 WETLANDS – CONSERVATION TARGET

Collectively, wetlands are the second largest feature type observed. As a whole, this Conservation Target represent approximately 27.5 % of the site and is integral to defining the greater Small Swale wetland complex (City of Saskatoon, 2013).

WETLANDS, WETLAND COMPLEX, AND HYDROLOGICAL SYSTEMS

Overall, wetlands play a significant role in the local biodiversity, water filtration and purification, flood control, carbon sequestration and storage, and habitat. According to the information reviewed, the various wetlands present within the site are home to a variety of flora and fauna and federal SAR such as northern leopard frog, which have been confirmed within the southern portion of the site (LSD 3 & 13-13-37-05 W3M; south of McOrmond Drive).

Wetlands in the greater Small Swale (23.4 ha) are conservatively estimated to provide approximately $749,134 (City of Saskatoon, 2020b) in ecosystem services (e.g., carbon sequestration and storage, habitat, wastewater treatment, and storm water management). They also offer an opportunity for passive recreation (e.g., bird watching, meditation, photography) and education.

SOMC (FLORA & FAUNA) & CULTURALLY SIGNIFICANT SPECIES

As noted previously, wetlands residing in the site provide habitat for a variety of SOMC. The primary wildlife SOMC is the northern leopard frog. This anuran species was recorded by EDI (2021) in three locations within the southern portion of the site (south of McOrmond Drive). Additionally, due to their wide range of habitat uses, amphibians are good bio-indicators (Environment Canada, 2012). This means that based on monitoring amphibian population health other management objectives such as watershed management, habitat fragmentation, and Snow Storage Facility influences (e.g., salinity concentrations) can be quantified.

A comprehensive list of known SOMCs can be found in Section 3 – Ecological Context. As species are detected in the future, this section should be revised to reflect those changes.

5.2.1.3 ECOLOGICAL CONNECTIVITY – CONSERVATION TARGET

Ecological connectivity is generally the level of ease with which organisms can travel amongst habitat patches within a landscape (Taylor *et al*., 1993). In the context of the site, it will be used to evaluate connectivity for flora and fauna species both within the site (intra-connectivity); and to the remaining portion of the greater Small Swale, and other natural areas within Saskatoon and the Meewasin Valley (inter-connectivity). The understanding and the subsequent conservation of intra- and inter-ecological connections will be critical to maintaining and enhancing wildlife movement, biodiversity, ecosystem services, and habitat use in the context of current and future land use changes that may occur within and surrounding the site. See **Appendix E** for the Ecological Connectivity Evaluation Framework, provided to further detail key considerations or concerns for this Conservation Target.

The following sub-Targets are nested within the Ecological Connectivity target.

INTRA-CONNECTIVITY

Intra-connectivity refers to the physical and functional connections between the various natural features residing within the site such as, but not limited to the identified wetlands, various grassland types and small forested pockets located south of South Grid Road near the River. Typically, the review of intra-connectivity is grouped by target wildlife types (e.g., birds, small, medium and large mammals) to analyze effective management tools in the maintenance or possible enhancement of wildlife movement within a select area. When improperly considered, infrastructure such as roads and trails and even human gathering places can weaken a connection, leading to a negative change in the distribution and movement behavior of species frequenting a given area. Therefore, identifying current and future impacts from such ‘barriers’ will be an important management consideration for the site which contains multiple defined habitat types that need to coexist with human use.

INTER-CONNECTIVITY

Inter-connectivity refers to the interactions and relationships between the site and other retained natural features. Understanding this metric plays critical role in evaluating regional wildlife movement potential, general ecological processes, species migration, and overall ecosystem health in a given area. For the purposes of the Ecological Connectivity Conservation Target, inter-connectivity will consider wildlife migration to and from the site (e.g., connection between the

Small Swale, river corridor, and Northeast Swale) gene flow across this political boundary, and the physical and functional connection for interdependent ecological units.

5.2.1.4 HISTORICAL & CULTURAL CONNECTION – HUMAN WELL-BEING TARGET

The Small Swale is known to be of historical significance, as demonstrated by the findings of the Riddell Paleontological Site. With the site being only 1.5 km south of the Wanuskewin Heritage Park, which is Canada's longest running archaeological dig, the likelihood of archaeological findings in the future are significantly increased. Cultural significance, particularly that of the Indigenous communities has been noted as an important target for stakeholders and has thus been identified as a Human Well-Being Target.

RIDDELL PALEONTOLOGICAL SITE

The Riddell Paleontological Site is located in the southeastern portion of the Small Swale close to the river. In 1976, a paleontological exploration program discovered vertebrate fossils and other remnants from the late Pleistocene epoch (Late Rancholabrean Age) (EDI, 2021). The findings gave great insight of species extent and distribution during that epoch. Protection and celebration of this site have been identified as a sub-target and was identified by stakeholders as part of the engagement process.

INDIGENOUS CONNECTION

The sub-target of "Indigenous Connection" refers to fostering a cultural connection through the lens of the Indigenous communities. The site is home to plants and wildlife species which have a recorded significance with Indigenous communities. Further engagement is required with the appropriate communities to define the specifics of the sub-target.

5.2.1.5 EDUCATION & CONNECTION TO NATURE – HUMAN WELL-BEING TARGET

Community and stewardship are important to fostering spiritual, emotional, and knowledgeable connections by creating a sense of ownership and pride. Connecting people to nature can take the form of an educational programming, volunteer programming, and allowing people to physically interact with nature in a way which is sensitive to the environmental context.

EDUCATION

Education as a sub-target refers to educational opportunities for professionals, students, and visitors. Education is important as a sub-target to foster an understanding of the significance and complexities of the Small Swale. Education can be considered in the form of guided tours, educational signage, school-tours, and partnerships with local groups for research opportunities.

CONNECTION TO NATURE

Connection to nature, sense of place, and relationship to the land can be achieved in various ways. Responsible and low-impact passive recreation creates opportunities for humans to connect with nature and build a sense of place. Spending time in nature and interacting with the environment fosters a sense of belonging and responsibility for the land. Conserving natural spaces that are already cherished by residents, like the site, facilitates the overall connection to nature.

5.2.2 REFERENCE ECOSYSTEMS

A reference ecosystem represents an undisturbed version of the ecosystem that is to be restored. The attributes and successional phase of the reference ecosystem is to be similar to the restoration project site (Gann et. al., 2019). Therefore, to assist in the development of the restoration goal setting objectives for the various Conservation Targets listed, two potential local reference ecosystems have been identified through stakeholder engagement. Kernen Prairie and northern portions of the site have been selected as possible reference ecosystems for the grasslands and wetlands south of McOrmond Drive.

These areas were chosen as potential reference ecosystems as they are the closest ecosystems resembling '*healthy*' native conditions in the region. Kernen Prairie is one of the largest remaining Fescue Prairie patches in Saskatchewan. The land was donated to the University of Saskatchewan by Fred W. Kernen Jr. under the arrangement to preserve its native state for ecological research (University of Saskatchewan, n.d b). North portions of the site are considered to be some of the best examples of prairies and wetlands that exist in the valley (Pers. comm. Chet Neufeld, Native Plant Society 2023)

Once baseline condition and long-term monitoring areas within the site are determined, the area in the north assessed as "Healthy", according to the rangeland health assessment guide (Thorpe, 2014) should be flagged. In addition, specific areas within Kernen Prairie should be confirmed for future comparisons during applicable restoration/rehabilitation programs proposed within the site's boundaries.

Additionally, professional judgement and available guidelines such as the Steward and Kantrud (1971) wetland classification system for wetlands and Thorpe (2014) for fescue prairie should also be considered.

5.3 VIABILITY ASSESSMENT

To develop a sound CP, an understanding of the current biodiversity health of the site is required. Therefore, a Viability Assessment (VA) was conducted for each Conservation Target, using the Key Ecological Attributes (KEA) and their indicators as a measurement of health. The VA was informed by the available baseline information extracted from previous studies, stakeholder engagement, and environmental reports relevant to the site (refer to Section 3 – Ecological Context for the summary and **Appendix B** for specific details). Where information was lacking, professional experience was applied.

For the purposes of this site-specific VA, the following steps were followed:

- Identify the KEA for each Conservation Target
- Establish indicators can be applied to each KEA that are specific, measurable, precise, consistent, and achievable, and timely (i.e., actually responds to the attribute we are measuring)
- Use/develop an indicator rating system that can be used to rate and possibly rank each Conservation Target

5.3.1 KEA SELECTION AND INDICATOR RATING

A KEA is defined as a "structure, composition, interaction, or biotic and abiotic processes that enable the target to persist through influence on the target's size, condition, and landscape context" (The Nature Conservancy, n.d.). It is a fundamental component of the target's life history, habitat, community interaction, or physical processes (e.g., number of species of management concern, extent of invasive species). KEA are positioned into three categories of ecological status: size, condition, and landscape context which are used to assess biodiversity health. According to the German Corporation for International Cooperation (Deutsche Gesellschaft für Internationale Zusammenarbeit [GIZ]; 2020):

- Size is defined as "a measure of the area of the target's occurrence or abundance of the target's occurrence".
- Condition is described as "a measure of the biological composition, structure, and biotic interactions that characterize the space in which the target occurs".
- Landscape Context is "an assessment of the target's environment, including ecological processes, regimes, and connectivity".

As KEAs cannot be directly measured, indicators are identified to determine the status of the KEA. An indicator is "a measurable entity that is used to assess the status and the trend of a KEA" (e.g., hectare, population size) (The Nature Conservancy, n.d.). Every KEA and its indicator will likely vary over time within a certain range. This variation is either natural and consistent with long-term trends, or outside of the natural range and due to human actions. Conserving targets is then defined by these indicators as maintaining each target's KEA within their acceptable ranges of variation.

For the purposes of this VA, the indicator rating system applied has been adopted from The Nature Conservancy (n.d.), which uses "the ranges of variation as an indicator that define and distinguish very good, good, fair, and poor rating categories to provide a consistent and objective basis for assessing the status of the indicator". Refer to **Table 5-3** for details associated with the rating criteria used.

Table 5-3: Rating Criteria [a]

POOR	FAIR	GOOD	VERY GOOD
Allowing the indicator to remain in this condition for an extended period will make restoration or prevention of extirpation of the Conservation Target practically impossible.	The indicator lies outside of the range of acceptable variation and requires human intervention for maintenance. If unchecked, the Conservation Target will be vulnerable to serious degradation.	The indicator is functioning within the range of acceptable variation, although it may require some human intervention for maintenance.	The indicator is functioning within an ecologically desirable status, requiring little human intervention for maintenance within the natural range of variation (i.e., is as close to "natural" as possible and has little chance of being degraded by some random event).

Note:
a) Adapted from The Nature Conservancy (n.d.)

The three primary Conservation Targets have been associated with a list of applicable KEAs to assess the overall health of the target. **Table 5-4** details each KEA selected for each Conservation Target assessed.

Table 5-4: KEAs by Conservation Target

CONSERVATION TARGET	KEA	KEA DESCRIPTION
1.0 Prairie	1.1 Spatial extent of grassland communities identified	Change in spatial extent over time (baseline conditions are 34.8 ha of native dominated grassland, native dominated tame grassland, and tame grassland).
	1.2 Extent of area that is burned, or grazed replicating natural disturbance regimes	Change in spatial extent as influenced by naturally or anthropogenically driven disturbance activities that have been and/or are occurring.
	1.3 Vegetation community structure, diversity, and cover	Change in average score of the standard Rangeland Health Assessments as per the Rangeland Health Assessment - Native Grassland and Forest Field Workbook by Saskatchewan PCAP Greencover Committee (2008).
	1.4 SOMC and Culturally Significant Species abundance and diversity	Change in the number of population size and spatial extent (e.g., number of locations) of confirmed SOMC and Culturally Significant Species observed within the site (SOMC: starting out with 15 species of which 11 are wildlife species and 4 are plant species). Refer to 1.6 and 1.5 to see how flora and fauna SOMC and Culturally Significant species indicators are differentiated.
	1.5 Native flora species abundance and diversity	Change in spatial extent in hectares over time of the Conservation Target with an initial focus on the Fescue Prairie sub-Target by decreasing hay land (10.5 ha) or disturbed lands (9.9 ha) extents on site (refer to **Table 3-1**). Decrease in invasive/undesirable species number, population size, and spatial locations to promote a healthier native flora assemblage.
	1.6 Native fauna species abundance and diversity	Change in Shannon-Wiener Diversity Index (e.g., change in diversity of species in a community). The higher the value, the higher the diversity of species in the target community. A range of 0 to >3.5 will be used to assess this KEA.

CONSERVATION TARGET	KEA	KEA DESCRIPTION
2.0 Wetlands	2.1 Spatial extent of all wetlands identified	Change of hectares over time (available baseline is 23.4 ha of total wetland area).
	2.2 Function of catchment areas	Change to hydrological inputs generated from pre-development catchment areas in a post-development context over time (positive, negative, and neutral).
	2.3 Water Quality	Change of CCME Water Quality Index over time (The CCME water quality index provides the possibility to evaluate complex water quality data. The formula is based on three main components: scope (number of variables not meeting water quality objectives), frequency (number of times these objectives are not met), and amplitude (amount by which objectives are not met). The index produces a number between 0 (worst water quality) and 100 (best water quality), which is divided into five categories. For the purpose of the indicator ratings, the lowest two categories were combined into the poor rating. The variables measured, objectives set, and time period used for the index can vary depending on the overall goal or objective of the study. A minimum of four variable sampled four times will be needed to calculate the index (Canadian Council of Ministers of the Environment, 2001; Water Security Agency, 2015).
	2.4 SOMC and Culturally Significant Species abundance and diversity	Change of quantity of confirmed SOMC and Culturally Significant Species on site (SOMC: starting out with 15 species of which 11 are wildlife species and 4 are plant species).
	2.5 Native flora species abundance and diversity	Change of spatial extent in hectares over time.
	2.6 Native fauna species abundance and diversity	Change in Shannon-Wiener Diversity Index (The Shannon-Wiener Diversity Index measures the diversity of species in a community. The higher the value, the higher the diversity of species in the community. A value of 0 indicates a community of only one species.).
3.0 Ecological Connectivity	3.1 Intra-species Connectivity	Development and implementation of intra-connectivity management strategies.
	3.2 Inter-species Connectivity	Development and implementation of inter-connectivity management strategies.

Table 5-5: Indicator Ratings Table – Prairie

CATEGORY	KEY ECOLOGICAL ATTRIBUTE	INDICATOR	INDICATOR RATINGS[a]			
			POOR	FAIR	GOOD	VERY GOOD
Size	1.1 Spatial extent of prairie.	Total hectares (34.8 ha of native dominated grassland, native dominated tame grassland, and tame grassland).	More than 25% (or 9.0 ha) reduction of prairie area.	No more than 25% reduction (or 8.7 ha) in the total prairie area.	No further reduction in prairie habitat.	*Up to 25% increase (or 8.7 ha) in aerial extent through reconstruction or acquisition.*
Landscape Context	1.2 Extent of area that is grazed replicating natural disturbance regimes.	Hectares of grazing.	No grazing strategy implemented.	Less than 25% areas identified as prairie or grassland have an effective grazing strategy implemented.	*25-49% of areas identified as prairie or grassland have an effective grazing strategy implemented.*	More than 50% of areas identified as prairie or grassland have an effective grazing strategy implemented.
	1.3 Extent of area that is undergoes prescribed burn management, replicating natural disturbance regimes.	Percent of management units that receive a prescribed burn within a 3–7-year fire interval.	No prescribed burn plan has been developed or implemented, and/or 0-20% of management units have received a prescribed burn within the 3-7year fire interval.	21-50% of management units have received a prescribed burn within the 3–7-year fire interval.	*51-75% of management units have received a prescribed burn within the 3–7-year fire interval.*	>76% of management units have received a prescribed burn within the 3–7-year fire interval.

CATEGORY	KEY ECOLOGICAL ATTRIBUTE	INDICATOR	INDICATOR RATINGS[a]			
			POOR	FAIR	GOOD	VERY GOOD
Condition	1.3 Vegetation community structure, diversity, and cover.	Score of Rangeland Health Assessments.	Not conducted.	Average score of permanent sampling plots is Unhealthy.	*Average score of permanent sampling plots is Healthy with Problems.*	Average score of permanent sampling plots is Healthy.
	1.4 SOMC and Culturally Significant Species abundance and diversity.	Quantity of confirmed SOMC and Culturally Significant species on site (15 species – 11 wildlife and 4 plants).	More than half of SOMC and Culturally Significant species lost.	Decreased quantity of SOMC and Culturally Significant species across the site.	Current population remains stable (15 species – 11 wildlife and 4 plants).	*Increase in SOMC and Culturally Significant species detection.*
	1.5 Native flora species abundance and diversity.	Population extent (hectares).	Population extent not determined or unknown.	Statistically significant loss of population extent.	Stable population.	*Statistically significant increase of population extent.*
	1.6 Native fauna species abundance and diversity.	**Shannon-Wiener Diversity Index[b].**	**Shannon-wiener Diversity Index of 2.0 and below.**	**Shannon-wiener Diversity Index of 2.5 -2.99.**	***Shannon-wiener Diversity Index of 3.0 -3.49.***	**Shannon-wiener Diversity Index of 3.5 and above.**

Notes:
a) Preferred or desired rating is presented in italics; current rating is presented in colour.
b) **Current rating is unknown.**

Table 5-6: Indicator Ratings Table – Wetland

CATEGORY	KEY ECOLOGICAL ATTRIBUTE	INDICATOR	INDICATOR RATINGS[a]			
			POOR	FAIR	GOOD	VERY GOOD
Size	2.1 Total Wetland Size.	Spatial extent of set pre-development wetlands in hectares (23.4 ha of wetlands).	More than 20% reduction of the set pre-development wetland area.	19-11% (or 2.6-4.4 ha) reduction of set pre-development wetland area.	No more than 5-12% (or 1.2-2.8) reduction in the set pre-development wetland area.	*No reduction in wetland habitat from the selected pre-development extent.*

CATEGORY	KEY ECOLOGICAL ATTRIBUTE	INDICATOR	INDICATOR RATINGS[a]			
			POOR	FAIR	GOOD	VERY GOOD
Landscape context	2.2 Function of catchment areas as a function of average annual runoff.	Accessible functional catchment areas. Maintenance of catchment areas from pre-development.	More than 20% change from the set pre-development average annual runoff.	19-11% change from the set pre-development average annual runoff.	Less than 5-12% change from the set pre-development average annual runoff.	*Maintain set pre-development average annual runoff and natural hydroperiod.*
Condition	2.3 Water quality.	CCME Water Quality Index[b].	CCME WQI Value 0-64 – water quality is frequently threatened or impaired; conditions often depart from natural or desirable levels.	CCME WQI Value 65-79 – water quality is usually protected but occasionally threatened or impaired; conditions sometimes depart from natural or desirable levels.	*CCME WQI Value 80-94 – water quality is protected with only a minor degree of threat or impairment; conditions rarely depart from natural or desirable levels.*	CCME WQI Value 95-100) – water quality is protected with a virtual absence of threat or impairment; conditions very close to natural or pristine levels.
	2.4 SOMC and Culturally Significant Species abundance and diversity.	Quantity of confirmed SOMC and Culturally Significant species on site (15 species – 11 wildlife and 4 plants).	More than half of SOMC and Culturally Significant species lost.	Decreased quantity of SOMC and Culturally Significant species across the site.	Stable (15 species – 11 wildlife and 4 plants).	*Increase in SOMC and Culturally Significant species detection.*
	2.5 Native flora species abundance and diversity.	Population extent (ha).	Population extent (ha).	Statistically significant loss of population extent.	Stable population.	*Statistically significant increase of population extent.*
	2.6 Native fauna species abundance and diversity	**Shannon-wiener Diversity Index**	**Shannon-wiener Diversity Index of 2.0 and below**	**Shannon-wiener Diversity Index of 2.5- 2.99**	**Shannon-wiener Diversity Index of 3.0-3.49**	**Shannon-wiener Diversity Index of 3.5 and above**

Notes:

a) Preferred or desired rating is presented in italics; current rating is presented in colour.

b) **Current rating is unknown.**

Table 5-7: Indicator Ratings Table – Ecological Connectivity

CATEGORY	KEY ECOLOGICAL ATTRIBUTE	INDICATOR	INDICATOR RATINGS[a]			
			POOR	FAIR	GOOD	VERY GOOD
Landscape Context	3.1 Intra-connectivity.	Development and implementation of intra-connectivity plan.	No plan developed.	Plan developed and areas of improvement identified.	*Plan developed and implemented.*	Pre-emptive strategies identified and implemented successfully.
	3.2 Inter-connectivity	Mitigation strategies for barriers developed and implemented.	No barriers identified and no strategies developed for current of future barriers.	Major barriers identified, but mitigation strategies not developed or implemented.	*Barriers identified and mitigation strategies implemented.*	Pre-emptive strategies identified and implemented successfully.

Notes:
a) Preferred or desired rating is presented in italics; current rating is presented in colour.

5.3.2 VA SUMMARY

The ecological status of each Conservation Target was rated by inspecting up to three categories, including condition, landscape context, and size on the four-part scale detailed in Section 5.2.1 – Conservation and Human Well-Being Targets. An average of these ratings across the categories was then used to determine the overall status or viability of the applicable Conservation Target.

To assess the categories for each Conservation Target, at least one KEA for each category was utilized. Refer to **Table 5-5**, **Table 5-6**, and **Table 5-7** for a detailed summary of each KEA and the indicator to measure change. The final VA rating for each Conservation Target is listed below.

All Conservation Targets are assessed as of November 2023 and are to be reassessed in 2033.

The overall rating for the Prairie Conservation Target is **fair.**

The overall rating for Wetland Conservation Target is **good.**

The overall rating for Ecological Connectivity is **poor**. This rating is predominately driven by the current barrier effects associated with roads possibly impacting overall connectivity, as well as human-altered areas including the Snow Storage Facility and the trail system located in sensitive areas.

5.3.3 RESTORATION FEASIBILITY

There is potential for restoration and reclamation activities on site to enhance the ecological and human well being Conservation Targets identified in Section 5.2.1 – Conservation and Human Well-Being Targets. A Conceptual Plan has been developed (WSP, 2023b) which outlines a monitoring framework in detail. A summary is presented in **Figure 5-1** below.

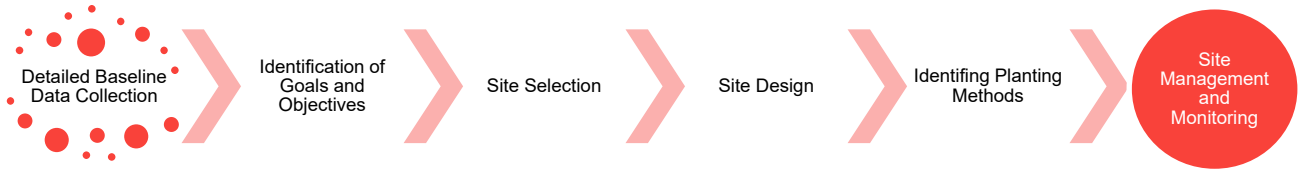

Figure 5-1: Summary of Restoration or Reclamation Framework

The Ecological Recovery Wheel (ERW) is a tool developed by the Society for Ecological Restoration (SER). It is designed to guide and track the progress of ecological restoration projects. The ERW provides a structured way to assess the stages of recovery in an ecosystem. It is designed as a visual framework to emphasize that ecological restoration is a dynamic and always-changing process that requires consideration of multiple environmental and anthropogenic factors. The ERW presents six attributes with three sub-attributes each to rank the subsections on a five-star scale, where five stars represent an ecosystem being fully recovered.

The information collected from the baseline data collection should be input into the relative sub attribute table for the Ecological Recovery Wheel which have been defined in the International Principles and Standards for the Practice of Ecological Restoration (Gann et al., 2019).

As detailed baseline data is required to use the ERW, only estimates about two pre-selected locations were made. The areas are used to demonstrate how the ERW would function once sufficient baseline data is collected. For sub-attributes that were not able to be assessed, they were given a score of zero and under the evidence for recovery column it was indicated with "Cannot be assessed at this point":

- **Location 1:** Grassland Assessment Unit 3, located within a shrub community in the northeast, just outside of the site boundary (EDI, 2021). This location was selected because of its close proximity to the site, the level of detail available, and its suitability as a restoration location

— **Location 2:** Snow Storage Facility, selected as an example for reclamation due to the expressed interest of improving the facility

The ERW is comprised of six key ecosystem attributes (with three sub-attributes each) that, when ranking high, contribute to ecosystem integrity. These six attributes are used to characterize the reference ecosystem, evaluate the baseline conditions of the to be restored ecosystem, set restoration project goals, and monitor the recovery of the restoration site. Further definitions of the sub-attributes as well as ecological recovery scale are described in the Conceptual Plan (WSP, 2023). **Figure 5-2** and **Table 5-8** show the current estimated status of Location 1 (including recovery level). **Table 5-9** and **Figure 5-3** describe the same for the Snow Storage Facility. A level of the highest possible recovery cannot be stated at this point as an appropriate level of detailed baseline data is still required.

5.3.3.1 ERW LOCATION 1

Location 1 has five sub-attributes that were not able to be assessed at this time, and best estimates were made using the data collected by EDI as part of the UH3 Neighbourhood Natural Areas Screening Report (2021).

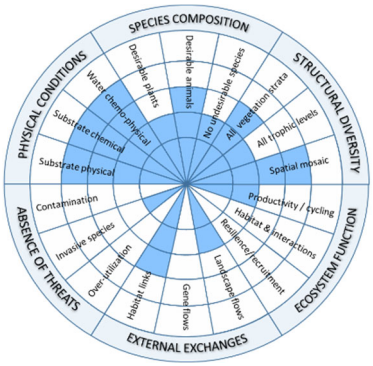

Figure 5-2: Ecological Recovery Wheel Scores for Location 1

The wheel represents the estimated current status of the sub-attributes and coincides with the Rangeland Health Assessment score of "Unhealthy" for this location (EDI 2021).

Table 5-8: Baseline Condition Scoring for Location 1

ATTRIBUTE CATEGORY	BASELINE RECOVERY LEVEL (1-5)	EVIDENCE FOR RECOVERY LEVEL
ATTRIBUTE 1. ABSENCE OF THREATS		
Over-utilization	0	Cannot be assessed at this point. Refer to Strategy #1 Action item 2 in **Appendix C**.
Invasive species (external)	1	The site is close to a road (roads are a main facilitator in introducing invasives to an area). Invasives, like European buckthorn and leafy spurge, are known to occur on site.
Contamination	0	Cannot be assessed at this point. Refer to Strategy #1 Action item 2 in **Appendix C**.
ATTRIBUTE 2. PHYSICAL CONDITIONS		
Substrate physical	4	Existing species composition indicates healthy soils.
Substrate chemical	4	Existing species composition indicates healthy soils, and no bare patches which may indicate chemical spills.
Water chemo-physical	4	The Snow Storage Facility may influence local hydrology. However, the extent and nature of the Snow Storage Facility impact is currently unknown.

ATTRIBUTE CATEGORY	BASELINE RECOVERY LEVEL (1-5)	EVIDENCE FOR RECOVERY LEVEL
ATTRIBUTE 3. SPECIES COMPOSITION		
Desirable plants	2	Species like silverleaf psoralea, crowfoot violet, and plains rough fescue are present in the northeast part of the Small Swale, but the area is dominated by non-native grasses like Kentucky bluegrass and smooth brome.
Desirable animals	3	The UH3 Neighbourhood baseline report identified 22 breeding bird species, 1 amphibian (northern leopard frog), and 4 mammal species (EDI, 2021).
No undesirable species	2	The area is dominated by Kentucky bluegrass and smooth brome. Canada thistle was the most common forb observed (EDI, 2021).
ATTRIBUTE 4. STRUCTURAL DIVERSITY		
All strata present	3	The location is missing several graminoid layers, and forb structure (EDI, 2021).
All trophic levels	2	The trophic complexity is low due to lack of native graminoid and forb structure.
Spatial mosaic	4	The spatial pattering is similar to reference community (woody and nonwoody species present).
ATTRIBUTE 5. ECOSYSTEM FUNCTION		
Productivity, cycling etc.	2	There is likely some grazing occurring in the area but otherwise, there was no natural disturbance regimes (e.g., burning) observed. Historical efforts of haying or farming are unknown.
Habitat interactions	0	Cannot be assessed at this point. Refer to Strategy #1 Action item 2 and Strategy #10 Action Item 2 in **Appendix C**.
Resilience, recruitment etc.	0	Cannot be assessed at this point. Refer to Strategy #1 Action item 2 and Strategy #10 Action Item 2 in **Appendix C**.
ATTRIBUTE 6. EXTERNAL EXCHANGES		
Landscape flows	2	Adjacent land use changes have not occurred yet, connectivity between the Small Swale, South Saskatchewan River, and the Northeast Swale is currently present. However, a portion of the site is bisected by McOrmond Drive and South Grid Road may impact wildlife connectivity from the South Saskatchewan River valley system. The nature and extent of this impact is currently unknown.
Gene flows	0	Cannot be assessed at this point. Refer to Strategy #1 Action item 2 and Strategy #10 Action Item 2 in **Appendix C**.
Habitat links	3	Intra-connectivity is mostly sustained. However, McOrmond Drive does bisect the northern portion of the site which is likely negatively impacting wildlife connectivity. However, the nature and extent of this impact is currently unknown.

5.3.3.2 ERW LOCATION 2

Location 2 has two sub-attributes that were not able to be assessed at this time, and best estimates were made using available data.

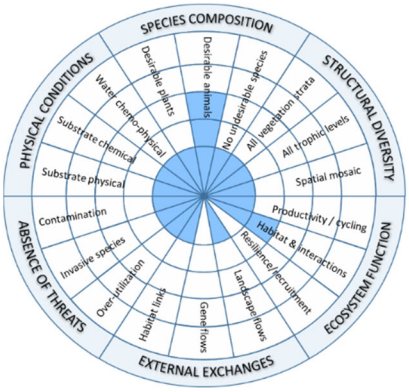

Figure 5-3: Ecological Recovery Wheel Scores for Location 2

The resulting wheel shows the overall degradation of the site, and the potential areas for improvement in the future.

Table 5-9: Baseline Condition Scoring for Location 2

ATTRIBUTE CATEGORY	RECOVERY LEVEL (1-5)	EVIDENCE FOR RECOVERY LEVEL
ATTRIBUTE 1. ABSENCE OF THREATS		
Over-utilization	1	Exploitation of the site is occurring from active contamination.
Invasive species (external)	1	Invasive species like European buckthorn, leafy spurge, and sow-thistle are present on site.
Contamination	1	Chemical contamination may be is present in form of high salinity. Invasive, nuisance, and noxious species are present in high numbers. However, the extent and nature of the Snow Storage Facility impact is currently unknown.
ATTRIBUTE 2. PHYSICAL CONDITIONS		
Substrate physical	1	High soil compaction may be present due to continuous snow and material storage.
Substrate chemical	1	Likely high salt contents and other chemicals are present in soil.
Water chemo-physical	1	The Snow Storage Facility likely influences local hydrology. However, the extent and nature of influence is currently unknown.
ATTRIBUTE 3. SPECIES COMPOSITION		
Desirable plants	1	The site predominantly shows invasive, nuisance, and noxious species.

ATTRIBUTE CATEGORY	RECOVERY LEVEL (1-5)	EVIDENCE FOR RECOVERY LEVEL
Desirable animals	3	In proximity to the Snow Storage Facility, previous studies observed 18 breeding bird species, 3 amphibian species (boreal chorus frog, wood frog, northern leopard frog), 3 mammal species (coyote, white-tailed deer, and racoon), and an active Swainson's hawk stick nest. However, no habitat observations are available for within the facility proper. It is anticipated that this feature would represent poor habitat viability for local wildlife due to a lack of native vegetation and concentrated human use.
No undesirable species	1	Invasive, nuisance, and noxious species are present in high numbers on site.
ATTRIBUTE 4. STRUCTURAL DIVERSITY		
All strata present	1	The site does not show vegetative structures, as only occasional weedy species are present.
All trophic levels	1	Incidental species observations are recorded on site, but the trophic hierarchy is overall limited.
Spatial mosaic	1	The site has negative influence on spatial pattern, as bare ground dominates, thus increasing habitat fragmentation.
ATTRIBUTE 5. ECOSYSTEM FUNCTION		
Productivity, cycling etc.	1	The site likely produces artificial hydrological inputs (refer to Section 3.4 – Wetlands and Hydrology, Section 3.8.3 - Aquatics and **Appendix D** for details).
Habitat interactions	2	Northern leopard frog, nesting birds, and migrating waterfowl presence downstream in the wetland complex may suggest some interactions between different habitat is possible to some degree. However, the facility likely represents a greater negative influence to any present interactions due to the lack of desirable habitat and possible contamination.
Resilience, recruitment etc.	0	Cannot be assessed at this point. Refer to Strategy #1 Action item 2 and Strategy #10 Action Item 2 in **Appendix C**.
ATTRIBUTE 6. EXTERNAL EXCHANGES		
Landscape flows	1	The Snow Storage Facility may be inhibiting ecological flow through the local landscape by impacting wildlife functional connectivity (e.g., artificial change in wildlife behavior) and structural connectivity (physical presence of the facility).
Gene flows	0	Cannot be assessed at this point. Refer to Strategy #1 Action item 2 and Strategy #10 Action Item 2 in **Appendix C**.
Habitat links	1	The Snow Storage Facility may be a barrier between habitats through physical presence and subsequent operation. Refer to 'Landscape flows' for additional rationale.

5.4 THREAT ASSESSMENT

To understand the negative forces acting on the Conservation Targets and the KEA, **Direct Threats** and **Stresses** were identified and then assessed. Direct Threats, both **Conventional Threats** and **Climate Threats** were first identified in conjunction with a Climate Change Vulnerability Assessment (CCVA). Once threats were established, Stresses were then identified to show the biophysical linkages between the Direct Threats and the Conservation Targets.

The aim of this step is to have a thorough understanding of the direct pressures on the applicable KEAs associated with each of the Conservation Targets to develop appropriate mitigation paths to achieve future improvement or enhancements that move the indicator ratings towards the desired status.

5.4.1 CONVENTIONAL THREATS

A Conventional Threat is "a human action that directly degrades one or more Conservation Targets" (CMP, 2020). Conventional Threats were first identified during the stakeholder engagement process and refined to reflect the greatest pressures on the site. For a list of the identified Conventional Threats refer to **Table 5-10**.

5.4.2 CLIMATE THREATS

For the purposes of this threat assessment, Climate Threat is defined as "observed and expected changes in climate that degrade one or more conservation targets or exacerbate existing conventional threats" (GIZ, 2020).

To identify Climate Threats, an understanding of the vulnerability of the site to climatic changes is required. In this context, climate vulnerability refers to the degree to which an ecological system, habitat, or individual species is likely to experience harm as a result of changes in climate (GIZ, 2020). To explore climate as a threat, the Conservation Standards, uses a CCVA as tool to assess how climate change is likely to impact the identified Conservation Targets (GIZ, 2020). Therefore, a CCVA was conducted by analysing the projections from a selected climate model for the City of Saskatoon and surrounding area. Climate Threats were then itemized and assessed based on the capacity of the threat to degrade the KEA of the Conservation Targets. For a list of the identified Climate Threats refer to **Table 5-10**.

CLIMATE CHANGE VULNERABILITY ASSESSMENT

The CCVA completed for this site, was undertaken following these four steps:

1. A climate model was selected as a base for projections.
   a. The Climate Atlas Report was used to inform the assumed projections and climate change data for Saskatoon (Climate Atlas, 2023).
2. Climate variables were then identified to assess the relationship between the climate and the health of the Conservation Targets.
   a. Using the High Carbon Future (RCP 8.5) as a baseline, it is anticipated that Saskatoon will in general be subject to more frequent and severe storms, an increase in average temperatures, more frequent hot days, and drought (see **Figure 5-4**).
3. Once Steps 1 and 2 were completed, climate impacts, or Climate Threats which impact the Conservation Targets were identified and ranked.
   a. As such, three Climate Threats were selected which represent these climactic changes and pressures on the Conservation Targets.
4. The final step completed was linking the Climate Threats and associated Stresses to the Conservation Targets in the Situation Model completed for the site.

Variable	Period	1976-2005	2021-2050			2051-2080		
		Mean	Low	Mean	High	Low	Mean	High
Precipitation (mm)	annual	351	265	377	500	270	392	525
Precipitation (mm)	spring	78	41	88	146	48	99	162
Precipitation (mm)	summer	158	87	162	257	80	160	254
Precipitation (mm)	fall	65	33	73	123	34	75	132
Precipitation (mm)	winter	50	32	54	79	34	58	86
Mean Temperature (°C)	annual	2.7	3.2	4.9	6.6	5.1	7.2	9.3
Mean Temperature (°C)	spring	3.1	2.1	5.2	8.4	3.9	7.2	10.6
Mean Temperature (°C)	summer	17.6	17.8	19.7	21.6	19.5	22	24.3
Mean Temperature (°C)	fall	3.9	3.5	5.9	8.1	5.9	8.2	10.5
Mean Temperature (°C)	winter	-14.3	-15.8	-11.7	-7.7	-13	-8.8	-4.7
Tropical Nights	annual	0	0	2	6	1	9	23
Very hot days (+30°C)	annual	14	10	28	47	21	47	72
Very cold days (-30°C)	annual	14	0	6	16	0	2	7
Date of Last Spring Frost	annual	May 12	April 17	May 4	May 19	April 6	April 28	May 14
Date of First Fall Frost	annual	Sep. 23	Sep. 17	Oct. 2	Oct. 18	Sep. 21	Oct. 10	Oct. 29
Frost-Free Season (days)	annual	130	125	147	171	134	162	192

Figure 5-4: Climate Projection for Saskatoon

5.4.3 STRESSES

A Stress is an attribute of a Conservation Target's ecology that are impaired directly or indirectly by human activities or climate threats (CMP, 2020). Following the identification of the Direct Threats (Conventional and Climate Threats), Stresses, or biophysical attributes, were identified and linkages made between the Direct Threat and the Targets. These linkages represent the ways in which the Stresses impact the Conservation Targets. For instance, the Introduction of Invasive or Undesirable Species (Direct Threat) leads to competition for, and decline in, resources for native species (Stress), which thereby places pressure on the Key Ecological Attribute of a Target, such as that for the Prairie. Refer to **Table 5-10** for a complete list of the identified Stresses.

5.4.4 SUMMARY OF DIRECT THREATS & STRESSES

A summary of the Direct Threats (Conventional Threats and Climate Threats) and the associated Stresses have been compiled in **Table 5-10**. The summary provides a list of the elements nested within each of the named Direct Threats, as well as a list of the identified Stresses. Many Stresses overlap with threats; therefore, they are listed as a grouping. For a visual on the linkages between the Direct Threats, Stresses and Targets, refer to **Figure 5-5.**

Table 5-10: Direct Threats (Conventional Threat & Climate Threat) and Stresses

THREAT	THREAT INCLUDES	JUSTIFICATION FOR INCLUSION OF THREAT	STRESSES
Introduction of Invasive & Undesirable Species (Conventional Threat)	- Introduction of provincially listed noxious and prohibited noxious species (e.g., European buckthorn, leafy spurge for example). - Introduction of undesirable species. - Introduction of pests, diseases, and invasive wildlife species, such as wild boar.	- Based on available information, 11 noxious and nuisance weed species have been identified that can have ecological, economic, and social impacts including outcompeting native species, disrupting local ecosystem, and cause ecological imbalances.	- Competition for, and decline in, resources for desirable flora and fauna. - Change to hydrological systems, water levels, water quality, and physical structure.

THREAT	THREAT INCLUDES	JUSTIFICATION FOR INCLUSION OF THREAT	STRESSES
Incompatible External land Use (Conventional Threat)	- Existing and future transportation routes, such as McOrmond Drive, Central Avenue, South Grid Road, and the future Saskatoon Freeway. -.Future land use changes, such as the UH3 Neighbourhood.	- Current or future land use changes proposed in proximity to the site that are undertaken in isolation without appropriate baseline biophysical understanding could lead to site isolation, impacting wildlife connectivity.	- Decline in vegetation community structure/species composition, genetic diversity, size, and distribution. - Increased barriers and fragmentation of habitats. - Increase in pollution, light, sound, sedimentation, and fertilizers. - Increase/decline in predators (i.e., domestic pets), pests, and diseases. - Increased human pressure on site (i.e., quantity of people with direct access to site). - Increased impermeable surfaces and structures. - Change to topography. -Wildlife conflict with humans (vehicular and other). - Die-offs heat and desiccation stress. - Increasing evaporation. - Change in temperature, precipitation, and seasonal patterns.
Incompatible Human Use of Site (Conventional Threat)	- Existing Snow Storage Facility. - Existing materials storage facility. - Existing illegal uses, such as dumping and hunting. - Future irresponsible recreational uses (i.e., off-trail use, vehicular use, etc.).	- Incompatible human uses contribute to fragmentation and ecosystem degradation of the site.	
Suppression of Natural Disturbance regimes (Conventional Threat)	- Complete suppression of fire, grazing, and flooding.	- The suppression of natural disturbances leads to community simplification. - Possible extreme and more intense uncontrolled/unplanned disturbed due to elevated fuel loading.	
Fragmentation & Barriers (Conventional Threat)	- Impermeable barriers, such as fences and walls. - High-risk wildlife movement barriers, such as existing or proposed transportation routes adjacent to, or bisecting the site. - Future development along the perimeter of the site. - Loss of inter-connection between the site and future or current retained natural areas located in the greater Meewasin Valley.	- Current or future land use changes proposed within (e.g., trail construction) or in proximity to the site that are undertaken in isolation without appropriate baseline biophysical understanding could lead to wildlife connectivity impacts and a reduction in faunal species richness observed.	
Water Management (Conventional Threat)	- Alterations to physical structure of wetlands and watercourses (including supporting catchments), riparian edges. - Reduced water quality.	- Improper water management (e.g., artificial flooding/drought) will lead to negative waterbody impacts.	

THREAT	THREAT INCLUDES	JUSTIFICATION FOR INCLUSION OF THREAT	STRESSES
Frequency and Severity of Storms & Natural Disasters (Climate Threat)	- Increased flooding, wildfires, snowstorms, and hail.	- Climate threats need to be considered in every plan as it is inevitable that some form of climate change will be experienced.	
Increasing Average Temperatures & Drought (Climate Threat)	- Increase in the mean average temperatures.		
Change to precipitation (Climate Threat)	- Frequency and severity of droughts.		

5.4.5 DIRECT THREATS ASSESSMENT CRITERIA

Threats were assessed and ranked based on the following Direct Threat Assessment Criteria as defined by the Conservation Standards (CMP, 2020):

- Scope - Proportion of the Conservation Target that can reasonably be expected to be affected by the threat within ten years given the continuation of current circumstances and trends. For ecosystems and ecological communities, measured as the proportion of the target's occurrence. For species, measured as the proportion of the target's population
- Severity - Within the scope, the level of damage to the target from the threat that can be reasonably expected given the continuation of current circumstances and trends. For ecosystems and ecological communities, typically measured as the degree of destruction or degradation of the target within the scope. For species, usually measured as the degree of reduction of the target population within the scope (CMP, 2020)
- Irreversibility - The degree to which the effects of a threat can be reversed, and the target affected by the threat restored (CMP, 2020)

A ranking of either Low, Medium, High, or Very High was applied to understand the impact of the Direct Threats on the Conservation Targets. See below for a detailed description of the criteria used to assess and subsequently rank the Direct Threats.

Table 5-11: Direct Threats Assessment Criteria

CRITERIA	RANK	CRITERIA
Scope	Low	The threat is likely to be very narrow in its scope, affecting the target across a small proportion (1%-10%) of its occurrence/population.
	Medium	The threat is likely to be restricted in its scope, affecting the target across some (11%-30%) of its occurrence/population.
	High	The threat is likely to be widespread in its scope, affecting the target across much (31%-70%) of its occurrence/population.
	Very High	The threat is likely to be pervasive in its scope, affecting the target across all or most (71%-100%) of its occurrence/population.
Severity	Low	Within the scope, the threat is likely to only slightly degrade/reduce the target or reduce its population by 1%-10% within ten years or three generations.
	Medium	Within the scope, the threat is likely to moderately degrade/reduce the target or reduce its population by 11%-30% within ten years or three generation.
	High	Within the scope, the threat is likely to seriously degrade/reduce the target or reduce its population by 31%-70% within ten years or three generations.
	Very High	Within the scope, the threat is likely to destroy or eliminate the target or reduce its historical population by 71%-100% within ten years or three generations.
Irreversibility	Low	The effects of the threat are easily reversible, and the target can be easily restored at a relatively low cost and/or within 0-5 years (e.g., off-road vehicles trespassing in wetland).
	Medium	The effects of the threat can be reversed, and the target restored within a reasonable commitment of resources and/or within 6-20 years (e.g., ditching and draining of wetland).

CRITERIA	RANK	CRITERIA
	High	The effects of the threat can technically be reversed, and the target restored, but it is not practically affordable and/or it would take 21-100 years to achieve this (e.g., wetland converted to agriculture).
	Very High	The effects of the threat cannot be reversed, and it is very unlikely the target can be restored, and/or it would take more than 100 years to achieve this (e.g., wetlands converted to shopping center).

5.4.6 DIRECT THREATS ASSESSMENT SUMMARY

Using the Miradi software, a summary threat ranking was produced based on the rankings of each Direct Threat across each of the Targets as part of the Threat Assessment. **Table 5-12** below provides a summary of the ranking of each Direct Threat. These rankings have influence on the priority of the Actions in Section 5.6 - Action Plan.

Table 5-12: Threat Analysis Matrix

	CONSERVATION TARGET			
Direct Threat (Conventional and Climate Threat)	PRAIRIE	WETLANDS	ECOLOGICAL CONNECTIVITY	SUMMARY THREAT RANKING
Introduction of Invasive & Undesirable Species (Conventional Threat)	Very High	Very High	N/A	Very High
Incompatible external land use (Conventional Threat)	High	High	High	High
Incompatible Human Use of Site (Conventional Threat)	Very High	Very High	Very High	Very High
Suppression of natural disturbance regimes (Conventional Threat)	High	High	High	High
Fragmentation & Barriers (Conventional Threat)	Medium	Medium	High	Medium
Water Management (Conventional Threat)	Very High	Very High	Very High	Very High
Frequency and Severity of Storms & Natural Disasters (Climate Threat)	Very High	Very High	Very High	Very High
Increasing Average Temperatures & Drought (Climate Threat)	Very High	Very High	Very High	Very High
Change to precipitation (Climate Threat)	Very High	Very High	Very High	Very High
Summary Target Ratings	Very High	Very High	Very High	Very High

5.5 SITUATION ANALYSIS

To gain a full understanding of the forces acting upon the Conservation Targets and Direct Threats, a Situation Analysis was conducted. As part of the CP, the Situation Analysis brings together the information gathered in the previous steps (i.e., Targets, Threats, and Stresses) to create a common understanding of the project's context. This includes the biological environment, the social, economic, political, and institutional systems that affect the ecosystems, species, and human well-being targets (GIZ, 2020).

5.5.1 CONTRIBUTING FACTORS (INDIRECT THREATS & OPPORTUNITIES)

Contributing Factors were identified for each of the Conventional Threats. Contributing Factors drive Conventional Threats and are composed of both Indirect Threats and Opportunities relevant to the project's context (GIZ, 2020). Refer to the Situation Model (**Figure 5-5**) for a full account of all identified contributing factors.

Contributing factor: An Indirect Threat, Opportunity, or other important variable that positively or negatively influences Conventional Threats:

- **Indirect threat:** A factor identified in a situation analysis that is a driver of a conventional threat and is often an entry point for conservation Actions
- **Opportunity:** A contributing factor that could have a positive effect on a conservation target, directly or indirectly, and is often an entry point for conservation Actions

5.5.2 SITUATION MODEL

A situation model is a visual diagram summarizing the NAMP team's understanding of the project's context – including describing the relationships among the biological environment and the social, economic, political, and institutional systems and associated stakeholders that affect the conservation targets desired to be conserved.

The situation model developed for the site (**Figure 5-5**) contains the following elements: Project scope, Conservation targets, Human Well-Being targets, Stresses, Conventional Threats, Climate Threats, and Contributing Factors (Indirect Threats & Opportunities).

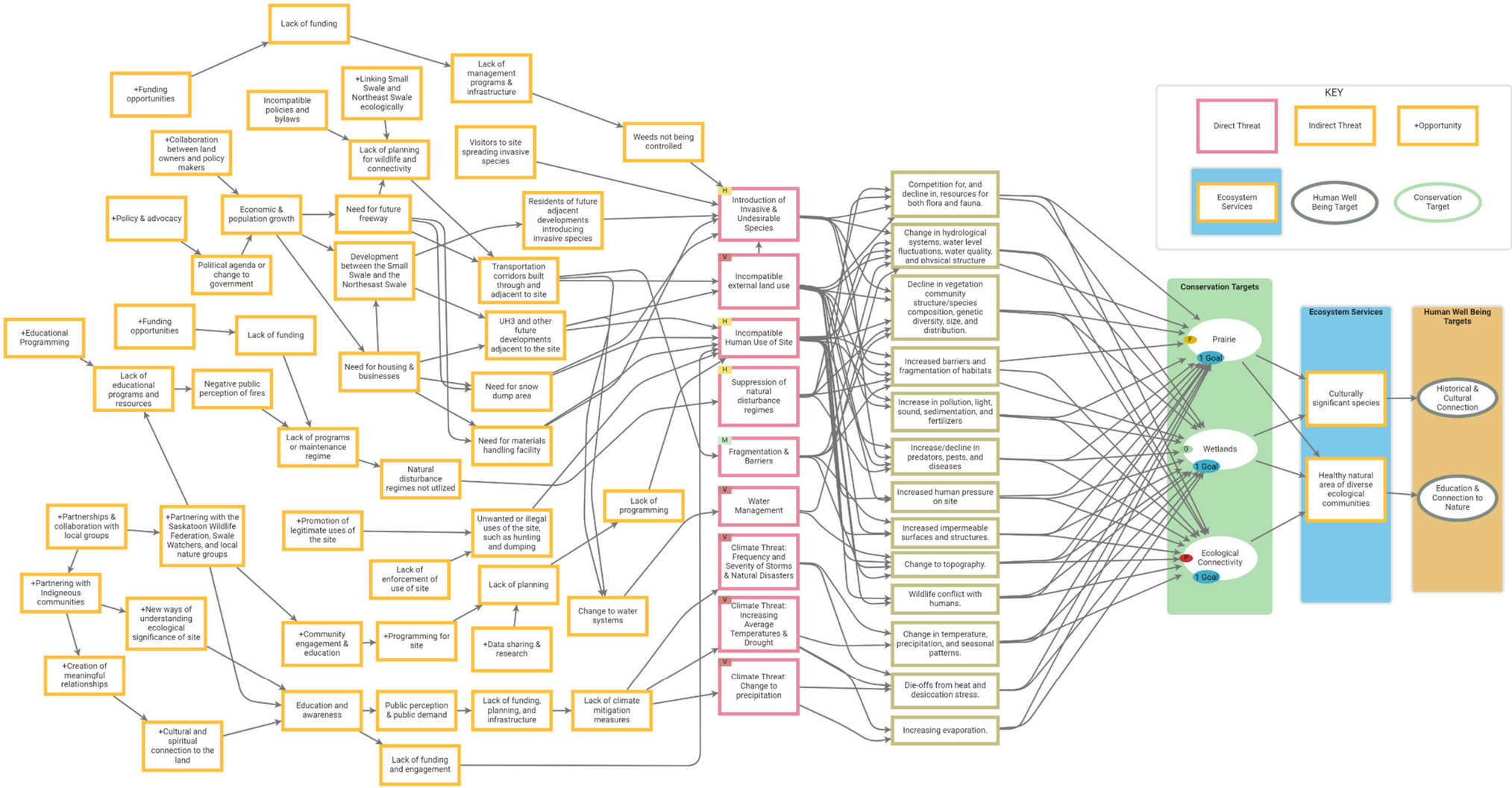

Figure 5-5: Situation Model

5.6 ACTION PLAN

An Action Plan, as defined by the Conservation Standards (CMP, 2020) is "a description of a project's Goals and Objectives and the Strategies that will be undertaken to abate identified Threats and make use of Opportunities" (CMP, 2020). The Action Plan is one part of the three-part Strategic Plan (i.e., Action Plan, Monitoring Plan, and Operational Plan) defined by the Conservation Standards for the successful management of a site. The remaining two parts of the Strategic Plan (Monitoring Plan and Operational Plan) are addressed in subsequent sections of this NAMP.

The Action Plan builds upon the Targets and Threats addressed in the previous sections of the CP, following the following steps with the aim of producing a final Action Plan:

1. Goals.
2. Strategies.
3. Results Chains.
4. Actions.
5. Objectives.
6. Final Action Plan.

5.6.1 STEP ONE: GOALS

In the context of the Conservation Standards, a Goal is linked to the Conservation Targets and represent the desired status of those Targets over the long-term (CMP, 2020). An effective goal should conform to the SMART criteria, meaning that it should be specific, measurable, achievable, results-oriented, and time-limited. Goals were developed for each Conservation Target and are intended to a be a measurable summary of the future desired status of the Indicators for each Conservation Target. As an additional step, goals were also developed or each Human Well-Being Target to ensure all aspects of the Targets were achieved. Refer to Section 5.6.6 – Action Plan Summary for a summary of the Goals identified for each Target.

5.6.2 STEP TWO: STRATEGIES

Strategies are defined as: a set of activities or Actions with a common focus that work together to achieve specific Goals and Objectives by targeting key intervention points, optimizing opportunities, and limiting constraints (CMP, 2020). An effective strategy meets the criteria of being linked, focused, feasible, and appropriate (CMP, 2020).

Eleven Strategies were identified to abate both the listed Direct Threats and Indirect Threats and make use of the Opportunities. Once identified, each Strategy was assessed and ranked based on the Potential Impact of the Strategy on the Goals, and the Feasibility to implement the Strategy. See below for a summary of the assessment of the Strategies.

STRATEGY ASSESSMENT

Strategies were assessed and ranked based on the following Strategies Criteria as defined by the Conservation Standards (CMP, 2020):

- Potential Impact: The confidence of the NAMP team that the Strategy will achieve its desired Goals and/or Objectives
- Feasibility: The assumed ability of the City of Saskatoon, and potential partners, to implement the strategy within likely time, financial, staffing, ethical, and other constraints

Each criterion was then ranked using a qualitative indicator of either Not Effective, Need More Info, Effective, or Very Effective. Refer to **Table 5-13** for summary of the Strategy Assessment Criteria used.

Table 5-13: Strategy Assessment Criteria

CRITERIA	RANK	CRITERIA
Potential Impact	Low	The Strategy is unlikely to meaningfully contribute to project goals and/or objectives.
	Medium	The Strategy could meaningfully contribute to project goals and/or objectives but would need pilot-testing to ensure it is effective under this project's conditions.
	High	The Strategy is likely to meaningly contribute to project goals and/or objectives but would need effectiveness monitoring to ensure it is effective under this project's conditions.
	Very High	The Strategy is likely to meaningfully contribute to one or more project goals and/or objectives and can be implemented at scale with only implementation monitoring.
Feasibility	Low	The Strategy is not ethically, technically or financially feasible.
	Medium	The Strategy is ethically feasible, but either technically or financially difficult without substantial additional resources.
	High	The Strategy is ethically and technically feasible but may require some additional financial resource(s).
	Very High	The Strategy is ethically, technically and financially feasible.

Final Strategy Ranking: The final rating for each Strategy was produced in Miradi based on the ratings of each Strategy for Potential Impact and Feasibility. See **Table 5-14** below for a summary of the Strategy Ratings which were subsequently used to guide the prioritization of the identified strategies for implementation to abate the Threats and make use of the Opportunities.

Note: The "Baseline Collection & Data Management" Strategy has been ranked as "Not Effective" as data collection alone does not have the ability to reduce a direct threat. This ranking should not be confused for the importance of this strategy. Data collection is a critical step in each Strategy as demonstrated in Section 5.6.6 – Action Plan Summary.

Table 5-14: Strategy Rating

STRATEGY	POTENTIAL IMPACT	FEASIBILITY	STRATEGY RATING
Baseline Collection & Data Management	Low	Medium	Not Effective
Policy, Enforcement, and Urban Planning	High	High	Effective
Buffering of Adjacent Lands	High	High	Effective
Enhancements & Improvements	High	High	Effective
Invasive & Undesirable Species Management	High	High	Effective
Natural Disturbance Regime Management	High	High	Effective
SOMC (Flora & Fauna) Management	High	High	Effective
Historically and Culturally Significant Species & Features Management	High	High	Effective
Water Management	High	High	Effective
Ecological Connectivity Management	High	High	Effective
Human Use Programming	High	High	Effective

5.6.3 STEP THREE: RESULTS CHAINS

A Results Chain is a tool which depicts Assumptions in a casual ("if then") progression of results which represent how the NAMP team believes the Strategies will lead to a long-term result (CMP, 2020). Therefore, Results Chains was developed for each Strategy to illustrate the theory of change, or Assumptions of how each Strategy will assist with achieving each Goal.

The Situation Model was used as the basis for developing the Results Chains to show how the Strategy will affect the current state of the Targets. The Results Chains underwent multiple refinements with the final Results depicted for each Strategy in Section 5.6.6 – Action Plan Summary.

5.6.4 STEP FOUR: ACTIONS

Each Strategy presented is a combination of multiple Actions, with each Action being a measurable task(s) which are intended to be completed in order of the priority assigned to each Action. The Actions development consider the following nine categories so that each Strategy represents a complete and dynamic management approach:

1. Data Collection.
2. Planning & Implementation.
3. Financing.
4. Partnerships & Community Stewardship Initiatives.
5. Engagement Initiatives.
6. Education, Training, and Research Initiatives.
7. Monitoring, Maintenance, and Adaptive Management.
8. Adherence to Laws and Guidelines (i.e., guidelines, standards, policies, and laws).
9. Climate Change Mitigation Initiatives.

When developing each Action, the MVRMP (MVA, 2017) was consulted to ensure the various Actions detailed for the site were in alignment with valley-wide initiatives. Where the NAMP could expand or support the goals of the 2017 plan, Actions were developed.

A complete list of the Actions identified for each Strategy is detailed in **Appendix B** – Actions Summary and is summarized in Section 5.6.6 – Action Plan Summary.

Actions were added to the Results Chains to show the progression of the Actions required to advance each of the Strategies. For a visual representation of how the Actions are tied to the Strategies, refer to Section 5.6.6 – Action Plan Summary for the complete Results Chains.

5.6.5 STEP FIVE: OBJECTIVES

Objectives are defined as a formal statement detailing a desired outcome of a Strategy, such as reducing a Critical Threat or decreasing vulnerability to climate change (CMP, 2020). For each of the identified Strategies, one or more Objectives have been identified as a means of measuring the effectiveness of the Strategy in achieving a Goal or Goals. See Section 5.6.6 – Action Plan Summary for a list of Objectives and their relationship to the Strategies.

5.6.6 STEP SIX: ACTION PLAN SUMMARY

The Action Plan is one part of the Strategic Plan to manage the site long-term. The Action Plan Summary provides a complete overview of the recommendations of the NAMP team to achieve the Targets, Goals, and Objectives, by utilizing the Strategies to mitigate the Direct Threats, Stresses, and Indirect Threats, and make use of Opportunities.

The Action Plan Summary below is composed of the following:

1. Summary of Targets & Goals.
2. Summary of Strategies, Actions, and Objectives.
3. Summary of Results and Assumptions.

The Action Plan is intended to be used to guide future management of the site. Future efforts should employ each of the Strategies, undertaking the associated Action in order of listed priority with the aim of achieving the Objectives and Goals. Should these Goals and Objectives be met, the Targets are assumed to be achieved and will result in an improved state for the site. This Action Plan is intended to be used in conjunction with the Management Plan and Operational Plan included in subsequent sections of this NAMP.

SUMMARY OF TARGETS AND GOALS

The following Goals (**Table 5-15**) will be used to measure the success of the various initiatives undertaken on site and effectiveness of each Target. All Goals are Target specific and reflect the KEAs identified during the VA completed for each Conservation Target. As noted previously, a 10-year timeframe has been used as a benchmark for the Goals to provide a measurable timeframe when the NAMP should be revaluated as a whole to ascertain overall effectiveness in the management of the site.

Table 5-15: Summary of Targets and Goals

TARGETS	GOAL(S)
Prairie (Conservation Target)	Goal One: By 2035, total hectares of native dominant grassland, native dominant tame grassland, and tame grassland have increased from a recorded baseline; Prairie area undergoes regular 'natural' disturbance regimes; overall site vegetation community, structure, diversity, and cover is considered healthy; Undesirable species (e.g., weeds) are 'managed'; SOMC and Culturally Significant Species are abundant and diverse; Native flora and fauna species are abundant and diverse.
Wetlands (Conservation Target)	Goal Two: By 2035, spatial extent of wetlands is maintained from recorded baseline and chosen pre-development status; hydrological inputs are maintained, and wetlands are considered 'functioning' (when the Minnesota Routine Assessment Method (MnRAM) is applied); Water quality is appropriate for restoration/maintenance/enhancement end target or parallels reference community used; SOMC and Culturally Significant Species are abundant and diverse; Native flora and fauna species are abundant and diverse.
Ecological Connectivity (Conservation Target)	Goal Three: By 2035, connectivity is maintained/enhanced, and wildlife move freely throughout the site; connectivity corridors with other retained natural areas located in the Meewasin Valley that are in relative proximity to the site have been considered, established and are functioning.
Historical & Cultural Connection (Human Well-Being Target)	Goal Four: By 2035, historically and culturally significant features are identified and protected; historical and cultural programs are developed and implemented.
Education & Connection to Nature (Human Well-Being Target)	Goal Five: By 2035, the educational programs are identified and implemented; infrastructure and programs allow for a connection to the landscape.

SUMMARY OF STRATEGIES, ACTIONS, AND OBJECTIVES

The following Strategies, Actions, and Objectives were developed to support the various Goals developed. It is anticipated that multiple Strategies, and associated Actions and Objectives will be utilized to achieve each Goal successfully. Objectives follow the same 10-year timeframe used in Goal setting, while Actions have shorter timeframes and priority of implementation (i.e., Short-Term [one-year], Mid-Term [five years], and Long-Term [five+ years]). The shorter time frame for the Actions represents the immediate steps which may be taken to manage the site. For a complete list of the Actions associated with each Strategy, including the priority of each Action, refer to **Appendix C**.

Table 5-16: Summary of Strategies and Objectives

STRATEGY	OBJECTIVE(S)	GOAL(S) SUPPORTED
1 Baseline Collection & Data Management An initial comprehensive and subsequent ongoing biophysical data collection and analysis (e.g., targeted baseline and monitoring) program executed in an appropriate timeframe to support and confirm the successful execution of the various conservation tools developed to restore/reclaim/enhance aspects of the site. Development of a data management system to collect, store, and share data.	Objective 1.1 By 2035, initial baseline studies have all been identified and ranked in importance; and individual assessments have been executed. Objective 1.2 By 2025, data management system has been developed and is operational.	All goals.
2 Policy, Enforcement, and Urban Planning Establish protection of the site through existing planning tools; acquisition of additional lands; existing and future policy; ongoing governance and enforcement.	Objective 2.1 – By 2035, land acquisition plan is developed and implemented; additional land is acquired when it becomes available. Objective 2.2 – By 2035, the site is zoned appropriately for a retained natural area; future planning on and off-site adheres to current land use designation(s). Objective 2.3 – By 2035, enforcement of bylaws, policies, and site rules are planned for and implemented.	All goals.
3 Buffering of Adjacent Lands Reduce the threats of the incompatible off-site land use by planning and implementing on-site buffering methods; collaborate with off-site developers to plan for off-site mitigation; and form stewardship opportunities with future residents/land-owners.	Objective 3.1 – By 2035, on-site buffering measures are in place, and threats from off-site development minimized/mitigated; partnerships with adjacent developers formed & plans developed that consider the sustainability of the site; adjacent residents engaged and active in the stewardship of the site.	All goals.
4 Enhancements & Improvements Reduce threats of invasive species, and improve degraded lands through enhancement and improvement initiatives, including the closure and reclamation of the existing Snow Storage Facility.	Objective 4.1 – By 2035, restoration/rehabilitation/enhancement areas have been identified, prioritized, funding allocated, and various plans initiated (funds permitting); health of vegetation communities improved. Objective 4.2 – By 2035, existing Snow Storage Facility impacts have been baselined; and an informed strategy has been developed to remediate and remove the Snow Storage Facility and associated impacts while maintaining the hydrological inputs that have artificially changed the size, shape, and class of applicable wetlands residing within the site.	All goals.

STRATEGY	OBJECTIVE(S)	GOAL(S) SUPPORTED
5 Invasive & Undesirable Species Management Control of invasive and undesirable species pursuant applicable legislation, regulations, policies, guidelines and bylaws.	Objective 5.1 – By 2035, all provincially listed noxious, and nuisance invasive species have been identified, influence on site have been categorized, site-specific IPM plan(s) have been developed and executed as required. Objective 5.2 – By 2035, all undesirable species/invasive species (not provincially listed) have been identified, influence on site have been categorized, site-specific IPM plan(s) have been developed and executed as required.	All goals.
6 Natural Disturbance Regime Management Develop and implement natural disturbance regime management to promote healthy vegetation communities which normally would be subject to natural disturbances.	Objective 6.1 – By 2035, appropriate site-specific disturbance mechanisms to manage natural nutrient cycling and species composition/health are understood and selected; frequency of application agreed to and prescribed; and plans developed and initiated.	All goals.
7 SOMC (Flora & Fauna) Management Protection of identified habitat and sensitive locations for known (current and future) SOMC within the site based on baseline/monitoring analysis, and present and future standards.	Objective 7.1 – By 2035, fauna and flora SOMC species have been categorized, ranked in importance, and species-specific enhancement programs are implemented as required.	All goals.
8 Historically and Culturally Significant Species & Features Management Historically and culturally significant species and features identified, protected, enhanced, and celebrated.	Objective 8.1 – By 2035, appropriate Indigenous and other communities engaged, species identified, culturally significant features and species identified, plan(s) developed and implemented. Objective 8.2 – By 2030, historically significant features are verified, reviewed and protected as required. Engagement plan is initiated.	All goals.
9 Water Management Management of all hydrological features within the site.	Objective 9.1 – By 2035, hydrological processes associated with the sustainability of the various waterbodies (natural wetlands, relationship with groundwater and drainage linkages) are understood, a pre-development hydrological baseline is chosen; a staged plan is developed to maintain the pre–development hydrological inputs and executed as internal and external development within the identified local catchments/greater watershed(s) occur.	All goals.

STRATEGY	OBJECTIVE(S)	GOAL(S) SUPPORTED
10 Ecological Connectivity Management Management of intra and inter-connectivity.	Objective 10.1 – By 2035, current and future intra-connectivity requirements are understood, planning complete, and infrastructure (if any) installed and monitored. Objective 10.2 – By 2035, the role that the site represents within the greater Meewasin Valley in a post-development ecological context is understood. Plans to maintain important inter-connectivity elements are addressed at appropriate phases of any future land use changes proposed in adjacent to and immediately surrounding the current and future extent(s) of the site. General wildlife movement to and from current and future identified natural features slated for retention in the greater Meewasin Valley has been successfully considered.	All goals.
11 Human Use Programming Planning for responsible human-use of the site.	Objective 11.1 – By 2035, human-use needs are understood, plans developed, implemented, and monitored; responsible human-use of the site which does not harm the natural assets.	Goals associated with Human Well-Being Targets.

RESULTS CHAINS & ASSUMPTIONS

Results Chains are a graphical depiction to illustrate core assumptions and the logical sequence linking the identified Strategies to one or more of the defined Conservation Targets. For each of the identified Strategy, a results chain has been prepared and is illustrated below.

Note that Strategy #1 does not have a stand-alone results chain as other Strategies must be implemented in conjunction with Strategy #1 to have an effect on the Threats. As such, Strategy #1 is included as a vital step in each of the other Strategies.

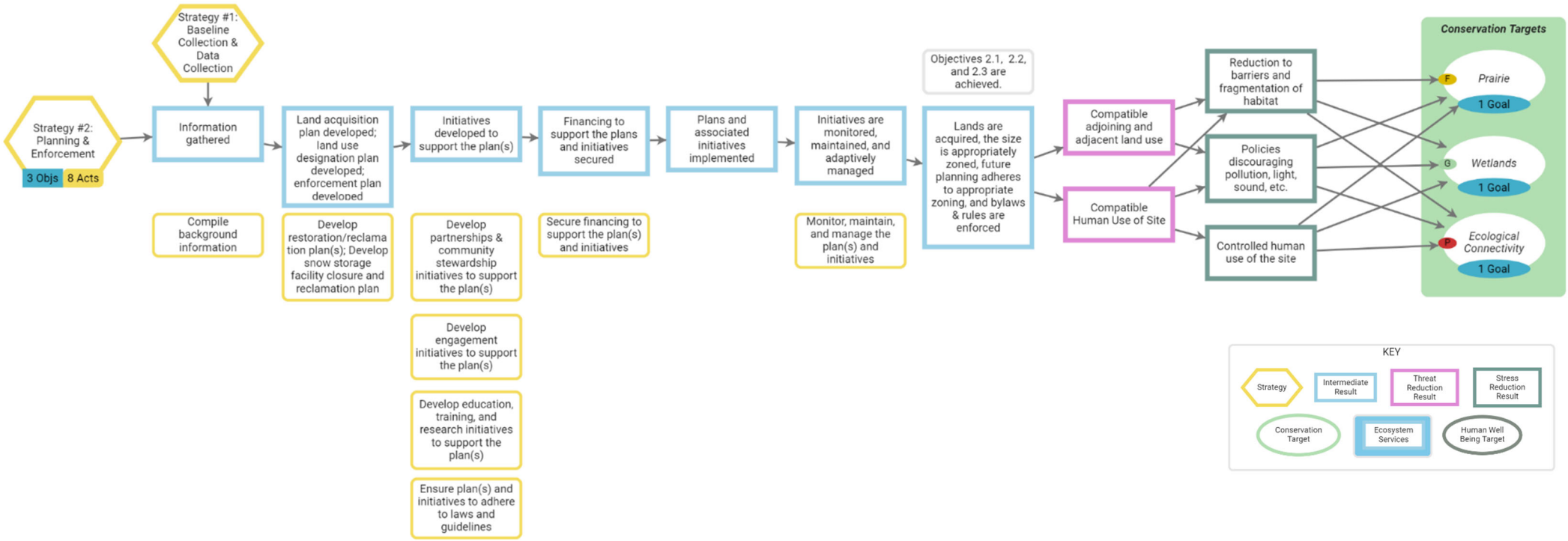

Figure 5-6: Results Chain - Strategy #2

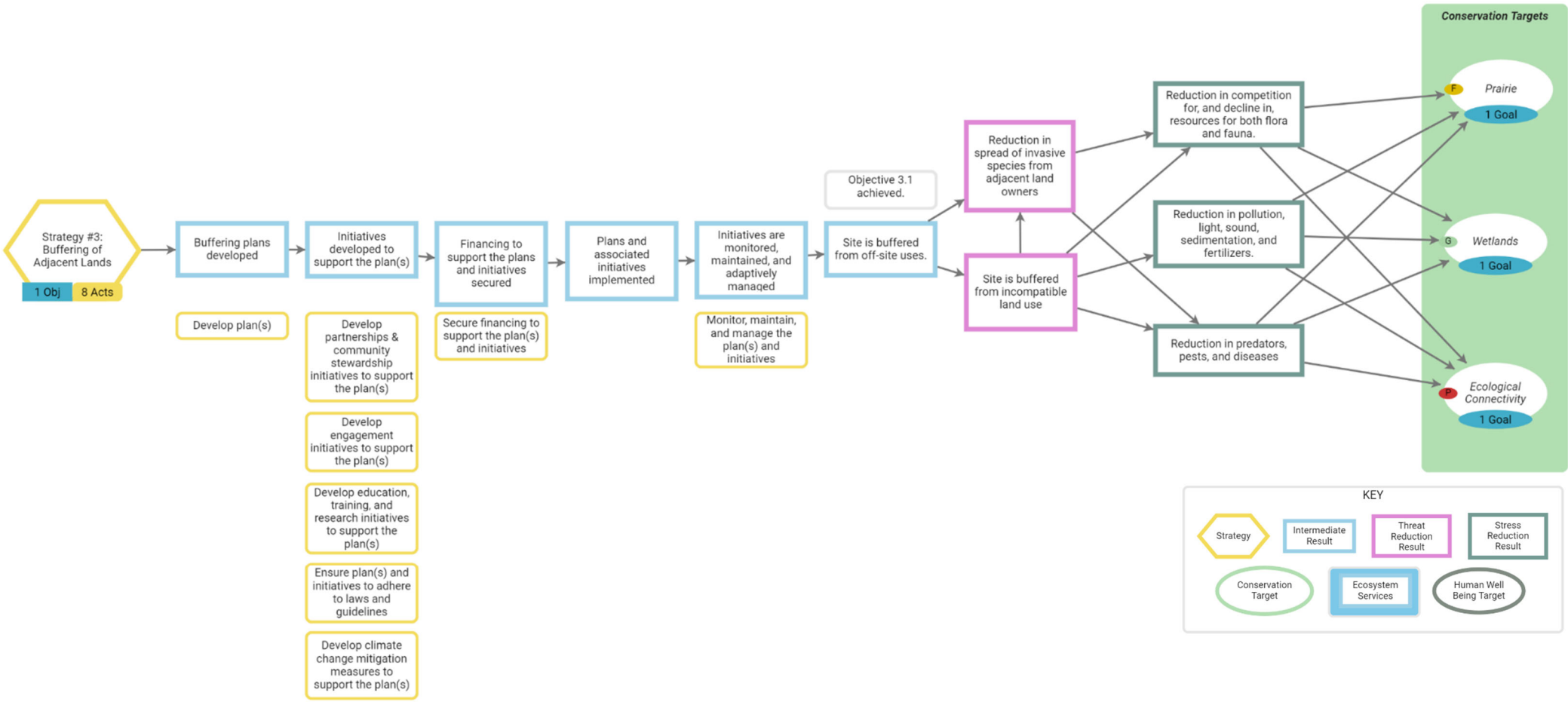

Figure 5-7: Results Chain - Strategy #3

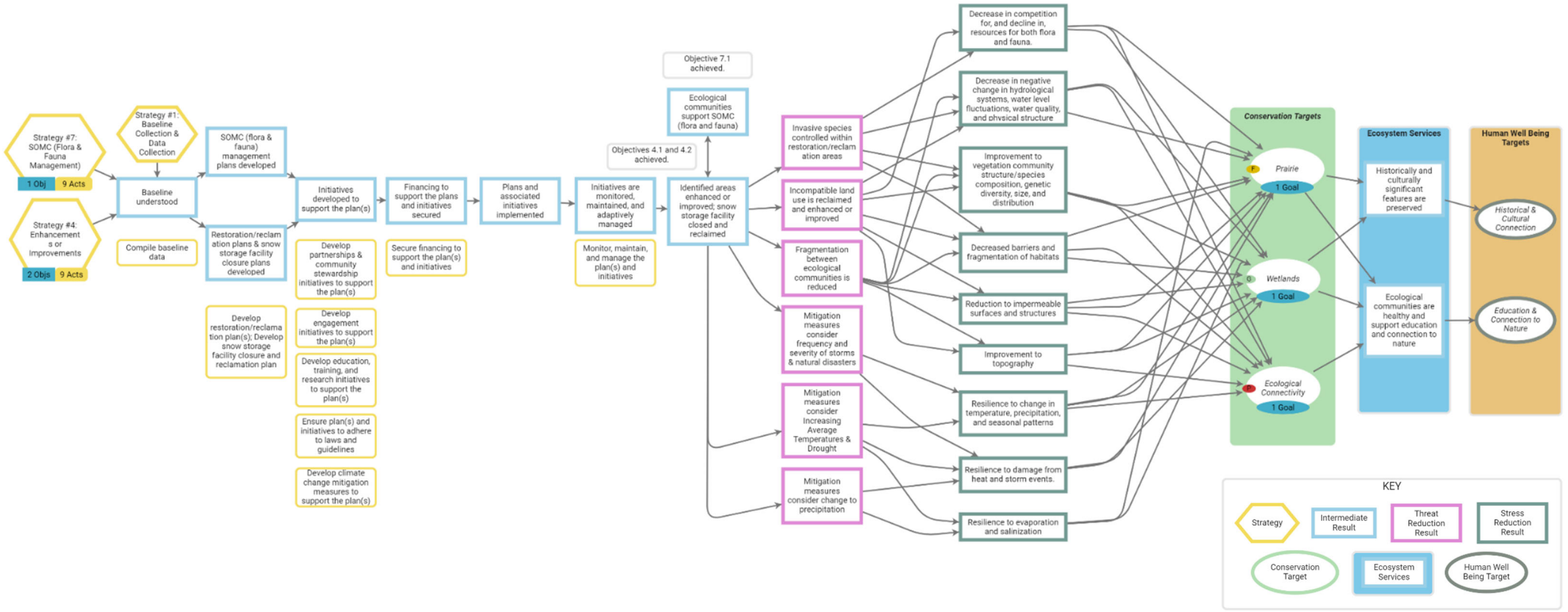

Figure 5-8: Results Chain - Strategy #4 & #7

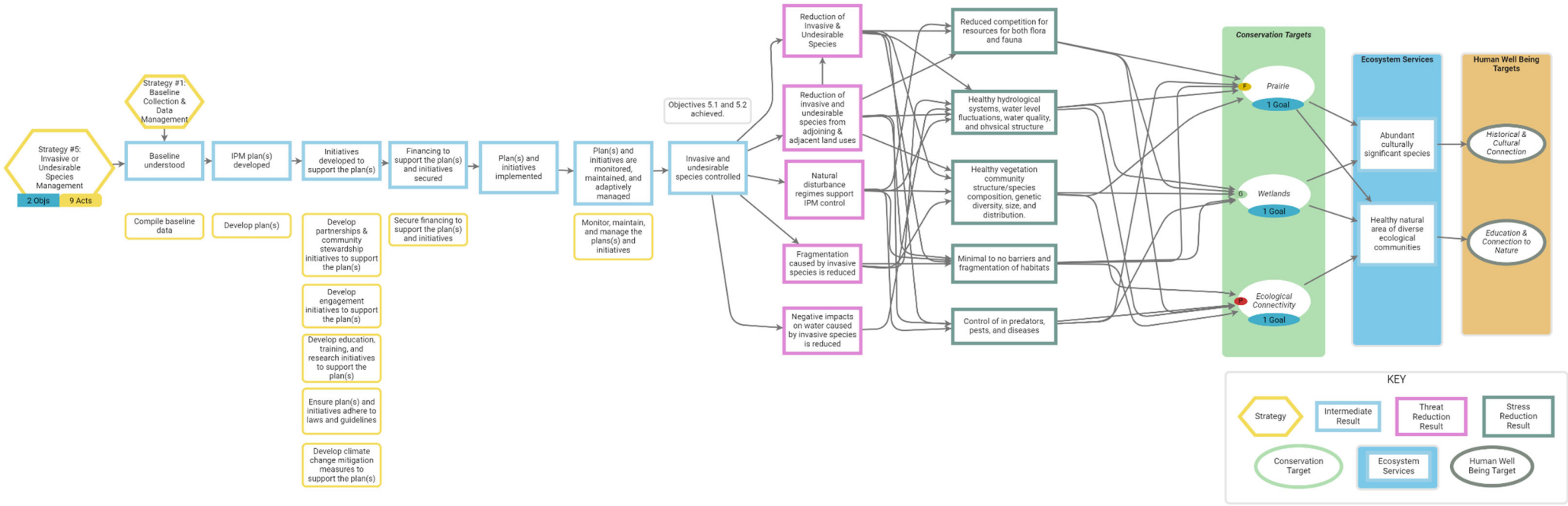

Figure 5-9: Results Chain - Strategy #5

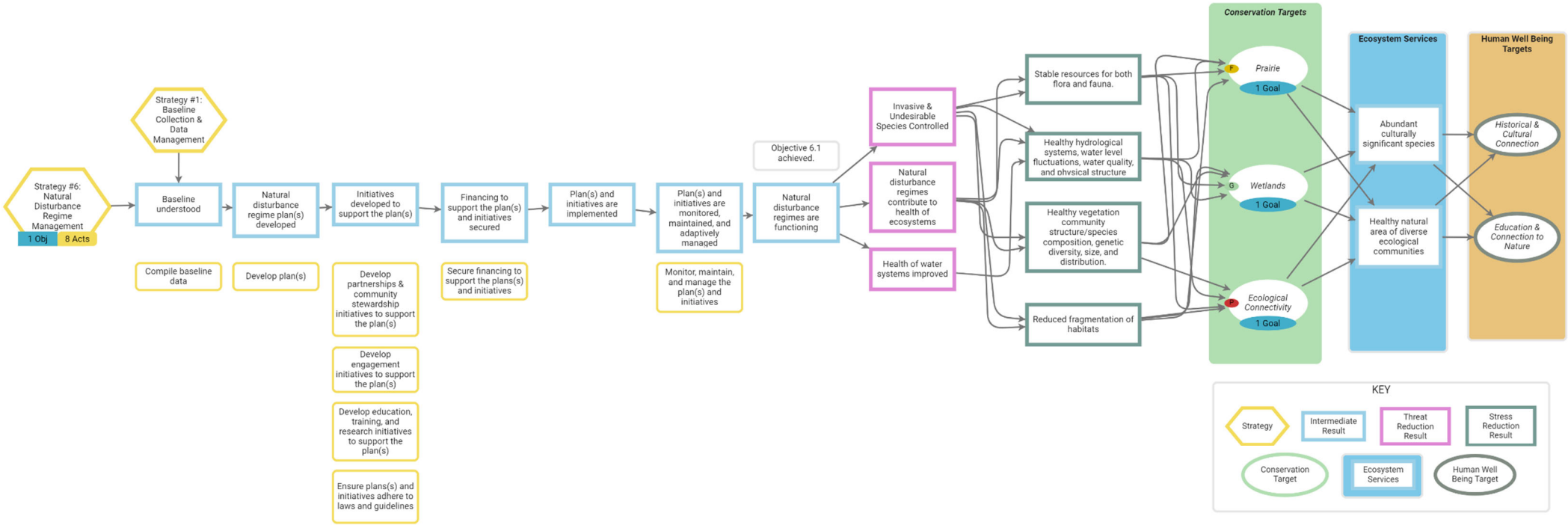

Figure 5-9: Results Chain - Strategy #6

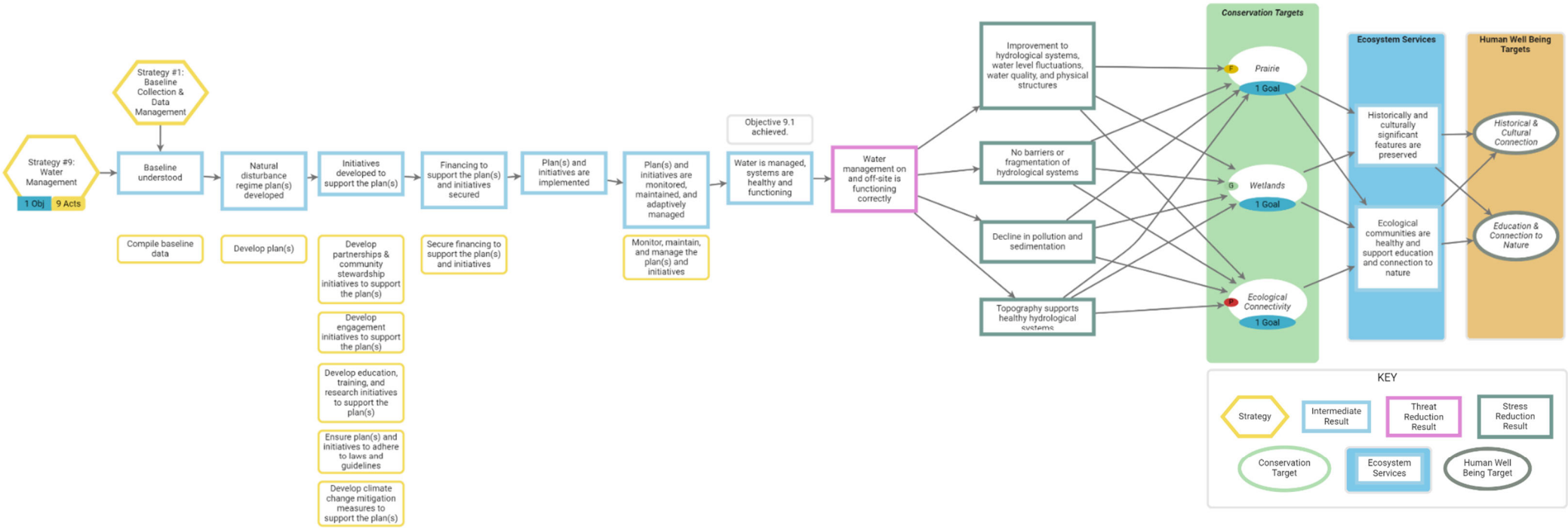

Figure 5-10: Results Chain - Strategy #9

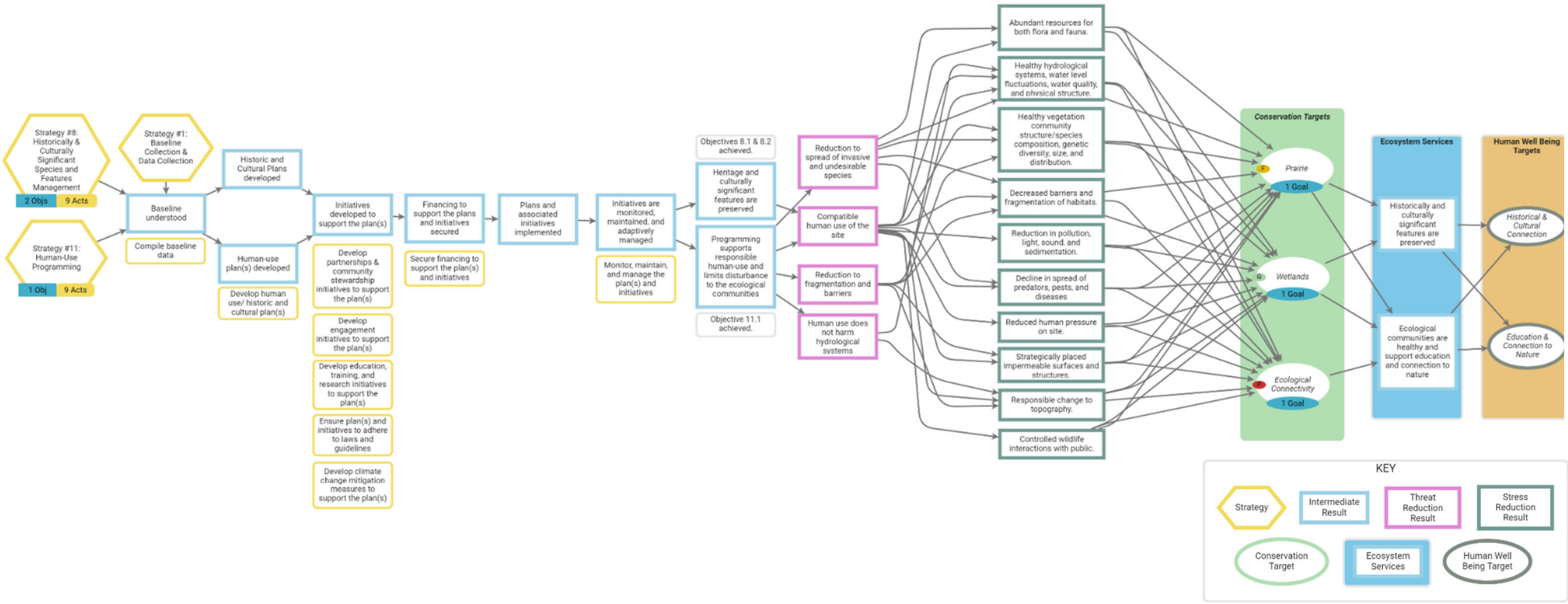

Figure 5-11: Results Chain - Strategy #8 & 11

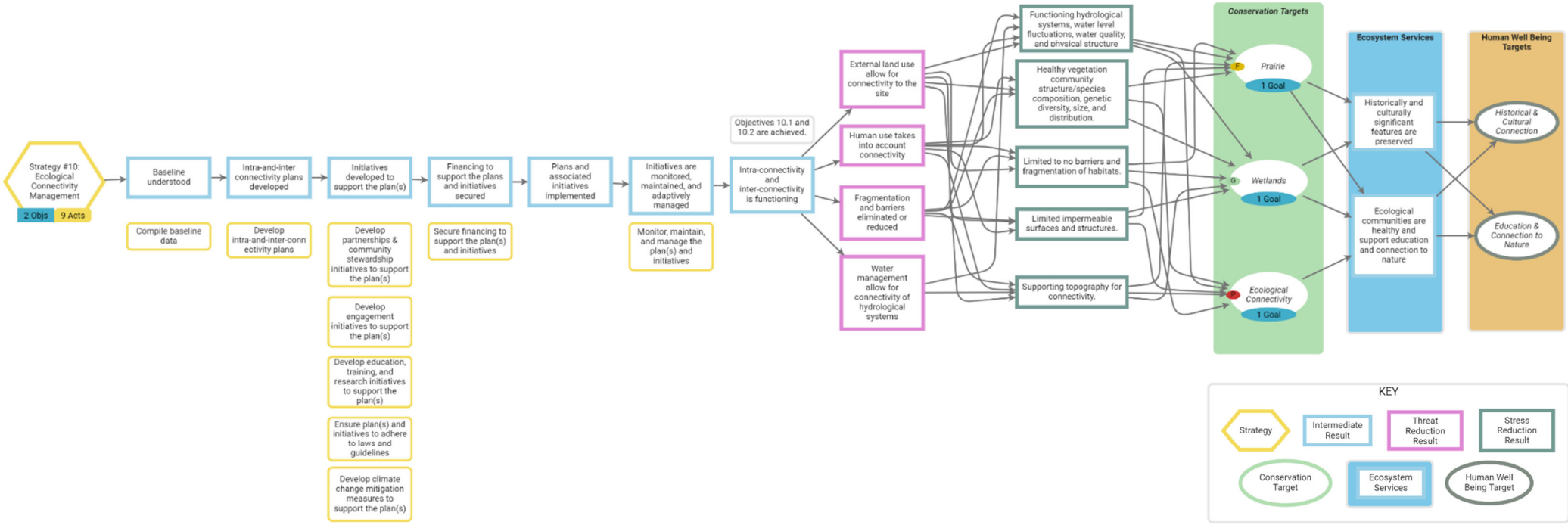

Figure 5-12: Results Chain - Strategy #10

6 HUMAN USE

Anticipation of current and future human use through ecologically sensitive design is critical for the long-term protection of the site. Without proper planning, the site will continue to be subjected to unsanctioned human use (e.g., “volunteer” trail formation), thereby increasing the probability that sensitive ecosystems and species at risk could be impacted.

Successful human use planning and ecologically sensitive design considers the needs of humans and the protection of the environment by limiting or eliminating disturbance. Long-term human use management should consider balancing appropriate uses of the site based on the environmental sensitivity present (e.g., currently identified or discovered in the future), targeted public enjoyment vectors (e.g., passive recreation), and public safety.

6.1 PUBLIC USE AND INFRASTRUCTURE

Public use of the site considers the appropriate programming of the site, restrictions on use, the infrastructure required to support the recommended uses, and opportunities for community stewardship. These recommendations are intended to be used to guide the future design programs. These recommendations are based on current and expected use of the site, however they should be reviewed and updated as required to reflect current needs.

6.1.1 PROGRAMMING

Human use programming (i.e. design for use) of the site is heavily influenced by the feedback received during stakeholder engagements. As such, the programming first considers the conservation of the site and, secondly, responsible passive recreation. It is recommended that human use programming supports the Human Well-Being Targets and considers the following:

- Opportunities for historical and cultural connection
- Opportunities for education and connection to nature, including passive recreation

6.1.2 MANAGEMENT ZONES

Three management zones (Ecological Core, Passive Programmable, and Stormwater Management) have been developed for the site based upon the existing conditions of the natural features as reviewed by the Biophysical Baseline Environmental Summary. They will influence the programming and management of the site and inform the location of appropriate site uses. **Table 6-1: Management Zones** provides a summary of each zone, including a summary of the spatial extent, proposed programming, and design considerations. For a visual extent of the zones, refer to **Appendix A – Figure 9**.

Note, the management zone extents currently presented will be subject to change as new information is received and initiatives are undertaken (e.g., baseline data collection and monitoring program advancement). The spatial extents of the presented management zones should be reviewed as part of the management plan review process.

Table 6-1: Management Zones

	ECOLOGICAL CORE ZONE	PASSIVE PROGRAMMABLE ZONE	STORMWATER MANAGEMENT ZONE
Spatial Extent	Existing vegetation communities and waterbodies of high ecological or historical value; and known habitats of SOMC.	Existing communities of fair or degraded landscapes.	Existing and proposed areas of stormwater management.
Proposed Programing	Limited low-impact passive recreation. Support the Target(s): - Historical and Cultural Connection - Education and Connection to Nature.	Low-impact passive recreation. Support the Target(s): - Historical and Cultural Connection - Education and Connection to Nature.	Stormwater management. Support the Target(s): - Education and Connection to Nature.
Design Considerations	Protect and buffer the ecological zone from other land uses, both within and adjacent to the site. Utilize various human use barriers, such as fences, gates, and barricades to limit access. Enhance zone through planting or restoration activities, if required. Limited infrastructure located at appropriate offsets from identified sensitive species. Support educational opportunities to highlight importance of the natural assets.	Enhance the passive programmable zone through planting or restoration activities, if required. Limited infrastructure located at appropriate offsets from sensitive species. Locate higher-impact infrastructure within existing degraded areas. Support educational opportunities to highlight importance of the natural assets.	Stormwater to be managed so as not to cause harm to the site or adjacent lands. Future and existing stormwater systems (e.g., forebay south of McOrmond Drive) should be (re)designed to actively restore and improve the surrounding area. Naturalization and biodiversity to be considered in all designs put forth.

6.1.3 PERMITTED USES AND RESTRICTIONS

To support the Human Well-Being Targets, the following uses (**Table 6-2**) are recommended to be permitted and encouraged. Based on the permitted uses, restrictions are to be implemented to reduce and/or remove the risk of harm to ecological communities present.

Table 6-2: Permitted Uses and Restrictions

	DESCRIPTION	HUMAN WELL-BEING TARGET SUPPORTED	RESTRICTIONS ON ACTIVITY
Passive Recreation	Low impact activities such as walking/hiking, bird-watching, geocaching and photography.	Supports the Targets of "Historical & Cultural Connection" and "Education & Connection to Nature" by allowing for controlled access to the historical, cultural, and environmentally significant features of the site.	Visitors must remain on trails. Use of site is recommended to be from dawn to dusk to avoid unwanted uses of the site.
Educational Tours	Group tours (e.g., school groups) or self-guided tours.	Supports the Targets of "Historical & Cultural Connection" and "Education & Connection to Nature" by providing educational and understanding of historical, cultural, and environmental topics.	Same restrictions as "Passive recreation."
Harvesting* *subject to further engagement and research.	Harvesting of culturally significant plants by designated professionals or individuals.	Supports the Target of "Historical & Cultural Connection" by allowing for traditional use of culturally significant species and the land.	To be developed through further engagement. Considerations may include specific areas or plants which can be harvested, and seasonal timeframes of harvesting.
Citizen Science	Public assists in collecting data to accelerate scientific research.	Supports the Target of "Education & Connection to Nature" by allowing for the public to interact with the environment and further citizen research.	Same restrictions as "Passive recreation."

6.1.4 INFRASTRUCTURE TO SUPPORT PERMITTED USES

Infrastructure recommended to support the permitted uses and programming have been identified and are listed in **Table 6-3** below. Infrastructure should be reviewed during future detailed design and planning of the site.

Table 6-3: Infrastructure

TYPE	DESCRIPTION	INFRASTRUCTURE
Site Access	Controlled site access to provide protection from illegitimate uses, control access in-and-out of the site, define boundaries, and assist in wayfinding.	Signage. Perimeter fencing. Gates & blockades. Boot cleaning stations. Waste receptacles. Parking lot (off-site). Restroom facilities (off-site).

TYPE	DESCRIPTION	INFRASTRUCTURE
Circulation Route & Seating Nodes	Trail system to guide visitors through the site, while avoiding sensitive features. Seating nodes to provide areas of rest and contemplation. Layout of circulation system to tie into future UH3 Neighbourhood designs, and other future adjacent developments.	Trails (of various types and functions). Benches. Signage.
Gathering Areas	Allows for community engagement, rest, education, and ceremonial uses.	Seating. Signage. Waste receptacle.
Lookout	Allows for access to and engagement with a sensitive area without causing damage.	Seating. Signage. Gates & blockades.
Communications Programming	Signage for site recognition, wayfinding, education, interpretation, emergency locators, and rules.	Site map. Secondary entry maps. Wayfinding. Educational signage. Prohibited use signage.

6.1.5 PROHIBITED USES

Prohibited Uses are activities which have a high potential to be disruptive and cause ecological harm. The following are activities which are recommended to be discouraged, and labelled as Prohibited Uses, on site. The City of Saskatoon may wish to add to this list as new risks are identified.

- No dogs (off-leash or leashed)
- No motorized vehicles, including but not limited to: ATVs, snowmobiles, and passenger vehicles
- No bicycles or scooters (either electric or mechanical)
- No collecting of wildflowers or plants (unless sanctioned as harvesting. See Permitted Uses)
- No dumping or littering
- No hunting or poaching
- No swimming or skating
- No camping or overnight use
- No use of site outside of posted hours
- No open fires
- No use of site off designated trails

6.1.6 OPPORTUNITIES FOR COMMUNITY STEWARDSHIP

Opportunities for community stewardship should focus on the community taking an active role in caring for and maintaining the ecological health and recreational value of the area.

Community stewardship is recommended at multiple levels, including:

1. Engagement of the community:
   a. During the implementation of the Strategies and Actions, throughout future design programs, construction, and maintenance phases. Fostering a sense of ownership of the site from the design stage is critical to initiating a sense of ownership of the site.
2. Cultivation of volunteer and partnership opportunities, such as with:

a Local nature groups, such as the Saskatoon Nature Society.
b Local advocacy groups, such as the Swale Watchers.
c Organizations which may use the site for educational purposes, such as local schools.
d Companies which may support future initiatives, such as local native plant suppliers.
e Local compatible user groups, such as bird watching groups.
f Local experts and conservationists, such as Meewasin.
g Indigenous communities.

Volunteer and partnerships can be utilized to organize the following community stewardship initiatives:

Table 6-4: Community Stewardship Opportunities

COMMUNITY STEWARDSHIP INITIATIVE	DESCRIPTION
Planting Program	Engage the community in planting initiatives, such as planting days.
Invasive Species Control Program	Engage the community in invasive species control, such as removal of invasive species.
Maintenance Program	Engage the community in maintenance of the site, including maintenance of trails, site furniture, fence repair, and garbage clean up days.
Educational Program	Encourage the community to organize educational programs, workshops, and guided nature walks to raise awareness about local ecosystems, wildlife, and the importance of conservation.
Monitoring and Reporting Program	Encourage the community to participate in data collection efforts to monitor the health of ecosystems, water quality, and wildlife populations. This information can help inform conservation strategies.
Advocacy and Outreach Program	Encourage the community to advocate for policies and regulations that protect the natural area. Advocacy and outreach can be supported by such means as social media campaigns.
Artistic Program	Encourage creative projects like art or photography exhibitions which can highlight the beauty and significance of the natural area, fostering a deeper connection with the community.
Cultural Programs	Engage with Indigenous groups to develop cultural programs which may focus on such things as, education of the public on culturally significant species, and harvesting.

6.2 PUBLIC SAFETY AND CPTED

To ensure safety for site users, the City of Saskatoon's Crime Prevention Through Environmental Design (CPTED) must be adopted into the future site design. Per the recommendations of the CPTED committee, the site was reviewed for a Crime and Safety Risk Assessment, and recommendations were developed for each of the CPTED policies.

6.2.1 CRIME AND SAFETY RISK ASSESSMENT

Site specific risks and mitigation measures have been identified in the following Crime and Safety Risk Assessment table. Mitigation measures are recommendations to reduce the risk and improve safety for visitors (**Table 6-5**).

Table 6-5: Crime & Safety Risk Assessment

RISK	MITIGATION MEASURE
Conflicting user groups	Signage on trails indicating permitted uses. Planting high-canopy trees to aid in sightlines. No bicycles on trails to potentially be implemented.
Water safety (i.e., risk of falling into wetlands or stormwater pond).	Prohibiting use of wetlands for swimming. Buffering of wetland edges and posting signage to discourage access into riparian edges of the wetland. Implementing climb-resistant railings on wetland outlook and boardwalks.
Uneven terrain (i.e., slips, trips, and falls).	Utilizing durable surfacing materials for improved accessibility along primary trails. Posting signage indicating which trails are accessible.
Emergency situations (i.e., ability of emergency vehicles to access and locate the site).	Posting a site map at each entrance indicating the information recommended by the CPTED policies.
Wildlife encounters (i.e., conflict between people and local wildlife).	Posting signage at site entrance to inform and educate (i.e., "entering a wildlife area"). Encouraging people to stay on trails and not to feed wildlife.
Criminal activity (i.e., unintended use of the site, such as vandalism, theft, or assault).	Discourage criminal activity through encouragement of positive, or legitimate, uses of the site (i.e., bird watching and other activities). Have posted hours of use at each site entrance (i.e., from dawn to dusk). Improve safety of parking lots by means of dark-sky compliant lighting.
Litter and trash (i.e., garbage left on site which could attract pests and diseases).	Discouraging littering and dumping within the site by means of signage and controlled access points. Posting education signage about the risk to wildlife and humans.
Disorientation (i.e., getting lost or disoriented on trails).	Wayfinding signage along trails and a park map at each entrance to orient users through the park.
Fires (i.e., unsanctioned bonfires risking uncontrolled wildfire).	Encourage reporting of unsanctioned fires. Post educational signage regarding risk of uncontrolled fires. Employ fire safety planting prescriptions along property line, such standard setbacks of trees to houses.
Crossing McOrmond Drive and South Grid Road. (i.e., conflict with traffic).	Encourage crossing at crosswalks. Trail system to connect to existing pathways along McOrmond Drive to direct people to the cross walk. Post wayfinding signage indicating safe crossing areas.
Hunting (i.e., conflicts with illegal hunting).	Signage to indicate hunting as prohibited use. Perimeter fence to indicate boundaries of site and provide visual clue for hunters not to cross.

6.2.2 CPTED POLICIES AND RECOMMENDATIONS

To ensure future planning complies with the City of Saskatoon's CPTED policies, each of the 11 policies related to public parks (which is the most applicable to a natural area) have been reviewed and a recommendation applied. The following **Table 6-6** outlines each of the CPTED policies and recommendations for the site.

Table 6-6: CPTED Policies & Recommendations

CPTED POLICY	RECOMMENDATION
1.0 TERRITORIALITY RISK	
1.1 Risk Assessments	See Crime and Safety Risk assessment table above.
1.2 Name Signs	Large, easily readable signs to be maintained or erected at each entrance. Site entry signs to include the name of the site, maintenance, emergency numbers, and any other information established by the City of Saskatoon. Signs will be easily visible, and not blocked by landscaping material or snow during the winter months.
1.3 Edge Definition	Edge of site to be defined by perimeter fencing that is wildlife permeable.
2.0 NATURAL SURVEILLANCE	
2.1 Landscaping	Best practices to be employed for landscaping to enhance safety, such as retaining or enhancing sightlines, and reducing conflicts along trails.
2.2 Foliage	Plantings to be focused on naturalization of the site, and aesthetic value in areas of high use, such as parking lots.
2.3 Lighting	Lighting is not recommended within the site. Safety could be enhanced in the parking lots and along the outside perimeter of the Greenway buffer by means of dark-sky compliant lighting.
2.4 Amenities	Amenities (i.e., washrooms) to be placed in areas that visible and should mimic site hours.
3.0 ACCESS CONTROL	
3.1 Fencing	Wildlife friendly fencing of the permitter of the site is recommended to define the area and prevent unwanted vehicular access.
4.0 IMAGE	
4.1 Management and Maintenance	Maintenance schedule for the site is recommended to manage benches, trails, waste receptacles, and other site features.
4.2 Lighting Repair	Lighting to be maintained in proper working order.
4.3 Materials Used	Materials used for will be graffiti and fire resistant and be able to withstand various conditions.
5.0 CONFLICTING USER GROUPS	
5.1 Conflicting Users	Legitimate use of the site to be encouraged by means of improvements to infrastructure, and engagement with user groups. Illegitimate uses to be discouraged by means of signage and bylaw enforcement.
6.0 ACTIVITY SUPPORT	
6.1 Telephones and Emergency Devices	Emergency devices to be considered, including the implications for maintenance.
6.2 Seating and Benches	Proposed benches to be vandal resistant and well maintained. Benches to be located in highly visible locations for natural surveillance.
7.0 LAND USE MIX	
7.1 Nearby Activities	Proposed parking lot(s) to be located within adjacent compatible land uses.
8.0 MOVEMENT PREDICTORS	
8.1 Routes to Parks, Recreational Areas or Playgrounds	Site access to be encouraged for both pedestrians and vehicles from nearby land uses along dedicated paths and roads. Designated paths are recommended to have both entry and exit points for user safety.

CPTED POLICY	RECOMMENDATION
8.2 Routes within Parks	Routes within site to consider circulation within the site and to the access points. Safety to be addressed through wayfinding signage.
9.0 DISPLACEMENT	
9.1 Consider Potential Displacement	Use of the site to be encouraged by means of signage, including hours of use.
9.2 Lighting On or Off	Wildlife compliant lighting is recommended for parking lots and along the outer perimeter of the Greenway for public safety and discourage use after hours. Alternatively, parking lots are inaccessible after site hours.
10.0 COHESION	
10.1 Bulletin Boards	Bulletin board to be recommended to post cultural events, community activities, and crime watch.
10.2 Naming of Park	N/A
11.0 CONNECTIVITY	
11.1 Gathering Areas	Gathering area is recommended within the site to build positive rapport with surrounding community, increase sense of ownership, and attract a variety of users without conflict.

6.3 GUIDANCE FOR THE IMPLEMENTATION OF SITE IMPROVEMENTS

Site improvements for human use are recommended to be implemented in a way which will limit, or eliminate, disturbance to the identified natural assets (**Table 6-7**).

Table 6-7: Guidance for the Implementation of Site Improvements

IMPROVEMENT CONSIDERATIONS	ECOLOGICAL RECOMMENDATIONS
Construction (Timing and Methodologies)	Construction activities to limit disruption to sensitive wildlife and vegetation species. Timing of construction to be designated outside of known breeding and nesting periods. Movement of vehicles, excavation, and grading activities to be of minimal disturbance. Public consultation to occur prior to construction activities.
Wildlife and Vegetation	Locations of SOMC to be verified prior to construction or disturbance. Wildlife corridors to be verified prior to initiation of future designs.
Materials	It is recommended that materials be selected which will not leach or harm the environment over the course of the material's lifetime. Consider the effects of climate change in the placement and materials chosen for the infrastructure, for example greenhouse gas (GHG) impacts of the materials chosen for the site.
Layout	Infrastructure to be placed where it will limit disruption to sensitive species, utilizing existing areas of disturbance where possible. Field-fit or confirm final placement on-site under the direction of a qualified consultant.
Buffering within Site	It is recommended that buffers or offsets be established between proposed site amenities and ecologically sensitive features/known locations of SOMC.
Buffering between Site and Adjacent Lands	As a physical buffer, it is recommended that a Greenway be installed between the site and any future adjacent developments of incompatible land use (e.g., UH3 Neighborhood). The Greenway is recommended to be installed on the exterior of the property line (outside of the site), following the example of the Northeast Swale, or with alterations to the design to allow for an alley way. Refer to the Actions Summary in **Appendix C** for more information.
Light & Sound Pollution	Lighting within the site is discouraged due to the status of the site as a natural area. Should lighting be utilized near the site, it is recommended that it be dark-sky compliant and on

IMPROVEMENT CONSIDERATIONS	ECOLOGICAL RECOMMENDATIONS
	timers to reduce the frequency of use. Considerations for tree planting along the exterior of the site should be explored to mitigate the effects of exterior light and sound pollution.
Location of High Impact Features	Locate the following outside of the boundaries of the site: parking lots, washroom facilities, lighting, and the Greenway.
Ecological Connectivity Considerations	Consider wildlife and ecological connectivity in layout and design of features.
Monitoring	Monitor the impacts of infrastructure and site uses on the natural assets, and re-evaluate as needed.

7 LEGISLATIVE RECOMMENDATIONS

Future development proposals including concept plans shall consider and align with the information included in this and any associated planning reports and studies including but not limited to the University Heights Sector Plan.

8 IMPLEMENTATION

To implement the Action Plan, a Monitoring Plan and an Operational Plan are required to complete the Strategic Plan. The Action Plan, Monitoring Plan, and Operational Plan will work together to guide the implementation of the NAMP by providing guidance on the required Strategies and Actions needed to achieve the Objectives, Goals and Targets, monitoring of the success and progress of the Strategies, and organizing the resources and finances required to execute the various Strategies developed for the site.

As the implementation of this NAMP may differ in responsibility from year to year, this section provides guidance on how to implement the Action Plan, the Monitoring Plan, and the Operational Plan.

8.1 ACTION PLAN

The Action Plan is to be implemented based on the priority assigned to each Action in the Actions Summary (refer to **Appendix C** – Actions Summary), dependent upon financing and available resources. The future team(s) implementing the various plans required to successfully complete tasks or projects for the site is advised to prepare detailed work plan(s) conforming to the following frameworks to harmonize the implementation of the overarching Action Plan and Monitoring Plan. To harmonize the implementation of the overarching Action Plan and Monitoring Plan. The elements of the monitoring framework are provided in Section 8.2.2. – Monitoring Plan for Actions, Strategies, Objectives, and Targets. More details on the Operational Plan can found in Section 8.3 - Operational Plan.

8.2 MONITORING PLAN

Monitoring is essential to help a team track the implementation of Actions and achievement of Goals and Objectives, test assumptions in the theories of change, reduce uncertainties, learn from information collected, and improve current and future programming (CMP, 2020).

Monitoring as part of an Action Plan is intended to gauge the progression of the plan and success of the Goals, Objectives, and Strategies. The Monitoring Plan prepared for the site follows the Conservation Standards, and addresses the "information needs, indicators and methods, spatial scale and location, timeframe, and roles and responsibilities for collecting data (CMP, 2020).

An adaptive approach to maintenance and management typically leads to greater success; therefore, a linkage from the various monitoring initiatives undertaken should drive changes to any required monitoring targets when considered over a period of time. As such, the information gathering through the monitoring process should be analyzed, and the Action Plan adapted as required to maintain the appropriate trajectory that leads to the greatest probability of successfully achieving the desired outcome.

8.2.1 AUDIENCE AND INFORMATION NEEDS

The first step in developing an effective Monitoring Plan was the identification of the Audience and their information needs. In this step, it was determined what the monitoring will be conducted for, and which responsible parties will need to know for decision-making purposes. For the purposes of the NAMP, it was determined that the Monitoring Plan will primarily be utilized to inform the City of Saskatoon and applicable Partners, such as Meewasin. The information gathered through the Monitoring Plan framework may also be of use to stakeholders, and financial donors who may be interested in the progress and results of the Action Plan.

The information gathered in the implementation of the Monitoring Plan framework will help to answer the following questions:

- Are the Strategies and Activities being implemented as expected?
- Are the Goals and Objectives being achieved?

- What is working, what is not, and why?
- How can the Strategies be improved?
- Should the Goals and Objectives be reconsidered?

8.2.2 MONITORING PLAN FOR ACTIONS, STRATEGIES, OBJECTIVES, AND TARGETS

The Monitoring Plan considers monitoring requirements of the Action Plan, including the Actions, Strategies, Objectives, and Targets. Monitoring of the progression of the Actions, and the accomplishment of the Objectives and Goals will help to determine if the various initiatives detailed in this NAMP are successful in supporting the health of the Conservation Targets defined for the site and provide guidance on if Strategies and Actions should be re-evaluated.

MONITORING OF STRATEGIES AND ACTIONS

Strategies and Actions are recommended to be monitored for progression (i.e., the status of the Action) and assess if that Action is effective in supporting the associated Strategy. The Operational Plan (Section 8.3) provides a tool to track the progression of the Actions (i.e., "on-track" or "delayed"), and record notes on the effectiveness of the Action. It is recommended that monitoring of the Strategies and Actions be completed in concert with their implementation.

Within each Strategy detailed in the Action Summary (**Appendix B**), there is an Action directly related to monitoring. Monitoring of certain Actions will require specific monitoring plans to monitor the success of the Action initiatives. For instance, each restoration plan (an Action) will require its own detailed monitoring plan, with the information gathered collected and analyzed for effectiveness.

In order to monitor the initiatives correctly, it is recommended that future detailed monitoring plans for specific Actions follow a central Monitoring Framework. The monitoring activities recommended within the Strategy-specific Monitoring Plans should always consider the minimum amount of data required to inform the success of the associated Objective. A Monitoring Framework has been developed by WSP for the use of guiding future monitoring activities and can be found in the Conceptual Plan for the Small Swale (WSP, 2023b). The Monitoring Framework considers the following:

- Wildlife Behaviour Monitoring
- Invasive Species Monitoring
- Vegetation Composition Monitoring
- Environmental Conditioning Monitoring
- Human-site Interaction Monitoring
- Collectively Powered Monitoring Networks

MONITORING OF OBJECTIVES, GOALS, AND TARGETS

To track the status of the Goals and monitor the effectiveness of the Objectives individual Indicators, monitoring activities, and timelines have been identified. Indicators have been developed for each Goal and Objective, and meet the criteria of being measurable, precise, consistent, and sensitive (CMP, 2020). The monitoring activity, or methods, are the ways in which the indicators will be measured, and aim to be accurate, reliable, cost-effective, feasible, and appropriate (CMP, 2020). To support the monitoring plan, it should be specified who will be responsible for the monitoring activity, and when the monitoring activity should occur. The "responsibility" column should be filled out by the City of Saskatoon when the City is prepared to implement the NAMP.

The indicators for the goals align with the Indicators of the KEAs identified for each Conservation Target in the Viability Assessment (see Section 5.3 – Viability Assessment). The Viability Assessment should be updated yearly (or more frequently) as new information is gained relating to the status of the indicators as measured for the Goal. The status of the Conservation Target should then be updated.

Table 8-1 outlines the monitoring plan for the Goals and Objectives. Refer to Section 5.6.6 – Action Plan Summary for the Goals and Objectives.

Table 8-1: Goals and Objectives Monitoring Plan

GOAL/ OBJECTIVE	INDICATOR(S)	MONITORING ACTIVITY	RESPONSIBILITY	TIMEFRAME
Goal 1	Up to 25% increase in arial extent of native dominant grassland, native dominant tame grassland, and tame grassland from a recorded baseline.	Monitor for change in spatial extent of native dominant grassland, native dominant tame grassland, and tame grassland.		Annually
	25-50% of identified Prairie undergoes regular disturbances to mimic natural regimes at appropriate intervals to re-establish ecosystem functions.	Monitor for change in spatial extent of naturally disturbed prairie (enhancement in nutrient cycling and species composition/health).		Annually
	Average score of permanent sampling plots is Healthy with Problems.	Monitor Rangeland Health Assessment scores.		Annually
	Minimum of 10% increase from baseline of SOMC and Culturally Significant Species.	Monitor for change in spatial extent/population size of SOMC and Culturally Significant Species.		Annually
	Native flora and fauna comprise at least 60% of all flora and fauna on site.	Monitor for change in spatial extent of native flora and change in population size of native fauna.		Annually
Goal 2	No reduction in wetland habitat from the selected pre-development extent	Monitor for change in spatial extent of wetlands.		Annually
	No restrictions on access to catchment areas.	Monitor for number of barriers in catchment areas.		Monthly (March-November)
	Water quality is protected with only a minor degree of threat or impairment; conditions rarely depart from natural or desirable levels.	Monitor water chemistry for changes in water quality.		Annually, or as projects demand
	Increase from baseline in SOMC or Culturally Significant Species.	Monitor for change in spatial extent/population size of SOMC and Culturally Significant Species.		Annually
	Native flora and fauna comprise at least 60% of all flora and fauna on site.	Monitor for change in spatial extent of native flora and change in population size of native fauna.		Annually
Goal 3	Barriers to wildlife movement have been mitigated within the site.	Monitor for movement barriers within the site.		Twice per year, winter survey and summer
	Vegetation communities are connected within the site.	Monitor for uninterrupted spatial extent of identified vegetation communities.		Annually
	No barrier for wildlife movement between the site and other retained natural areas in close proximity.	Monitor for wildlife movement success along established connection/corridors between the site and other retained natural features.		Annually

GOAL/ OBJECTIVE	INDICATOR(S)	MONITORING ACTIVITY	RESPONSIBILITY	TIMEFRAME
Goal 4	Historically and culturally significant features are protected.	Verify historical features identification and monitor protection or enhancement on site.		
	Visitors are engaged and educated.	Monitor for user satisfaction.		
Goal 5	Educational programming is functioning, including signage and outreach programs.	Monitor for number of educational programs yearly. Monitor for usage of signage.		Annually
	Visitors are able to connect to the landscape by means of responsible use supported by low-impact infrastructure.	Monitor for user satisfaction.		Annually
Objective 1.1	Verification of baseline studies identification, and data.	Review of records.		Annually
Objective 1.2	Verification of data management system and operational success.	Review of records.		Annually
Objective 2.1	Verification of a land acquisition plan.	Review of records.		Annually
	Verification of the acquired land.	Review of records.		Annually
Objective 2.2	Verification of land-use zoning designation.	Review of records.		Annually
	Verification that future plans adhere to land-use designation.	Review of records.		Annually
Objective 2.3	Verification of bylaw, policies, and site rules enforcement.	Review of records/interview with local authorities.		Annually
Objective 3.1	Verification that on-site buffing measures are in-place and functioning.	Monitor success of buffer for evidence of human disruption.		Annually
	Verification of adjacent developers are engaged, partnerships established, and NAMP recommendation/frameworks have been integrated into future designs.	Monitor for successful application of applicable NAMP recommendations/frameworks that guide future land use changes in proximity to the site.		Annually
Objective 4.1	Verification that restoration/ rehabilitation/ enhancement areas are identified, and plans are initiated.	Monitor for the creation of site-specific restoration/ rehabilitation/ enhancement plans.		Annually
	Verification that vegetation community health is improved.	Monitor plant vigour in reclamation/restoration sites.		Continuously to meet obligations. Annually once completed.
Objective 4.2	Verification that impacts from the Snow Storage Facility have been identified and an informed reclamation strategy has been developed.	Monitor and inform the development of a Snow Storage Facility reclamation strategy.		Continuously
		Monitor for hydrological changes within the site or the lack thereof.		Monthly

GOAL/ OBJECTIVE	INDICATOR(S)	MONITORING ACTIVITY	RESPONSIBILITY	TIMEFRAME
Objective 5.1	Verification that site-specific IPMs for provincially listed noxious and nuisance have been prepared and executed.	Monitor for abundance and distribution of provincially listed noxious and nuisance species.		Twice per year (early season and fall)
Objective 5.2	Verification that site-specific IPMs for undesirable/invasive (not provincially listed) species have been executed.	Monitor for abundance and distribution of undesirable/ invasive species.		Annually
Objective 6.1	Verification that site-specific disturbance mechanisms are selected, and application plans initiated.	Monitor for enhanced nutrient cycling and species composition/health.		Annually
Objective 7.1	Verification that species-specific enhancement programs for flora and fauna SOMC are implemented.	Monitor for improved abundance, distribution, and diversity of SOMC.		Annually
Objective 8.1	Verification Evidence that Indigenous communities are engaged, and culturally significant species plans are implemented.	Monitor for number of relevant established Indigenous relationships and number of identified culturally significant species.		Monthly
		Monitor for enhancement of abundance, distribution, and diversity of culturally significant species.		Seasonally
Objective 8.2	Verification that historically significant features are protected, and plans are initiated.	Monitor for unchanged condition of historically significant features.		Annually
Objective 9.1	Verification that pre-development hydrological baselines are chosen, and a staged plan is executed.	Monitor for hydrological baseline documents and a management plan.		Annually
Objective 10.1	Verification that intra-connectivity requirements are understood, and (if any) are installed.	Monitor for intra-connectivity conflict.		Annually
Objective 10.2	Verification that inter-connectivity plans in the greater Meewasin Valley are addressed and topic is included in future land use changes to maintain general wildlife movement.	Monitor for creation of green spaces and/or wildlife corridors connecting the site to other retained natural features.		Annually
		Monitor for future land use projects and their approach to connectivity.		Annually
Objective 11.1	Verification that human-use needs are implemented.	Monitor for recreation user satisfaction.		Seasonally

8.2.3 ANALYSIS AND ADAPTATION

For the NAMP to be successful, the Action Plan, Monitoring Plan, and Operational Plan should be analyzed at a regular pre-determined frequency and adapted as required. It is recommended that the results of the Monitoring Plan be:

- Assessed for whether the Actions and Strategies are being achieved, and if they are effective in achieving the Objectives
- Assessed for whether the Goals and Objectives are being met
- Assessed for whether the status of the Targets have changed

It is also recommended that the NAMP be reviewed, and relevant sections updated annually to capture any required changes based on the various initiatives executed, monitoring conducted, and any forthcoming management strategies not previously considered. The NAMP update review should also consider updates forthcoming from, but not limited to the MVRMP (MVA, 2017); municipal, provincial or federal legislation, bylaws, policies, guidelines, or frameworks; and future industry accepted practices for the sustainable management of the site that may apply.

8.3 OPERATIONAL PLAN

The Operational Plan is the final part of the three-part Strategic Plan (Action Plan, Monitoring Plan, Operational Plan). The Operational Plan is intended to synthesize the required funding and human capacity required to implement the Action Plan and Monitoring Plan. The successful implementation of the Action Plan and Monitoring Plan elements will require the proactive acquisition of funding and resources. It is recommended that a detailed work plan be developed based on each Action of the Operational Plan, including the specific individuals, rates, and timeframes per day or month required to be allocated to the execution of the Action. Execution of the Operational Plan is contingent upon city budget, and council review, and budgetary cycling.

To guide the future implementation of the Action Plan and Monitoring Plan, the following Operational Plan template is provided (**Table 8-2**). This template is specific to tracking the progress of the NAMP, however detailed Operational Plans should be developed to track the future assets as well. The template is to be built from the Action Summary (**Appendix C**), and should be used to track, at a minimum, the following:

- Each Action (including the monitoring actions)
- Date of when the Action is to be initiated and completed
- Responsible Department or Partner
- Estimated Capital and Operating Costs
- Progress of the Action (i.e., is the Action ongoing, delayed, or not started)
- Progress Details (i.e., monitoring notes on how the Action is performing)

Table 8-2: Template for Operational Plan

ACTIVITY	ACTIVITY DESCRIPTION	PRIORITY	DATE TO BE INITIATED AND COMPLETED	RESPONSIBLE DEPARTMENT (CITY AND PARTNERS)	ESTIMATED CAPITAL AND OPERATING COSTS	PROGRESS	PROGRESS DETAILS
Ex. Strategy #1, Activity #1	Ex. Data collection	Ex. Short-Term	Ex. Month/Year to Month/Year	Ex. Parks	Ex. $xxxx..xx	Ex. Ongoing	Ex. On track to be completed.

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Images

1 WSP. 2023. Small Swale – Cover Page (Photograph).
2 WSP. 2023. Small Swale – North of McOrmond (Photograph).
3 City of Saskatoon. 2023. Engagement (Photograph).
4 Unsplash. 2023. Birdwatching (Photograph); Calgary Zoo. 2023. Northern Leopard Frog (Photograph). https://www.calgaryzoo.com/blog/how-do-northern-leopard-frogs-spend-the-holidays/; https://unsplash.com/s/photos/bird-watching?license=free; Alberta Wilderness Society. 2023. Rough fescue [Photograph]. https://albertawilderness.ca/issues/wildlands/areas-of-concern/kirkpatrick-prairie/page/10/.
5 WSP. 2023. Small Swale – West Snow Storage Facility (Photograph).
6 WSP.2023. Small Swale – South Snow Storage Facility (Photograph).
7 WSP.2023.Small Swale – South of Forebay 1(Photograph).
8 WSP.2023.Small Swale – Southwest of Forebay 2 (Photograph).
9 WSP.2023.Small Swale – Illegal Dumping (Photograph).
10 WSP.2023.Small Swale – Existing Fence in Very Poor Condition (Photograph).
11 WSP.2023.Small Swale – Chain Link fence at Culvert (Photograph).
12 WSP.2023.Small Swale - Gate Access from South Grid Road (Photograph).
13 WSP.2023.Small Swale – Snow Storage Facility Gate (Photograph).
14 WSP.2023.Small Swale – Quiet Zone Sign (Photograph).
15 WSP.2023.Small Swale – Snow Storage Facility Sign (Photograph).
16 WSP.2023.Small Swale – Culvert 1 (Photograph).
17 WSP.2023.Small Swale – Culvert 3 (Photograph).

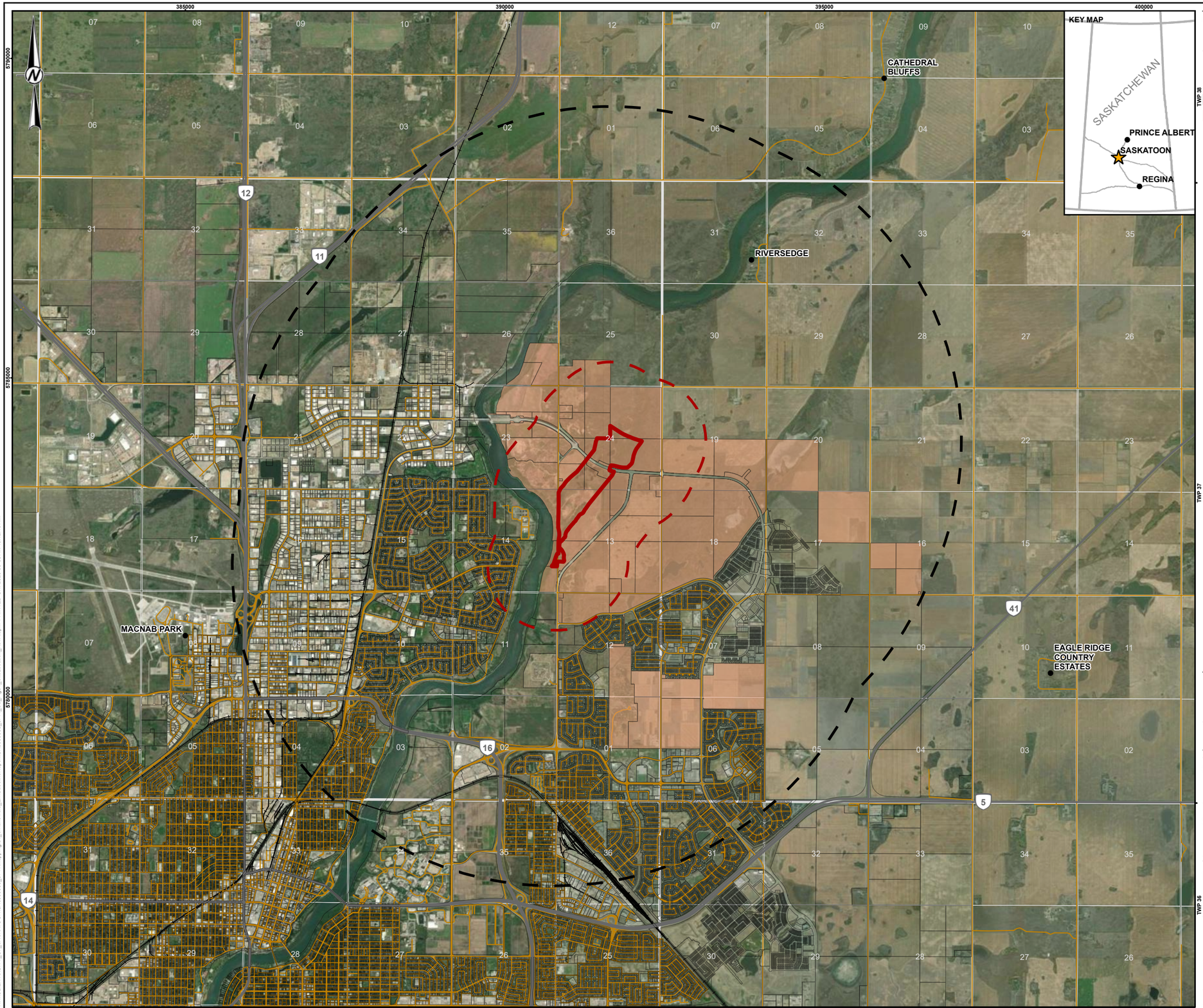
Complete List of City Supplied Documents

- Management plan boundaries for the Small Swale
- Approved land use plans for adjacent areas (e.g., University Heights, Blairmore) found on the City's Sector Plan web page
- Blairmore Natural Area Screening Final Report, 2022
- Bylaw No. 9700 – Official Community Plan, 2020
- City of Saskatoon Climate Adaptation Strategy:
  - Climate Projections and Possible Impacts (Part 1)
  - Corporate Climate Adaptation Strategy (Part 2)
- City of Saskatoon Contractor Environment Guidelines, 2019
- City of Saskatoon Green Infrastructure Strategy, 2020
- City of Saskatoon Pathways for an Integrated Green Network, 2022
- City of Saskatoon Standard Construction Specifications, 2023
- City of Saskatoon Wetland Policy (C09-041)
- Meewasin Northeast Policy, 2015
- Meewasin Valley-wide Resource Management Plan, 2017
- Montgomery Place Local Area Plan Final Report, 2018
- Natural Areas Inventory for the City of Saskatoon, 2019
- Natural Asset Inventory Dashboard, 2021
- Natural Capital Asset Valuation Pilot Project, 2020
- Northeast Swale Development Guidelines, 2012
- Northeast Swale Resource Management Plan, 2013
- Native Plant Solutions – Small Swale Study (draft report)
- UH3 Neighbourhood Natural Area Screening Report, 2021
- UH3 Neighbourhood Natural Area Screening What We Heart Report, 2022

APPENDIX

A FIGURES

FIGURES



LEGEND

- POPULATED PLACE
- PRIMARY HIGHWAY
- LOCAL ROAD
- RAILWAY
- PARCEL BOUNDARY
- UNIVERSITY HEIGHTS DEVELOPMENT AREA
- PROJECT STUDY AREA
- LOCAL STUDY AREA
- REGIONAL STUDY AREA

DRAFT

0 1,200 2,400

1:60,000 METRES

REFERENCE(S)

PARCEL BOUNDARIES PROVIDED BY THE CLIENT, MAY 2023. IMAGERY COPYRIGHT © 20220626 ESRI AND ITS LICENSORS. SOURCE: VIVID-MAXAR. USED UNDER LICENSE, ALL RIGHTS RESERVED. BASE DATA MAY BE OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED OR IHS MARKIT CANADA LIMITED.PROJECTED COORDINATE SYSTEM: NAD 1983 UTM ZONE 13N

CLIENT
CITY OF SASKATOON

PROJECT
SMALL SWALE NATURAL AREA MANAGEMENT PLAN

TITLE
SITE LOCATION

CONSULTANT

YYYY-MM-DD	2023-08-03
DESIGNED	BN
PREPARED	LMS
REVIEWED	
APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
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TWP 37
RGE 05 W3M
RGE 04 W3M
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07
South Saskatchewan River
SASKATOON

LEGEND

- PROJECT STUDY AREA
- VEGETATION LOCAL STUDY AREA
- LOCAL ROAD
- CLOSED CANOPY DECIDUOUS WOODLAND
- CROP LAND (CULTIVATED)
- DISTURBED/GRAVEL PIT
- DISTURBED/DEVELOPED
- HAY LAND (FORAGE)
- NATIVE DOMINANT GRASSLAND
- NATIVE DOMINANT/TAME GRASSLAND
- OPEN CANOPY DECIDUOUS WOODLAND
- SOUTH SASKATCHEWAN RIVER
- ROAD
- TALL SHRUB GRASSLAND
- TAME GRASSLAND
- WETLAND
- YARD SITE ABANDONED/TAME GRASSLAND
- YARD SITE ACTIVE
- <ALL OTHER VALUES>

DRAFT

0 400 800

1:20,000 METRES

REFERENCE(S)

CLIENT
CITY OF SASKATOON

PROJECT
SMALL SWALE NATURAL AREA MANAGEMENT PLAN

TITLE
LAND COVER CLASSIFICATION

CONSULTANT

YYYY-MM-DD	2023-08-03
DESIGNED	BN
PREPARED	LMS
REVIEWED	
APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
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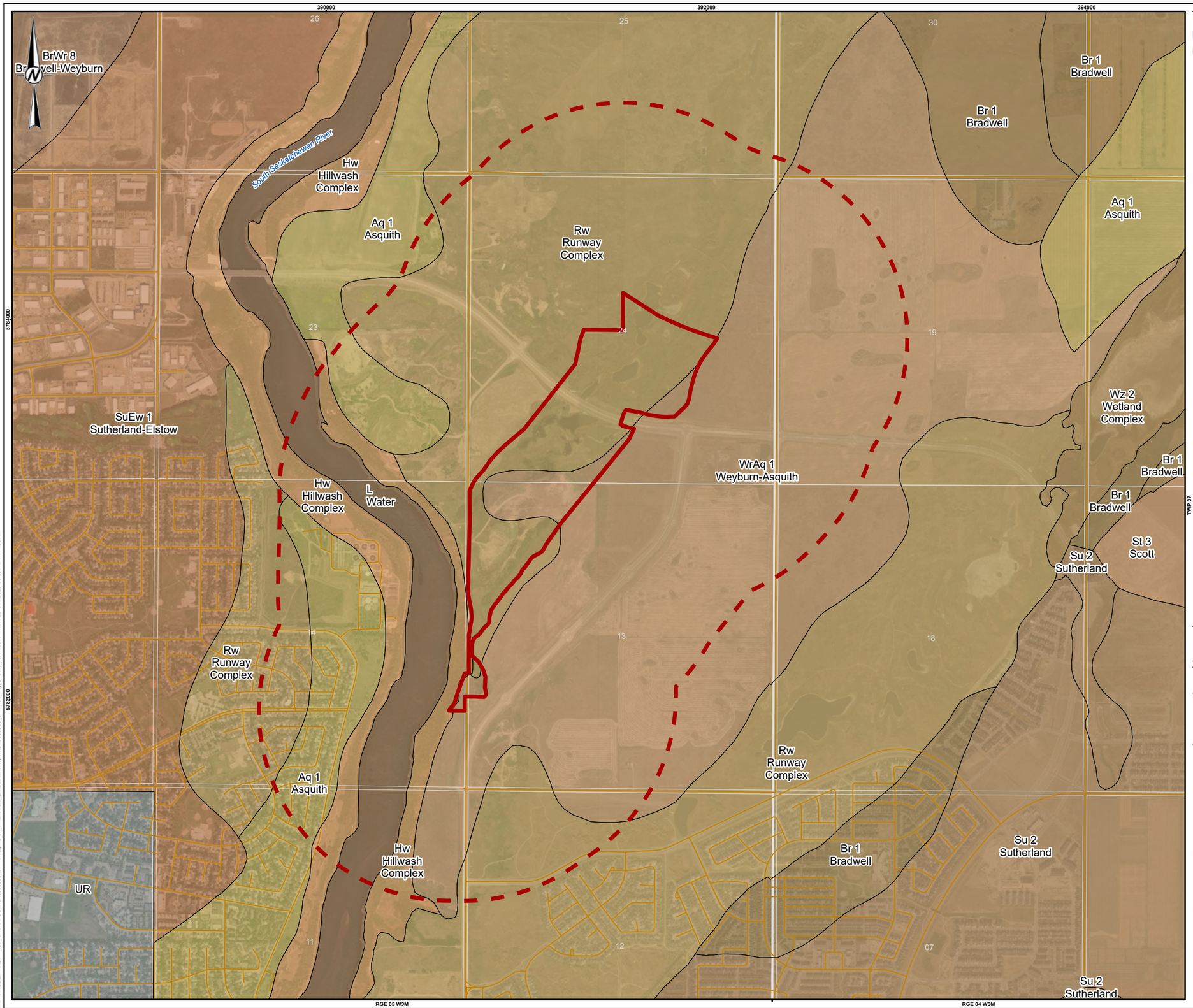

LEGEND

- PROJECT STUDY AREA
- SOILS LOCAL STUDY AREA
- LOCAL ROAD

SOIL ASSOCIATIONS

- ASQUITH
- BRADWELL
- BRADWELL-WEYBURN
- HILLWASH COMPLEX
- NONE - URBAN
- RUNWAY COMPLEX
- SCOTT
- SUTHERLAND
- SUTHERLAND-ELSTOW
- WATER
- WETLAND COMPLEX
- WEYBURN-ASQUITH

SYMBOL SEQUENCE

ASSOCIATION SYMBOL ← An 2 Allan → MAP UNIT

ASSOCIATION NAME

DRAFT

0 400 800

1:20,000 METRES

NOTE(S)

1. THE NUMBERS SHOWN WITH ASSOCIATION LABELS ARE TERMED MAP UNITS AND INDICATE DIFFERENT AND SPECIFIED COMBINATIONS OF SOIL SUBGROUP PROFILES WITHIN AN ASSOCIATION THAT ARE THE RESULT OF VARIATIONS IN TOPOGRAPHY, DRAINAGE OR ASPECT.

REFERENCE(S)

SOILS DATA OBTAINED FROM SASKATCHEWAN LAND RESOURCE UNIT - AGRICULTURE AND AGRI-FOOD CANADA, 2004. DIGITAL SOIL RESOURCE INFORMATION FOR AGRICULTURAL SASKATCHEWAN SKSISV2, 1:100,000 SCALE. IMAGERY COPYRIGHT © 20220626 ESRI AND ITS LICENSORS. SOURCE: VIVID-MAXAR. USED UNDER LICENSE, ALL RIGHTS RESERVED. BASE DATA MAY BE OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED OR IHS MARKIT CANADA LIMITED.PROJECTED COORDINATE SYSTEM: NAD 1983 UTM ZONE 13N

CLIENT
CITY OF SASKATOON

PROJECT
SMALL SWALE NATURAL AREA MANAGEMENT PLAN

TITLE
SOILS

CONSULTANT

wsp

YYYY-MM-DD	2023-08-03
DESIGNED	BN
PREPARED	LMS
REVIEWED	
APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
CA0003383.0741	200	A	3

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392000
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TWP 37
RGE 05 W3M
RGE 04 W3M

LEGEND

- PROJECT STUDY AREA
- VEGETATION LOCAL STUDY AREA
- LOCAL ROAD
- RAILWAY
- CLASS I WETLAND
- CLASS II WETLAND
- CLASS III WETLAND
- CLASS IV WETLAND
- CLASS V WETLAND
- ANTHROPOGENIC WETLAND

DRAFT

0 400 800

1:20,000 METRES

REFERENCE(S)

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CLIENT
CITY OF SASKATOON

PROJECT
SMALL SWALE NATURAL AREA MANAGEMENT PLAN

TITLE
WETLANDS CLASSIFICATION

CONSULTANT

YYYY-MM-DD	2023-08-03
DESIGNED	BN
PREPARED	LMS
REVIEWED	
APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
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TWP 37
RGE 05 W3M
RGE 04 W3M
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LEGEND

- PROJECT STUDY AREA
- WILDLIFE LOCAL STUDY AREA
- LOCAL ROAD
- RAILWAY

- AMERICAN BADGER
- BANK SWALLOW
- BARN SWALLOW
- BLACK-NECKED STILT
- BOBOLINK
- BROAD-WINGED HAWK
- COMMON NIGHTHAWK
- COOPER'S HAWK
- GLAUCOUS GULL
- GOLDENROD GALL FLY
- HARRIS'S SPARROW
- HORNED GREBE
- LAKE STURGEON
- LESSER YELLOWLEGS
- LITTLE BROWN MYOTIS
- LOGGERHEAD SHRIKE
- MIGRATORY BIRD CONCENTRATION SITE
- MONARCH
- NORTHERN LEOPARD FROG
- NORTHERN SHRIKE
- OLIVE-SIDED FLYCATCHER
- OSPREY
- PEREGRINE FALCON
- PINE GROSBEAK
- PRAIRIE FALCON
- RED-HEADED WOODPECKER
- RUSTY BLACKBIRD
- SHARP-TAILED GROUSE
- SHORT-EARED OWL
- TOWNSEND'S SOLITAIRE
- TURKEY VULTURE
- WESTERN RED DAMSEL
- WHOOPING CRANE
- YELLOW RAIL
- YELLOW-BANDED BUMBLE BEE

DRAFT

0 400 800

1:20,000 METRES

NOTE(S)

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REFERENCE(S)

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CLIENT
CITY OF SASKATOON

PROJECT
SMALL SWALE NATURAL AREA MANAGEMENT PLAN

TITLE
SPECIES OF MANAGEMENT CONCERN (WILDLIFE)

CONSULTANT

wsp

YYYY-MM-DD	2023-08-03
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PREPARED	LMS
REVIEWED	
APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
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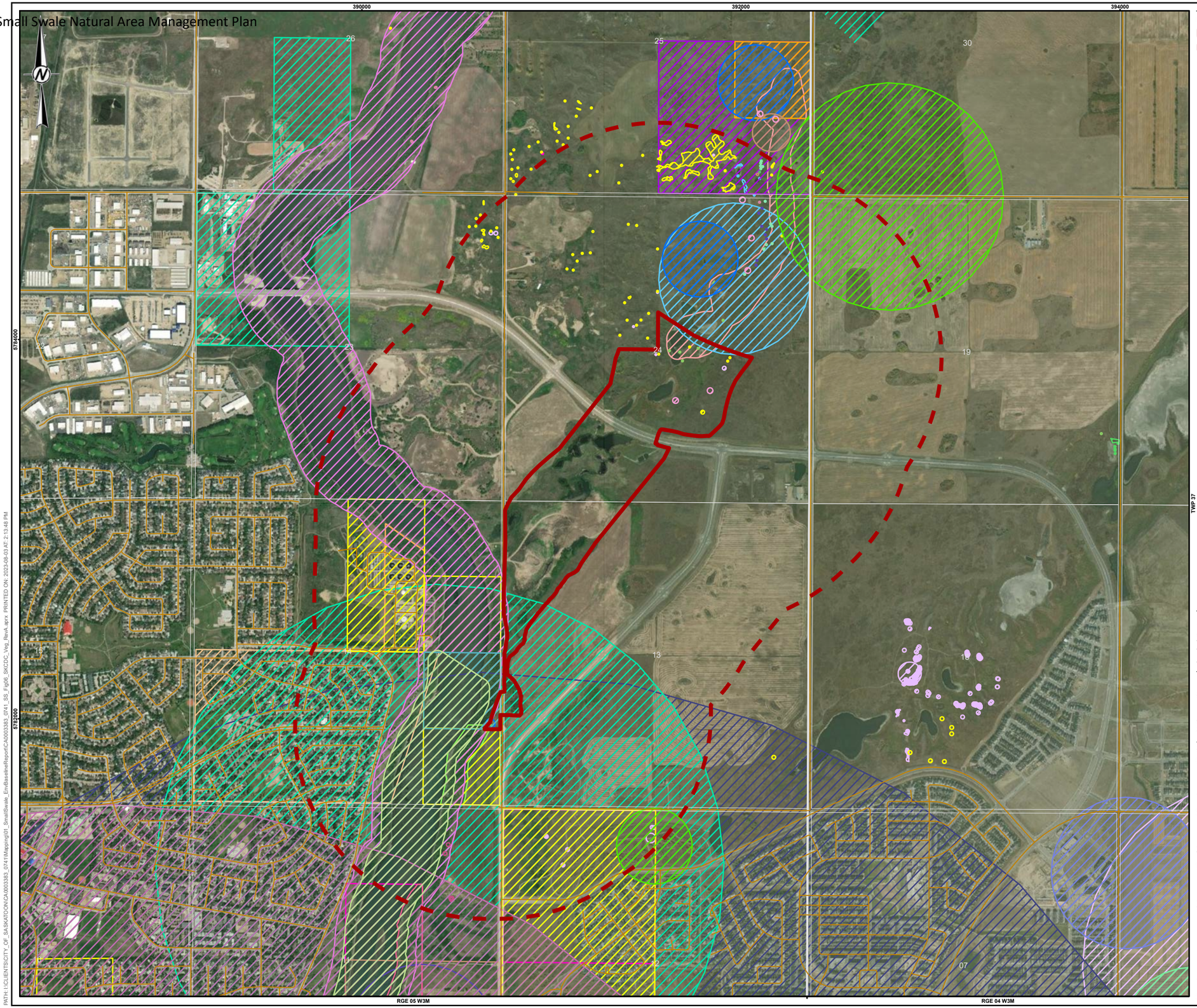
Small Swale Natural Area Management Plan



LEGEND

- PROJECT STUDY AREA
- VEGETATION LOCAL STUDY AREA
- LOCAL ROAD

- BLUEFLAG
- BRISTLE-LEAVED SEDGE
- CRAWE'S SEDGE
- CROWFOOT VIOLET
- CURVED YELLOW-CRESS
- DWARF CLUBRUSH
- EARLY CINQUEFOIL
- FEW-FLOWERED ASTER
- HAIRY GERMANDER
- HOOKER'S BUGSEED
- HUDSON'S CINQUEFOIL
- LESSER FRINGED GENTIAN
- LITTLE YELLOW-RATTLE
- LOW WHITLOWWORT
- MACOUN'S GENTIAN
- MARSH FELWORT
- MENZIES' CATCHFLY
- MUCRONATE BLUE-EYED-GRASS
- NARROW-LEAVED WATER PLANTAIN
- PALE MOONWORT
- PLAINS ROUGH FESCUE
- PRAIRIE DUNEWORT
- RED BULRUSH
- ROCKY MOUNTAIN SEDGE
- SANDHILLS CINQUEFOIL
- SMALL YELLOW LADY'S SLIPPER
- SMOOTH WILD ROSE
- STRIPED CORAL-ROOT
- TALL BLUE LETTUCE
- UPLAND WHITE GOLDENROD
- WATER PIMPERNEL
- WOOD LILY

DRAFT

0 400 800

1:20,000 METRES

NOTE(S)

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REFERENCE(S)

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CLIENT
CITY OF SASKATOON

PROJECT
SMALL SWALE NATURAL AREA MANAGEMENT PLAN

TITLE
SPECIES OF MANAGEMENT CONCERN (VEGETATION)

CONSULTANT

wsp

YYYY-MM-DD	2023-08-03
DESIGNED	BN
PREPARED	LMS
REVIEWED	
APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
CA0003383.0741	200	A	6

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 25mm

PATH: I:\CLIENTS\CITY_OF_SASKATOON\CA0003383_0741\Mapping\01_SmallSwale_Env\BaselineReport\CA0003383_0741_SS_Fig06_SKCDC_Veg_RevA.aprx PRINTED ON: 2023-08-03 AT: 2:13:48 PM

390000

South Saskatchewan River

TWP 37

5792000

RGE 05 W3M

LEGEND

- PROJECT STUDY AREA
- VEGETATION LOCAL STUDY AREA
- LOCAL ROAD

WEED TYPE

- ABSINTHE
- EUROPEAN BUCKTHORN
- NODDING THISTLE; MUSK THISTLE
- OXEYE DAISY

- CLOSED CANOPY DECIDUOUS WOODLAND
- CROP LAND (CULTIVATED)
- DISTURBED/GRAVEL PIT
- DISTURBED/DEVELOPED
- HAY LAND (FORAGE)
- NATIVE DOMINANT/TAME GRASSLAND
- OPEN CANOPY DECIDUOUS WOODLAND
- SOUTH SASKATCHEWAN RIVER
- ROAD
- TALL SHRUB GRASSLAND
- TAME GRASSLAND
- WETLAND
- YARD SITE ABANDONED/TAME GRASSLAND

DRAFT

0 100 200

1:5,000 METRES

REFERENCE(S)

CLIENT
CITY OF SASKATOON

PROJECT
SMALL SWALE NATURAL AREA MANAGEMENT PLAN

TITLE
. NOXIOUS AND NUISANCE WEEDS

CONSULTANT

wsp

YYYY-MM-DD	2023-08-03
DESIGNED	BN
PREPARED	LMS
REVIEWED	
APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
CA0003383.0741	200	A	8


NORTH
FUTURE SASKATOON FREEWAY
EXISTING GRAVEL OPERATIONS
EXISTING FENCE
FORMER GRAVEL OPERATIONS
McORMOND DRIVE
EXISTING AGRICULTURAL LAND USE/ FUTURE UNIVERSITY HEIGHTS SECTOR PLAN EMPLOYMENT AREA
EXISTING CULVERT WITH CHAIN LINK FENCE
EXISTING AGRICULTURAL LAND USE
PRIVATE PROPERTY
PRIVATE PROPERTY
SOUTH GRID ROAD (OLD CENTRAL AVE)
EXISTING POWER FACILITY
EXISTING FOREBAY
CENTRAL AVENUE
SASKATOON WILDLIFE FEDERATION
EXISTING SNOW STORAGE FACILITY
EXISTING TRAIL
PEGGY McKERCHER CONSERVATION AREA
EXISTING ROAD
RANGE RD 3050
EXISTING GATE WITH CONCRETE BARRIERS AND SIGNAGE
EXISTING MATERIALS STORAGE AREA
EXISTING AGRICULTURAL LAND USE/ FUTURE UH3 RESIDENTIAL AREA
WASTEWATER TREATMENT PLANT
SOUTH SASKATCHEWAN RIVER
EXISTING POST & RAIL FENCE
EXISTING METAL SWING GATE
EXISTING POST & WIRE FENCE
MOOSE WOODS TRAIL
EXISTING NATURAL SURFACE TRAILS
RIDDELL PALEONTOLOGICAL SITE

LEGEND:

- SITE BOUNDARY
- EXISTING CONTOUR (0.5M INTERVAL)
- EXISTING EASEMENT/ROW
- PROPOSED ROAD (BY OTHERS)
- EXISTING EXTERNAL TRAIL
- PROPOSED EXTERNAL TRAIL (BY OTHERS)
- EXISTING FENCE
- EXISTING CULVERT
- EXISTING SIGN
- EXISTING GATE
- EXISTING SITE ACCESS

0 30 60 90 120 150 180 210m

SCALE 1:4500

CONSULTANT:

WSP

CLIENT:

City of Saskatoon

PROJECT TITLE:

NATURAL AREA MANAGEMENT PLAN FOR THE

SMALL SWALE

SASKATOON, SASKATCHEWAN

DRAWING TITLE:

HUMAN USE & CONTEXT PLAN


NORTH
FUTURE SASKATOON FREEWAY
McORMOND DRIVE
SOUTH GRID ROAD (OLD CENTRAL AVE)
UNIVERSITY HEIGHTS SECTOR PLAN EMPLOYMENT AREA
SASKATOON WILDLIFE FEDERATION
CENTRAL AVENUE
RANGE RD 3050
PEGGY McKERCHER CONSERVATION AREA
FUTURE UH3 RESIDENTIAL AREA
WASTEWATER TREATMENT PLANT
SOUTH SASKATCHEWAN RIVER
RIDDELL PALEONTOLOGICAL SITE
LEGEND:
SITE BOUNDARY
EXISTING CONTOUR (0.5M INTERVAL)
EXISTING EASEMENT/ROW
MANAGEMENT ZONE 1: ECOLOGICAL CORE ZONE
MANAGEMENT ZONE 2: PASSIVE PROGRAMMABLE ZONE
MANAGEMENT ZONE 3: STORMWATER MANAGEMENT ZONE
0 30 60 90 120 150 180 210m
SCALE 1:4500

CONSULTANT:

wsp

CLIENT:

City of Saskatoon

PROJECT TITLE:

NATURAL AREA MANAGEMENT PLAN FOR THE

SMALL SWALE

SASKATOON, SASKATCHEWAN

DRAWING TITLE:

PROPOSED MANAGEMENT ZONES

APPENDIX

B BIOPHYSICAL BASELINE ENVIRONMENTAL SUMMARY

CITY OF SASKATOON
23-0124

SMALL SWALE SASKATOON

BIOPHYSICAL BASELINE ENVIRONMENTAL SUMMARY

DECEMBER 22, 2023

PUBLIC

SMALL SWALE SASKATOON

BIOPHYSICAL BASELINE ENVIRONMENTAL SUMMARY

CITY OF SASKATOON

PUBLIC

PROJECT NO.: CA0003383.0741
CLIENT REF:23-0124
DATE: AUGUST 18, 2023

WSP CANADA
UNIT 175
1810 8 STREET EAST
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WSP.COM

August 18, 2023

Public

CITY OF SASKATOON
City of Saskatoon
222 3rd Avenue North
Saskatoon, SK S7K 0J5

Attention: Jessie Best, Project Manager

Dear Madam/Sir:

Subject: Biophysical Baseline Summaries for the Small Swale NAMP
Client ref.: 23-0124

WSP Canada Inc. (WSP) has prepared this biophysical baseline environmental summary (BBES) report to support our strategy for the future management of the Small Swale (the Project).

This BBES report will provide a foundational understanding of the biophysical baseline when outlining the steps required to protect, restore, and manage the Project. This work is part of the implementation of "Pathways for an Integrated Green Network: An Implementation Plan for Saskatoon's Green Infrastructure Strategy." The BBES report presents the findings of a thorough literature review, environmental and heritage desktop screening, and site visit to confirm review findings for the proposed Project.

Yours sincerely,

Marc Obert, B.Sc., PBiol.
Senior Environmental Planner

MO/jr/pr

WSP ref.: CA0003383.0741

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APPROVED BY

Marc Obert, B.Sc., PBiol.
Senior, Environmental Planner, Ecology & Environmental Impact Assessment

December 22, 2023
Date

WSP Canada prepared this report solely for the use of the intended recipient, CITY OF SASKATOON, in accordance with the professional services agreement. The intended recipient is solely responsible for the disclosure of any information contained in this report. The content and opinions contained in the present report are based on the observations and/or information available to WSP Canada at the time of preparation. If a third party makes use of, relies on, or makes decisions in accordance with this report, said third party is solely responsible for such use, reliance or decisions. WSP Canada does not accept responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken by said third party based on this report. This limitations statement is considered an integral part of this report.

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APPENDICES

1 INTRODUCTION

WSP Canada Inc. (WSP) has been retained by the City of Saskatoon (the City) to develop a future Natural Area Management Plan (NAMP) for a portion of the Small Swale that resides within the City limits (the Project). This baseline summary will be used to support the future NAMP that will outline the steps required to protect, restore, and manage the Project. This work is part of the implementation of "Pathways for an Integrated Green Network: An Implementation Plan for Saskatoon's Green Infrastructure Strategy." This report presents the findings of a thorough literature and desktop review, environmental and heritage desktop screening, and a general site visit to initially confirm review findings for the proposed Project.

1.1 PROJECT LOCATION AND LOCAL CONTEXT

The Project is bound by the South Saskatchewan River to the south and active agricultural lands to the east, west, and north. The upper third of the Project area is intersected by McOrmond Road, which is oriented east to west (Appendix A; Figure 1).

The Project resides within the University Heights Development Area, designated as Urban Holding land. Within NE 25-37-05, two parcels are delineated (City of Saskatoon, 2023a):

- Parcel A, Plan 101466094
- Parcel B, Plan 102360136

According to the Meewasin Valley Authority (2019), University Heights Neighbourhood No. 3 has been identified as containing some of the City's largest Natural Asset Patches. The Project and the greater extent of the Small Swale is included in the Post-Glacial Channel Scar Conservation Target detailed in the Meewasin Valley-wide Resource Management Plan (Meewasin Valley Authority, 2017).

1.1.1 STUDY AREAS

Three spatial boundaries for the Project have been defined: the Project Study Area (PSA), the Local Study Area (LSA), and the Regional Study Area (RSA) (Figure 1, Appendix A). These areas were used to assess the Project boundaries and potential interactions with the surrounding environment. Each area is defined as follows:

Project Study Area: Area of future management provided by the City. The PSA covers approximately 85 ha.

Local Study Area: The LSA includes the PSA and a 1 km buffer. The 1 km buffer is defined to encompass the minimum setback distances for Sensitive Species (Ministry of Environment, 2017) and Species of Management Concern (SOMC). The LSA encompasses a portion of the South Saskatchewan River, as it is an important area that provides ecological services such as wildlife movement corridors and habitat.

Regional Study Area: The RSA includes the PSA plus a 5 km buffer. The 5 km buffer is defined to encompass potential environmental constraints (SOMC).

2 METHODS

2.1 LITERATURE AND DESKTOP REVIEW

A detailed review of studies, literature, and previously done assessments relevant to the Project, was completed in June 2023. Key reports included:

- University Heights Neighbourhood No. 3 Natural Area Screening Report (EDI Environmental Dynamics Inc., 2021).
- Natural Capital Asset Valuation; Pilot Project (City of Saskatoon, 2020).
- Northeast Swale Resource Management Plan (Meewasin, 2013).
- Valley-wide Resource Management Plan (Meewasin, 2017).
- Natural Areas Inventory for the City of Saskatoon (Meewasin, 2019).
- Natural Asset Inventory Dashboard, 2021 (Green Analytics, 2021).
- A complete list of literature supplied by the City and reviewed for the Project is included in Section 5 (Bibliography).

The desktop review also included targeted databases and general information to verify and update any existing information found through the literature review. The following reports and databases were considered:

- The Ecoregions of Saskatchewan (Acton, et al., 1998).
- Saskatchewan Soil Information System (SKSIS) (SKSIS Working Group, 2018).
- Saskatchewan Land Resource Units (SLRU) (Agriculture and Agri-Food Canada 2004; 2009).
- Classification of Natural Ponds and Lakes in the Glaciated Prairie Region (Stewart and Kantrud, 1971).

  A screening of previously documented plant and wildlife SOMC that have the potential to occur within the PSA and RSA using the Hunting, Angling, and Biodiversity Information of Saskatchewan (HABISask) online mapping application (SKCDC, 2023a).
- Saskatchewan Conservation Data Centre (SKCDC) tracked species lists that include information from federal and provincial status documents, provincial tracking lists, literature, modelling, and recorded distributions (SKCDC, 2023b, c). All species occurrences were cross-referenced with provincial (SKCDC, 2023b, c) and federal (Government of Canada, 2022) status lists to determine if listed species have been observed or recorded within the LSA.
- A review of reported occurrences of weed species identified under Saskatchewan's *Weed Control Act* (2010) using the iMapInvasives (NatureServe, 2022) database for the LSA.
- Publicly available imagery.

2.2 HABITAT MAPPING

Available world imagery from ESRI™ Basemap Service Layer was used to map the land cover types within the LSA. GoogleEarth™ imagery from various months in the years 2012, 2015, 2017, 2020, 2021, and 2022 was used at various scales to review historical conditions in the LSA to supplement available data (primarily for wetland mapping).

Habitat polygons were manually delineated in the LSA using the ArcGIS mapping platform. Habitat types selected for the Project were those identified in the Blairmore Natural Areas Screening Report (EDI Environmental Dynamics, 2022). Habitat classes defined in the Meewasin Natural Areas Inventory for the City of Saskatoon (2019) were used to further refine or classify the LSA.

Vegetation information collected from the 2023 site visit was used to refine vegetation mapping as necessary.

For ease of review, the various habitat types were grouped by the categories as listed in the University Heights Natural Areas Screening Report (2021) and the Meewasin Natural Areas Inventory for the City of Saskatoon (2019).

2.3 SITE VISIT

WSP ecologists conducted one general site reconnaissance on June 14, 2023, to bridge any knowledge gaps that arose and confirm results of the desktop review, as well, to record incidental species observations that may have previously gone unrecorded. Data collected included, but was not limited to, landcover and wetland mapping refinement; and site-specific descriptive information on habitats present in the PSA.

During the site reconnaissance, incidental wildlife and vegetation species observations of mammals, waterfowl, and noxious or nuisance weeds were recorded. The observations made are incorporated into the summaries provided in Appendix D and F).

2.4 SPECIES OF MANAGEMENT CONCERN

For the purposes of this report, SOMC are defined as flora or fauna species that meet any of the following criteria: tracked provincially by the Saskatchewan Conservation Data Centre (SKCDC); species protected by the Saskatchewan *Wildlife Act* and *Regulations*; designated by Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as Endangered, Threatened, or Special Concern; federally protected under Schedule 1 of the *Species at Risk Act* (SARA) and/or all other sensitive species and guilds included in the Saskatchewan Activity Restriction Guidelines (ARG) for Sensitive Species (MEnv, 2017). SOMC may require specific mitigation measures studies, or conservation to enable the Project to proceed.

Once all available data has been synthesized, important flora and fauna will be identified, and a probability of being present within the PSA will be assigned based on the following:

- Low: Habitat requirements not met, low population and isolated populations exist, not previously documented in PSA, and/or species is highly selective
- Medium: Species detection difficult, habitat requirements may be met, or species is a habitat generalist
- High: Habitat requirements met, habitat generalists, and/or indicator species present.

3 RESULTS

Results from the environmental review are a combination of literature and desktop reviews, supplemented with data collected during the site visit. Information collected during the site visit intended to bridge any knowledge gaps that arose during the reviews, as well, to confirm findings and record incidental species observations that may have previously gone unrecorded. Photo documentation taken during the field assessment of habitat types and other biophysical features are included in Appendix B.

3.1 ECOLOGICAL CONTEXT

The following Sections outline key biophysical criteria critical for inclusion into the NAMP.

3.1.1 BASELINE INFORMATION SUMMARY

The overall Swale network resides in the Prairie Ecozone within two Ecoregions, the Moist Mixed Grassland and Aspen Parkland (Meewasin, 2013). The Aspen Parkland Ecoregion is predominately composed of aspen groves and fescue grassland (Acton et al., 1998). Whereas the Moist Mixed Grassland is identified by short to mid-grasses in mixed stands (Acton, et al., 1998; Meewasin, 2017). The overall Swale network also includes areas of fescue prairie, which is one of the most threatened ecosystems in the Prairies (Grilz and Romo, 1995). The Small Swale is located within the Prairie Pothole Region of North America (DUC, 2023a). This region of North America was formed through the creation of countless shallow pools left behind during the last ice age. This is a region of importance not only for ecological function such as water regulation and filtration, but is among the best breeding grounds for waterfowl, supporting 12 of the most common duck species, found in North America (DUC, 2023a).

The Moist Mixed Grassland is considered a subhumid climate, less arid than its neighbouring Mixed Grassland Ecoregion to the south, but warmer and drier than the Aspen Parkland Ecoregion to the north. On average, this ecoregion receives approximately 383 mm of precipitation annually, with 240 mm of that precipitation occurring during the growing season (May through September). The annual average temperature is 2.4°C (Acton et al., 1998). The Moist Mixed Grassland Ecoregion is a vast plain landscape which is intermittently interrupted by scenic valleys and hilly uplands (Meewasin, 2013).

The spatial extent of the Project occurs entirely within the Saskatoon Plain (K08) Ecodistrict of the Moist Mixed Grassland Ecoregion (Acton et al., 1998). The environment within the Project is dominated by pockets of native treed areas, wetlands surrounded by a native prairie/agronomic graminoid matrix (Meewasin, 2013).

3.1.2 ECOLOGICAL PROCESSES, NATURAL DISTURBANCES AND HAZARDS

The Small Swale is glacial channel scar connected to the South Saskatchewan River and includes native grassland and wetland complexes (City of Saskatoon, 2020). Glacial scars are erosional landforms that remain when glaciers push aside rocks and debris, which are left behind when the glacier recedes (Klaus et al., 2005). These scars are rare in their occurrence, and tend to be ecologically significant (Meewasin, 2017).

With extreme weather events on the rise (including floods and storms), wetlands like those found in the Small Swale can act as a natural sponge, attenuating surface water run off generated from rainfall and snowmelt (City of Saskatoon, 2020). Additionally, wetlands as well as grasslands are huge carbon sinks. These ecosystems are able to lock a vast amount of carbon, supporting global climate control (City of Saskatoon, 2020).

Overall, these naturally occurring features present in the Small Swale (i.e., wetlands and native grasslands) are declining rapidly in Saskatchewan and globally (Meewasin, 2017). Kraus (2016) describes native grasslands as "the world's most endangered ecosystem"; and Ducks Unlimited Canada – Saskatchewan (2016) states that "in some areas of the province 90 per cent of wetland habitat is gone". The greatest threats to these vegetative community types are the conversion to agriculture or urban development land uses (City of Saskatoon, 2020; Meewasin, 2017).

In areas of concentrated human use, the loss of large wetlands and grasslands can have additional regional impacts. For example, the Small Swale is now an integral part of the green network of the City of Saskatoon (City of Saskatoon, 2022). It also acts as a corridor for a wide assortment of wildlife to move through the landscape (Meewasin, 2017). This feature will soon become even more important in the future sustainability of local wildlife use and movement as the City expands, and land uses change (i.e., urban development) to meet the growing demand for housing.

The Small Swale has been and continues to be subjected to a multitude of human-derived hazards, ranging from grazing, gravel operations, the presence of the Snow Storage facility and current and ongoing urban development.

Stored snow may contain contaminants, including organic chemicals, dissolved salts, or heavy metals (Transportation Association of Canada, 2013). The collected snow, if contained and subsequently disposed of incorrectly, may pose risks to the release environment (Alberta Environment, 1994). Additionally, large amounts of snow can cause soil compaction. Compacted soil impedes vegetation growth in the spring as shoots are unable to penetrate the compacted soil layer (Yukiyoshi et al., 2018).

Uninformed urban development within a known wetland catchment usually results in a loss or increase to the receiving waters, which can significantly change their natural hydroperiod leading to the drying out or constant flooding of a wetland. The Small Swale is maintained by three distinct watersheds, uncontrolled urban development in any of these areas could lead to an introduction of untreated and uncontrolled stormwater into wetlands which reside in the PSA. This intern would impact wetland health and erode wetland function, and could lead to a change in overall wetland classification if the hydrological inputs are not carefully managed (Native Plant Solutions, 2023).

3.1.3 ASSET INVENTORY AND ECOLOGICAL SERVICES

The habitat types mapped for the LSA are presented on Figure 2 (Appendix A). Habitat type definitions are provided in Appendix C. Based on the information reviewed, the PSA consists of 6.6 ha (7.7%) Native Dominated Grassland, 21.8 ha (25.6%) Native Dominated Tame Grassland, 6.4 ha (7.5%) Tame Grassland, and 23.4 ha (27.5%) Wetlands (Table 3-1).

Categories, Subcategories and Secondary Subcategories were classified using the Natural Areas Inventory (NAI) for the City of Saskatoon prepared by the Meewasin Valley Authority (2019).

Table 3-1 Land Cover in the Project and Local Study Areas

CATEGORY[1]	HABITAT TYPE	SUBCATEGORY	SECONDARY SUBCATEGORY	PSA AREA (ha)	PERCENTAGE	LSA AREA (ha)	PERCENTAGE
Agricultural Lands	Crop Land	Crop Land	n/a	0.3	0.4	205.3	21.2
	Hay Land (Forage)	Tame Forage	n/a	10.5	12.3	27.7	2.9
	Tame Grassland	Tame Forage	n/a	6.4	7.5	86.1	8.9
Natural Assets	Closed Canopy Deciduous Woodland	Forested and Shrubland	Native and Naturalized	2.4	2.8	60.6	6.3
	Native Dominated Grassland	Grassland Systems	Known Prairie	6.6	7.7	28.7	3.0
	Native Dominated Tame Grassland	Grassland Systems	Known Prairie	21.8	25.6	159.3	16.5
	Open Canopy Deciduous Woodland	Forested and Shrubland Systems	Native and Naturalized	0.8	0.9	6.5	0.7
	River	Aquatic Systems	River	0.0	0.0	65.7	6.8

CATEGORY[1]	HABITAT TYPE	SUBCATEGORY	SECONDARY SUBCATEGORY	PSA AREA (ha)	PERCENTAGE	LSA AREA (ha)	PERCENTAGE
	Tall Shrub Grassland	Forested and Shrubland Systems	Native and Naturalized	0.0	0.0	0.7	0.1
	Wetland	Aquatic Systems	Wetland	25.1	29.5	51.1	5.3
n/a	Disturbed/Developed	n/a	n/a	9.9	11.6	207.8	21.5
	Disturbed/Gravel Pit	n/a	n/a	0.0	0.0	20.3	2.1
	Road	n/a	n/a	1.4	1.7	30.8	3.2
	Yard Site Abandoned/Tame Grassland	n/a	n/a	0.0	0.0	3.4	0.3
	Yard Site Active	n/a	n/a	0.0	0.0	14.1	1.5
Totals				**85.2**	**100**	**968.1**	**100**

Note: [1] N/A denotes habitat types not categorized in the Meewasin 2019 Natural Areas Inventory for the City of Saskatoon.

EDI (2021) noted that depending on location in the PSA, the Native Dominant Grassland landcover hosts a relatively diverse number of native species in an area generally dominated by Kentucky bluegrass (*Poa pratensis*) and smooth brome (*Bromus inermis*).

3.1.4 TOPOGRAPHY AND SOILS

The Moist Mixed Grassland Ecoregion is dominated by Dark Brown Chernozemic soils (Acton, et al., 1998). The terrain in this ecoregion is characterized by gently undulating till plains. EDI (2021) described the soils in the PSA as being dominated by lacustrine clays and silts. The review of SKSIS (2018) and the Saskatchewan Land Resource Unit (SLRU) (Agriculture and Agri-food Canada 2004; 2009) provided digital soil resource information and was used to identify dominant soil types, texture, salinity, erosion potentials, landform/surface expression, and slope classes (Table 3-2).

To confirm and refine our understanding of site-specific soil and terrain conditions, information for soil association distribution and soil characteristics within the PSA was obtained through the SKSIS (2018) and the SLRU (Agriculture and Agri-food Canada, 2004; 2009). The review of SKSIS and the SLRU provided digital soil resource information and was used to identify dominant soil types, texture, salinity, erosion potentials, landform/surface expression, and slope classes. Agricultural capability of soils is used to describe the limitations of soils as a result of climate, and landscape (SKSIS 2018). Refer to Table 3-2 and Figure 3; Appendix A for a detailed summary of the additional soil information reviewed.

Table 3-2 Soil Map Units and Associated Soil Characteristics within the LSA

MAP UNIT	SOIL ASSOCIATION/ COMPLEX	PARENT MATERIAL	DOMINANT/ SUBDOMINANT SOILS	DOMINANT SURFACE TEXTURE	SURFACE EXPRESSION	SLOPE CLASS	SALINITY	AGRICULTURAL CAPABILITY
Aq 1	Asquith	Fluvial	Chernozemic	Sandy Loam	Hummocky	2 (0.5-2%)	2	5(6)M 4(4)M
Rw	Runway Complex	Undifferentiated mineral	Various	Various	Ridged	4 (5-10%)	1	5(10)TP

MAP UNIT	SOIL ASSOCIATION/ COMPLEX	PARENT MATERIAL	DOMINANT/ SUBDOMINANT SOILS	DOMINANT SURFACE TEXTURE	SURFACE EXPRESSION	SLOPE CLASS	SALINITY	AGRICULTURAL CAPABILITY
WrAq 1	Weyburn Asquith	Fluvial	Chernozemic	Gravelly Loam	Undulating Dissected	3 (2-5%)	1	4(10)MP
Hw	Hillwash Complex	Various	Various	Various	Hummocky	6 (15-30%)	U	6(10)TE

Source: SKSIS 2018, SLRU 2004; 2009

Notes: Agricultural Capability; 4 = severe limitations restricting range of crops, 5 = severe limitations restricting their use to the production of native or tame species of perennial forage, 6 = capable of producing native forage crops; M = insufficient soil water-holding capacity, T = limitation in agricultural use of soil as a result of unfavourable topography, P = limitation caused by excess stones, E = limitation caused by damage from wind and/or water erosion

The PSA is mainly comprised of two soil associations, the Runway Complex and the Weyburn-Asquith. These are listed as having severe limitations to growing crops or to the production of native or tame perennial forage either due to insufficient soil water-holding capability or because of unfavourable topography.

Impacted soils are expected within the City Snow Storage Site, as meltwater can contain salt or other ice control chemicals, oil, grease, and heavy metals from vehicles, litter and debris, and normal dirt, dust and airborne pollutants (Transportation Association of Canada 2013).

The Small Swale is post glacial scar that is a a naturally low lying area which has been split by McOrmond Drive. The lowest lying areas are open water and topography gently slopes to upland habitats. Area south of McOrmond is relatively flat with minor slopes, and moderate slopes along the west side. The Riddell Site has the steepest slopes with the most pronounced depression.

3.1.5 VEGETATION

In addition to reviewing the provided documents, additional desktop screenings were undertaken to identify previous occurrences of plant SOMC. As the SKCDC is routinely updated, a review of this database for historical plant SOMC with potential to occur within the LSA was completed. The "Tracked Vascular Plant Species by Ecoregion" found within the Saskatoon Plain to determine potential habitat for SOMC and *SARA*-listed species was also considered. Lastly, a review of reported occurrences of weed species identified under the Saskatchewan *Weed Control Act* (2010), using the iMapInvasives (iMapInvasives 2022) platform, was completed to the LSA extent.

The PSA is comprised of diverse vegetation of introduced species, such as smooth brome and Kentucky bluegrass, with pockets of native grassland species. Rangeland Health Assessments, originally conducted by Stantec in 2013 and again in 2019 by EDI, determined the overall rangeland health in the Small Swale and adjacent Grasslands to range from Unhealthy to Healthy. The Unhealthy grasslands were dominated by nonnative graminoid species, however, had an abundance of native forbs, including blue lettuce *(Lactuca pulchellum)*, common yarrow *(Achillea millefolium)*, dock *(Rumex sp.),* low prairie rose *(Rosa arkansana*), Many-flowered aster (*Symphyotrichum ericoides*), pasture sage *(Artemisia frigida*), prairie sage *(Artemisia ludoviciana),* silverleaf psoralea *(Pediomellum argophyllum)* and wavyleaf thistle *(Cirsium undulatum).* However, differentiation amongst the condition of the assessed grasslands was largely attributed to the presence of undesirable graminoid species, including smooth brome *(Bromus inermis),* Kentucky bluegrass *(Poa pratensis)* and crested wheatgrass *(Agropyron cristatum)*. Given the competitive nature of these graminoids, condition of the assessed grasslands will continue to decline without management.

Vegetation surrounding wetlands, and lower slope positions, were reported to be in the best condition with higher biodiversity of native vegetation within the Small Swale. Presence of invasive species, along with poor tree and shrub cover provided wetland vegetation communities the score of Healthy with Problems during Riparian Assessments (EDI 2021).

The 2023 site visit did not document any additional species. A full list of species identified by EDI (2021) is summarized in Appendix D.

3.1.5.1 *NOXIOUS AND NUISANCE WEEDS*

EDI (2021) documented 11 weed species that were detected (summarised in Table 3-3, Figure) during Grassland Assessments. Of the 11 identified, seven are designated as Noxious, and four as Nuisance under the Saskatchewan *Weed Control Act* (2010). Meewasin Valley Authority rates the threat of Invasive Species are Very High in hydro-riparian areas and High in the Swales, Native Grasslands, and Wetlands, deeming the threat to the entire Swale network as Very High (Meewasin, 2017). Notable species of concern identified by Meewasin (2019) throughout the Swale network, include leafy spurge (*Euphorbia esula*), purple loosestrife (*Lythrum salicaria*), scentless chamomile (*Matricaria perforata*), and common tansy (*Tanacetum vulgare*). There is a likelihood that these species may encroach into the PSA. These species are aggressive colonizers and may pose a threat to the overall health of the of the various native vegetation communities noted within the PSA.

Table 3-3 Nuisance and Noxious Weed Occurrences Recorded in the Project Study Area (2019)[1]

COMMON NAME	SCIENTIFIC NAME	WEED CONTROL ACT (2010) DESIGNATION[2]
Canada thistle	*Cirsium arvense*	Noxious
common dandelion	*Taraxacum officinale*	Nuisance
European buckthorn	*Rhamnus cathartica*	Nuisance
field bindweed	*Convolvulus arvensis*	Noxious
nodding thistle	*Carduus nutans*	Noxious
kochia	*Kochia scoparia*	Noxious
leafy spurge	*Euphorbia esula*	Noxious
perennial sow-thistle	*Sonchus arvensis*	Nuisance
Russian thistle	*Salsola kali*	Noxious
fox-tail barley	*Hordeum jubatum*	Noxious
quack grass	*Agropyron repens*	Nuisance

Notes:

1 Source: EDI, 2021

2 Weed species are defined as Prohibited under Schedule I, Noxious under Schedule II and Nuisance under Schedule III of the Weed Control Act (2010). "Nuisance weed" means any plant that is designated by order of the minister as a nuisance weed and includes the seeds or any other part of that plant that may grow to produce another plant.

"Noxious weed" means any plant that is designated by order of the minister as a noxious weed and includes the seeds or any other part of that plant that may grow to produce another plant.

The iMapInvasives platform was used to verify and update findings of the 2022 EDI report through the listings of historical reported occurrences of weed species within the LSA. The LSA was used during the desktop review to capture areas that extended outside of the PSA due to the developed nature of the surrounding area (e.g., developed areas, roads, and cultivated areas). The review of iMapInvasives conducted in June 2023 provided recordings of 1,000 individual weed occurrences within the LSA. Additional species that were not recorded in the 2022 EDI report are summarized in Table 3-4.

No weeds listed as Prohibited under the *Weed Control Act (2010)* have been observed historically within the LSA.

Table 3-4 Nuisance and Noxious Weed Occurrences Recorded in the Local Study Area from iMapInvasives

COMMON	SCIENTIFIC NAME	*WEED CONTROL ACT* (2010) DESIGNATION[1]	LAST RECORDED DATE OF OBSERVATION
absinthe	*Artemisia absinthium*	Noxious	2023
common tansy	*Tanacetum vulgare*	Noxious	2020
dames rocket	*Hesperis matronalis*	Noxious	2016
oxeye daisy	*Leucanthemum vulgare*	Noxious	2018
leafy spurge	*Euphorbia esula*	Noxious	2019
purple loosestrife	*Lythrum salicaria*	Noxious	2019
scentless chamomile	*Tripleurospermum inodorum*	Noxious	2019

Notes:

1 Weed species are defined as Prohibited under Schedule I, Noxious under Schedule II and Nuisance under Schedule III of the Weed Control Act (2010).

During the general 2023 site visit, species such as absinthe (*Artemisia absinthium*), nodding thistle (*Carduus nutans* ssp. *leiophyllus*), and kochia (*Kochia scoparia*) were observed from the roadside as there was limited property access.

3.1.5.2 *SPECIES OF MANAGEMENT CONCERN*

To facilitate an initial understanding of potential flora SOMC within the PSA, a staged review of available information as it pertains to the RSA, LSA, and then PSA was completed.

According to the SKCDC, 46 plant SOMC have the potential to occur within the RSA. Of the 46 SOMC, four species, crawe's sedge (*Carex crawe*i), few-flowered aster (*Almutaster pauciflorus*), Plains rough fescue (*Festuca hallii*), wood lily (*Lilium philadelphicum*), and crowfoot violet (*Viola pedatifida)* have a high likelihood to be found within the PSA based on species habitat preferences. SOMC within the RSA and the likelihood of occurrence within the PSA are in Table 3-6.

Table 3-5 Plant Species of Management Concern Identified Within the Regional Study Area and Their Potential to Occur in the Project Study Area

COMMON NAME	SCIENTIFIC NAME	SKCDC RANK[(a)]	PREFERRED HABITAT[(b)]	CORRELATING HABITAT SUBCATEGORY	LIKELIHOOD TO OCCUR WITHIN THE PSA[1]
American bugseed	*Corispermum americanum var. americanum*	S3	Sandy shores and prairies, sand dunes, disturbed roadsides, and old fields	Aquatic Systems Grassland Systems	Medium
blueflag	*Iris versicolor*	S1	Meadows; stream banks; marshes; swamps	Aquatic Systems	Low
bristle-leaved sedge	*Carex eburnea*	S3	Woods or shrublands	Forested and Shrubland Systems	Low
bristly gooseberry	*Ribes oxyacanthoides var. setosum*	S2	Stream banks, rocky slopes	Aquatic Systems	Medium
bushy cinquefoil	*Potentilla supina ssp. paradoxa*	S3	Moist or wet sandy soils of prairies, bottoms, riverbanks low fields, sand bars, and lake shores.	Aquatic Systems	Medium

COMMON NAME	SCIENTIFIC NAME	SKCDC RANK[(a)]	PREFERRED HABITAT[(b)]	CORRELATING HABITAT SUBCATEGORY	LIKELIHOOD TO OCCUR WITHIN THE PSA[1]
Columbia needlegrass	*Achnatherum nelsonii ssp. dorei*	S2	Upland prairie bordering woods or shrublands	Grassland Systems	Low
Crawe's sedge	*Carex crawei*	S3	Seepy, often calcareous sedge meadows, fens, bogs, and shores	Aquatic Systems	High
crowfoot violet	*Viola pedatifida*	S3	Sun; dry prairies, open woods	Grassland Systems	High (EDI confirmed)
curved yellow-cress	*Rorippa curvipes*	S3	Non-alkaline, drying mudflats and edges of sloughs in sandy or clay soil	Aquatic Systems	Medium
dry goosefoot	*Chenopodium desiccatum*	S3	Open land, prairies, adapts well to disturbed areas such as roadsides	Grassland Systems	Medium
dwarf clubrush	*Trichophorum pumilum*	S1	Calcareous ledges, gravels, shores, seepage areas, mires and bogs.	Aquatic Systems	Low
early cinquefoil	*Potentilla concinna var. concinna*	S2	Meadows and vernally moist openings in conifer and aspen woodlands, sagebrush rangelands, prairie hillsides, rocky outcrops and ridges	Aquatic Systems Grassland Systems	Medium
Engelmann's spike-rush	*Eleocharis engelmannii*	S3	Shores, marshes, and drying slough bottoms	Aquatic Systems	Medium
false spikenard	*Maianthemum racemosum ssp.amplexicaule*	S1	Moist woods and thickets	Forested and Shrubland Systems	Low
few-flowered aster	*Almutaster pauciflorus*	S3	Wet alkaline and saline soils such as inland salt marshes and salt flats	Aquatic Systems	High
hairy bugseed	*Corispermum villosum*	S2	Sandy prairie barrens, shores, sand dune blowouts, roadsides, sandy wastelands and old fields	Aquatic Systems Grassland Systems	Medium
hairy germander	*Teucrium canadense var. occidentale*	S3	Banks of streams, moist bottomlands, and lake shores	Aquatic Systems	Medium
Hooker's bugseed	*Corispermum hookeri var. hookeri*	S2	Sandy shores and prairies, sand dunes, disturbed roadsides, and old fields	Aquatic Systems Grassland Systems	Medium
Hudson's cinquefoil	*Potentilla hudsonii*	S2	Dry rocky grassy slopes	Grassland Systems	Low
lesser fringed gentian	*Gentianopsis virgata*	S3	Meadows and moist prairies	Aquatic Systems Grassland Systems	Medium
little yellow-rattle	*Rhinanthus minor ssp. minor*	S3	Meadows and fields, thickets, and moist slopes.	Aquatic Systems Grassland Systems	Medium
low whitlowwort	*Paronychia sessiliflora*	S3	Dry, stony hillsides	n/a	Low

COMMON NAME	SCIENTIFIC NAME	SKCDC RANK[(a)]	PREFERRED HABITAT[(b)]	CORRELATING HABITAT SUBCATEGORY	LIKELIHOOD TO OCCUR WITHIN THE PSA[1]
Macoun's gentian	*Gentianopsis virgata ssp. macounii*	S3	Meadows and moist prairies	Aquatic Systems Grassland Systems	Medium
marsh felwort	*Lomatogonium rotatum var.fontanum*	S3	Moist meadow depressions and marshy shores	Aquatic Systems Grassland Systems	Medium
Menzies' catchfly	*Silene menziesii*	S3	Moist woodlands	Forested and Shrubland Systems	Low
mucronate blue-eyed-grass	*Sisyrinchium mucronatum*	S3	Prairie/meadow/field	Aquatic Systems Grassland Systems	Medium
narrow-leaved water plantain	*Alisma gramineum*	S3	Sandy soil; shallow water, shores	Aquatic Systems	Medium
northern blue-eyed-grass	*Sisyrinchium septentrionale*	S3	Dry to moist meadows, prairie wetland margins (low prairie zone), pastures, and grassy streambanks. Often in gravelly soil	Aquatic Systems Grassland Systems	Medium
pale moonwort	*Botrychium pallidum*	S1	Forest Edge, Forest/Woodland, Forest - Conifer, Forest - Hardwood, Woodland - Conifer, Old field, Grassland/herbaceous, Sand/ dune	Aquatic Systems Forested and Shrubland Systems	Low
plains rough fescue	*Festuca hallii*	S3	Alpine tundra, subalpine grasslands, meadows, grassy slopes, woodland margins.	Grassland Systems	High (EDI confirmed)
prairie dunewort	*Botrychium campestre*	S3	Stabilized sand dune meadows and above prairie sloughs	Grassland Systems	Low
Pursh's milk-vetch	*Astragalus purshii var. purshii*	S3	Eroded, short grassland and mixed prairie	Grassland Systems	Low
red bulrush	*Blysmopsis rufa*	S3	Saline flats and meadows	Aquatic Systems	Medium
rocky mountain sedge	*Carex saximontana*	S3	Valleys and aspen groves	Forested and Shrubland Systems	Medium
sandhills cinquefoil	*Potentilla lasiodonta*	S2	Sun; dry, sandy prairie	Grassland Systems	Low
small yellow lady's slipper	*Cypripedium parviflorum var. makasin*	S3	Forested wetland, herbaceous wetland, bog/fen	Aquatic Systems	Medium
smooth hawk's-beard	*Crepis runcinata ssp. hispidulosa*	S1	Dry or moist alkaline meadows	Aquatic Systems Grassland Systems	Low
smooth wild rose	*Rosa blanda*	S1	Riparian deciduous or mixed woods and shrub thickets	Forested and Shrubland Systems	Low
soft wild bergamot	*Monarda fistulosa var. mollis*	S3	Dry open woods, fields, wet meadows and ditches	Aquatic Systems	Medium

COMMON NAME	SCIENTIFIC NAME	SKCDC RANK[(a)]	PREFERRED HABITAT[(b)]	CORRELATING HABITAT SUBCATEGORY	LIKELIHOOD TO OCCUR WITHIN THE PSA[1]
striped coral-root	*Corallorhiza striata var. striata*	S3	Aspen woods	Forested and Shrubland Systems	Low
tall blue lettuce	*Lactuca biennis*	S3	Moist woods and shrub thickets	Forested and Shrubland Systems	Low
tall bur-marigold	*Bidens frondosa*	S3	Along shores, wet ditches, wet fields, disturbed soil	Aquatic Systems	Medium
upland white goldenrod	*Solidago ptarmicoides*	S3	Part shade, sun; dry sandy or rocky prairies, bluffs, rocky open woods, rocky outcrops	Grassland Systems Forested and Shrubland Systems	Medium
water pimpernel	*Samolus parviflorus*	SH	Swamp, marsh and stream edges	Aquatic Systems	Low
wood lily	*Lilium philadelphicum*	S4	Mesic open woods and clearings	Forested and Shrubland Systems	High (EDI Confirmed)

Notes:

1 The list of SOMC that have the potential to occur in the PSA (Figure 5) is approximate and will need to be verified.

Notes:

a) Saskatchewan Conservation Data Centre Tracked Taxa Lists (SKCDC, 2023a)

S1 = Critically Imperiled/Extremely Rare, S2 = Imperiled/Very Rare, S3 = Vulnerable/Rare to Uncommon, S4 = Apparently Secure, S5 = Secure/Common.

b) University of Saskatchewan n.d.

When the spatial extent was reduced to the LSA, of the initial 46 species, 27 were identified as potentially occurring within the LSA (Figure 6).

At the PSA extent, 14 plant SOMC have been historically observed within the PSA, with the earliest recording dated 1937 (Table 3-6). Plant species that have been observed within the PSA are provincially ranked as Apparently Secure (S4), Vulnerable (S3), Imperiled/Very Rare (S2), and Critically Imperiled / Extremely Rare (S1).

Table 3-6 Plant Species of Management Concern Historically Documented in the Project Study Area by SKCDC

COMMON NAME	SCIENTIFIC NAME	SKCDC RANK[(A)]	LAST RECORDED DATE OF OBSERVATION
Blueflag	*Iris versicolor*	S1	1994
Crawe's sedge	*Carex crawei*	S3	1993
crowfoot violet	*Viola pedatifida*	S3	2021 (EDI Confirmed)
dwarf clubrush	*Trichophorum pumilum*	S1	1940
few-flowered aster	*Almutaster pauciflorus*	S3	2021
hairy germander	*Teucrium canadense var. occidentale*	S3	2021
marsh felwort	*Lomatogonium rotatum var. fontanum*	S3	2020
Menzie's catchfly	*Silene meziesii*	S3	1993
plains rough fescue	*Festuca hallii*	S3	2021 (EDI Confirmed)
prairie dunewort	*Botrychium campestre*	S3	1994
Rocky Mountain sedge	*Carex saximontana*	S3	1937
striped coral-root	*Corallorhiza striata var. striata*	S3	1993
Three-parted beggarstick	*Bidens tripartita*	S1	2023 (Swale Watchers Confirmed)
wood lily	*Lilium philadelphicum*	S4	2021 (EDI Confirmed)

Notes:

a) Saskatchewan Conservation Data Centre Tracked Taxa Lists (SKCDC, 2023a).

S4 = Apparently Secure; uncommon but not rare.

S3 = Vulnerable / Rare to Uncommon; at moderate risk of extinction or extirpation due to restricted range, relatively few.

populations, recent and widespread declines, threats, or other factors.

S2 = Imperiled / Very Rare; at high risk of extinction or extirpation due to a very restricted range, very few populations, steep declines, threats or other factors.

S1 = Critically Imperiled / Extremely Rare; at very high risk of extinction or extirpation due to extreme rarity, very steep declines, high threat level, or other factors.

EDI (2021) conducted Species Detection Surveys in accordance with the Rare Vascular Plant Survey Protocol (ENV, 2021), with the first (early) round of surveys done between April 27 and June 14, 2019, and the second (late) round of surveys conducted from August 5 to September 24, 2019. EDI (2021) confirmed two SOMC within the PSA (denoted as 'confirmed' in Table 3-5 and Table 3-6):

- Plains rough fescue (*Festuca halii*) within LSD 07-24-37-05 (population numbers not recorded).
- Approximately 225 crowfoot violet (*Viola pedatifida*) plants were documented within LSD 07-24-37-05.

Provincially ranked as Apparently Secure (S4), wood lily (*Lilium philadelphicum* var. *andinum*) was observed within the PSA. The Western red lily is Saskatchewan's official floral emblem and a protected species under the *Saskatchewan Emblems Act* (1988).

3.1.6 WETLANDS AND HYDROLOGY

The 2021 EDI report included previously assessed and classified wetlands from 2013, 2014, and 2019. The 2013 wetland assessment incorporated into the 2021 EDI report classified wetlands according to Stewart and Kantrud (1971; Table 3-7). It is understood that this information was updated during a functional wetland assessment completed in 2014 according to protocols outlined by the Minnesota Routine Assessment Method (MnRAM) (EDI, 2021). Class I wetlands were not assessed within the Study Area (EDI, 2021).

EDI (2021) conducted a third wetland assessment in 2019 to verify and update previous wetland studies. Within the PSA, seven wetlands were identified and were classified as Class III to Class V wetlands. Under the MnRAM functional assessment study, one Class III wetland was classified as Manage 2; three Class III wetlands were classified as Preserve; two large Class IV wetlands were classified as Preserve; and one Class V wetland was classified as Preserve (EDI, 2021). The SS is classified as a wetland complex, defined as "*a combination of individual wetlands and surrounding riparian areas that have complementary functions and have greater significance when viewed together compared to individual significance"* (EDI, 2021).

Table 3-7 Wetland Class Definitions[1]

CLASS	DEFINITION
Class I Wetland	Ephemeral wetlands have free surface water for only a short period of time after snowmelt or storm events.
Class II Wetland	Temporary wetlands are periodically covered by standing or slow-moving water with snowmelt lasting a few weeks and several days after a storm event.
Class III Wetland	Seasonal wetlands are usually dry by midsummer.
Class IV Wetland	Semi-permanent wetlands usually maintain surface water throughout the growing season (May to September).
Class V Wetland	Permanent wetlands maintain standing water year around, with the center deep enough that no emergent vegetation can establish. Includes dugouts.

Note: [1] Source: Stewart and Kantrud (1971)

As previous reporting had larger project boundaries, a more refined review of wetlands within the LSA was completed to refine wetland extents for the Project and aid in the general field reconnaissance and any future efforts expended on site. Information collected during the 2023 general field assessment was applied to confirm wetland presence and provide site-specific descriptive information for the noted wetlands. Within the PSA, 11 wetlands were identified, including Class II (0.4 ha) to Class V (17.7 ha) wetlands. Refer to Table 3-8 and Figure 4; Appendix A for more details pertaining to the location, size and number of noted wetlands within the LSA and PSA.

Table 3-8 Wetland Classification in the Project and Local Study Areas

WETLAND CLASS	PSA		LSA	
	NUMBER OBSERVED	WETLAND AREA (HA)	NUMBER OBSERVED	WETLAND AREA (HA)
Class II Wetland	3	0.4	5	10.1
Class III Wetland	4	4.5	5	4.5
Class IV Wetland	1	0.9	4	8.4

WETLAND CLASS	PSA		LSA	
	NUMBER OBSERVED	WETLAND AREA (HA)	NUMBER OBSERVED	WETLAND AREA (HA)
Class V Wetland	3	17.7	3	24.3
Total	**11**	**23.4**	**17**	**47.3**

Native Plant Solutions (NPS) conducted an ecological assessment of wetlands residing in the greater extent of the Small Swale in 2019 to outline restoration potential. They mapped three distinct watersheds (A, B, and C) supporting the various wetlands present.

- Watershed A – This feature has 134 catchments supporting 13 wetlands. The spatial extent was bisected by Range Road 3050, with greater than 50% residing to the east of this roadway. Primary flow direction was towards the north. This watershed and associated wetlands are outside of the PSA.
- Watershed B – This feature has 103 catchments supporting nine wetlands and provides hydrological inputs to the wetlands located north. Primary flow direction was towards the south. Portions of this watershed support all the wetlands located to the north of McOrmond Drive within the PSA.
- Watershed C has 4 catchments supporting 8 wetlands all of which are located in the PSA area, south of McOrmond Drive and northeast of the river. Primary flow direction is towards the river.

The Small Swale is believed to be linked to the Forest Farm Aquifer (Heilman 2023), which encompasses the Lower Floral Aquifer and the Upper Floral Aquifer (Heilman, 2023). It has been reported that this aquifer has been impacted by various developments at surface and currently has an overall vulnerability rating of moderate. It is believed that the wetlands present within the Small Swale maybe be influenced by this aquifer and represent areas of surface expression (e.g., discharge).

3.1.7 FISH AND FISH HABITAT

The presence of fish and fish habitat was not identified through the review of previous reports and studies. However, intermittent hydrological linkages to the South Saskatchewan River are presented in relation to the various wetlands observed within the PSA (EDI, 2021). Therefore, a HABISask search to the RSA was conducted in June 2023 to review fish-related SOMC (Table 3-9).

Table 3-9 Fish Species of Management Concern within the Location Study Area

COMMON NAME	SCIENTIFIC NAME	SKCDC RANK[(a)]	COSEWIC STATUS	SARA STATUS
blacknose dace	*Rhinichthys obtusus*	S3	-	-
brooke stickleback	*Culaea inconstans*	S5	-	-
brook trout	*Salvelinus fontinalis*	SNA	-	-
burbot	*Lota lota*	S5	-	-
cisco	*Coregonus artedi*	S5	-	-
common shiner	*Lucilus cornutus*	S3	-	-
emerald shiner	*Notropis atherinoides*	S5	-	-
fathead minnow	*Pimephales promelas*	S5	-	-
finescale face	*Chrosomus neogaeus*	S4	-	-

COMMON NAME	SCIENTIFIC NAME	SKCDC RANK[a]	COSEWIC STATUS	SARA STATUS
flathead chub	*Platygocio gracilis*	S3	-	-
goldeye	*Hiodon alosoides*	S4	-	-
Iowa darter	*Etheostoma exile*	S5	-	-
Johnny darter	*Etheostoma nigrum*	S5	-	-
lake chub	*Couesius plumbeus*	S5	-	-
lake sturgeon	*Acipenser fulvescens*	S2	Endangered	-
lake trout	*Salcelinus namaycush*	S5	-	-
lake whitefish	*Coregonus clupeaformis*	S5	Not at Risk	-
logperch	*Percina caprodes*	S5	-	-
longnose dace	*Rhinicthys cataractae*	S5	-	-
longnose sucker	*Catostomus catostomus*	S5	-	-
mooneye	*Hiodon tergisis*	S3	-	-
ninespine stickleback	*Pungitius pungitius*	S3	-	-
northern pike	*Esax lucius*	S5	-	-
pearl dace	*Margariscus nachtriebi*	S5	-	-
quillback	*Carpiodes cyprinus*	S4	-	-
rainbow trout	*Oncorhynchus mykiss*	SNA	-	-
river shiner	*Notropis blennius*	S3	-	-
sauger	*Sander canadensis*	S5	-	-
shorthead redhorse	*Moxostoma macrolepidotum*	S4	-	-
silver redhorse	*Moxostoma anisurum*	S4	-	-
slimy sculpin	*Cottus cognatus*	S4	-	-
spottail shiner	*Notropis hudsonius*	S5	-	-
trout-perch	*Percopsis omiscomaycus*	S5	-	-
walleye	*Sander vitreus*	S5	-	-
white sucker	*Catostomus commersonii*	S4	-	-
yellow perch	*Perca flavescens*	S5	-	-

Notes:

a) Saskatchewan Conservation Data Centre Tracked Taxa Lists (SKCDC, 2023a).

S4 = Apparently Secure; uncommon but not rare.

S3 = Vulnerable / Rare to Uncommon; at moderate risk of extinction or extirpation due to restricted range, relatively few populations, recent and widespread declines, threats, or other factors.

S2 = Imperilled / Very Rare; at high risk of extinction or extirpation due to a very restricted range, very few populations, steep declines, threats or other factors.

S1 = Critically Imperiled / Extremely Rare; at very high risk of extinction or extirpation due to extreme rarity, very steep declines, high threat level, or other factors.

3.1.8 WILDLIFE

To identify possible SOMC within the Project area, available wildlife information pertaining to the various spatial extents (RSA, LSA and PSA) was evaluated. A review using HABISask of the RSA resulted in 49 wildlife SOMC

that have the potential to occur within the PSA. Of the 49 species noted, 18 have a high likelihood of being found within the PSA based on habitat requirements. SOMC noted with potential to occur in the RSA and associated likelihood of occurrence within the PSA are summarized below in Table 3-10.

Table 3-10 Wildlife Species of Management Concern Documented within Regional Study Area and their Potential to Occur within the Project Study Area

COMMON NAME	SCIENTIFIC NAME	SKCDC RANK[a]	HABITAT[b]	CORRELATING HABITAT SUBCATEGORY	LIKELIHOOD TO OCCUR WITHIN THE PSA
Birds					
Baird's sparrow	*Centronyx bairdii*	S4B	Grasslands	Grassland Systems	High
barn swallow	*Hirundo rustica*	S4B	Open country, Marshes	Aquatic Systems Grasslands	High; Historic occurrence within the PSA (SKCDC)
bank swallow	*Riparia riparia*	S4B, S5M	Riverbanks	Aquatic Systems	High ; Historic occurrence within the PSA (SKCDC)
Barrow's goldeneye	*Bucephala islandica*	SNA	Deciduous forests along riverbanks	Aquatic Systems Forested and Shrubland Systems	Low
black-necked stilt	*Himantopus mexicanus*	SNA	Coastal Wetlands	Aquatic Systems	Low
Bobolink	*Dalichonyz oryzivorus*	S5B	Grasslands/Prairies	Grassland Systems	High ; Historic occurrence within the PSA (SKCDC)
broad-winged hawk	*Buteo platypterus*	S4B, S3M	Forests, Near water, Clearings	Aquatic Systems Forested and Shrubland Systems	Medium
Canada warbler	*Cardellina canadensis*	S4B, S3M	Shrubby areas, Forests	Forested and Shrubland Systems	Medium
common nighthawk	*Chordeiles minor*	S4B	Open pine and mixedwood forest	Forested and Shrubland Systems	High
Cooper's hawk	*Accipiter cooperii*	S4B,S2N,S2M	Wood edges, River groves	Aquatic Systems Forested and Shrubland Systems	High ; Historic occurrence within the PSA (SKCDC)
glaucous gull	*Larus hyperboreus*	S2N	Shorelines	Aquatic Systems	Low
Harris's sparrow	*Zanotrichia querula*	SUB, S5M	Grasslands	Grassland Systems	High ; Historic occurrence within the PSA (SKCDC)
horned grebe	*Podiceps auritus*	S5B	Wetlands	Aquatic Systems	High
lesser yellowlegs	*Tringa flavipes*	S4B	Wetlands	Aquatic Systems	High
loggerhead shrike	*Lanius ludovicianus excubitorides*	S3B	Open grasslands	Grassland Systems	High
northern hawk owl	*Surnia ulula*	S3B, S5N	Mature forests (closed canopy)	Forested and Shrubland Systems	Medium

COMMON NAME	SCIENTIFIC NAME	SKCDC RANK[a]	HABITAT[b]	CORRELATING HABITAT SUBCATEGORY	LIKELIHOOD TO OCCUR WITHIN THE PSA
northern shrike	*Lanius borealis*	S1B,S4N,S4M	Open woodland, Brush	Forested and Shrubland Systems	Medium
olive-sided flycatcher	*Contopus cooperi*	S4B	Pairies, deciduous forests	Forested and Shrubland Systems Grassland Systems	Medium
osprey	*Pandion haliaetus*	S3B	Near water and marshes	Aquatic Systems	High ; Historic occurrence within the PSA (SKCDC)
peregrine falcon	*Falco peregrinus*	S1B, SNRM	Open habitat, Desert	Grassland Systems	Medium
pine grosbeak	*Pinicola enucleator*	S2B, S4M	Mixedwood forests	Forested and Shrubland Systems	Low
prairie falcon	*Falco mexicanus*	S3B, S3N	Prairie	Grassland Systems	High ; Historic occurrence within the PSA (SKCDC)
red-headed woodpecker	*Melanerpes erythrocephalus*	S1B	Woodlands, River bottoms, Clearings, Swamps	Aquatic Systems Forested and Shrubland Systems	Low
rusty blackbird	*Euphagus carolinus*	S3B, SUN	River groves, Wooded swamps	Aquatic Systems Forested and Shrubland Systems	High; Historic occurrence within the PSA (SKCDC)
sharp-tailed grouse	*Tympanuchus phasianellus*	S5	Prairie	Grassland Systems	High
short-eared owl	*Asio flammeus*	S3B,S2N	Prairie, Grassland	Grassland Systems	High
Townsend's solitaire	*Myadestes townsendii*	S3N	Low shrub woodlands	Forested and Shrubland Systems	Low
turkey vulture	*Cathartes aura*	S3B	Open country, woodlands	Forested and Shrubland Systems	Medium
western grebe	*Aechmophorus occidentalis*	S3B	Near water, lakes	Freshwater Systems	Low
whooping crane	*Grus americana*	SXB,S1M	Forested wetlands	Forested and Wetland Systems	Low
yellow rail	*Coturnicops noveboracensis*	S3B	Wet fields, floodplains, bogs	Aquatic and Grassland Systems	Medium
Amphibians					
northern leopard frog	*Lithobates pipiens*	S3	Swamps, Marshes, slow-moving streams	Aquatic Systems	High (Confirmed by EDI, 2022)
western tiger salamander	*Ambystoma mavortium*	S3N	Wetlands	Aquatic Systems	Medium
Mammals					
American badger	*Taxidea taxus taxus*	S3S4	Open forests, grasslands	Grassland Systems Forested and Shrubland Systems	High

COMMON NAME	SCIENTIFIC NAME	SKCDC RANK[a]	HABITAT[b]	CORRELATING HABITAT SUBCATEGORY	LIKELIHOOD TO OCCUR WITHIN THE PSA
little brown myotis	*Myotis lucifugus*	S4B, S4N	Open Forests	Forested and Shrubland Systems	Medium
Invertebrates					
bicolored sallow moth	*Sunira bicolorago*	S3	Woodlands and fields	Grassland Systems Forested and Shrubland Systems	Medium
brown harpaline beetle	*Harpalus fuscipalpis*	S3	Riverside grassland	Riverside Grassland Systems	Medium
clay-beach bembidion beetle	*Bembidion patruele*	S3	Near water	Aquatic Systems	Medium
common green darner	*Anax junius*	S3	Wetlands, ponds, lakes, slow streams, shrublands, forests, and grasslands	Aquatic, Forested, Shrublands, and Grassland Systems	Medium
field bembidion beetle	*Bembidion rupicola*	S3	Near water	Aquatic Systems	Medium
goldenrod gall fly	*Eurosta solidaginis*	S3	Grasslands	Grassland Systems	High ; Historic occurrence within the PSA (SKCDC)
intermediate riverbank ground beetle	*Bembidion intermedium*	S3	Stream banks	Aquatic Systems	Medium
monarch	*Danaus plexippus plexippus*	S2B,SNRM	Open forests, prairies, wetlands	Forested, Grasslands, and Wetlands Systems	High
rapid riverbank ground beetle	*Bembidion rapidum*	S3	Stream banks	Aquatic Systems	Medium
salt bembidion beetle	*Bembidion insulatu*	S3	Near water	Aquatic Systems	Medium
twenty-spotted lady beetle	*Psyllobora vigintimaculata*	S2	Woodlands, Grasslands	Woodlands and Grasslands Systems	High
twice-stabbed lady beetle	*Chilocorus stigma*	S3	Forested	Forested Systems	Low
western red damsel	*Amphiagrion abbreviatum*	S2	Stream banks	Aquatic Systems	Low
yellow-banded bumble bee	*Bombus terricola*	S4	Grasslands	Grassland Systems	High ; Historic occurrence within the PSA (SKCDC)

Notes:

a) Saskatchewan Conservation Data Centre Tracked Taxa Lists (SKCDC, 2023b).

S1 = Critically Imperiled/Extremely Rare; S2 = Imperiled/Very Rare; S3 = Vulnerable/Rare to Uncommon; S4 = Apparently Secure; S5 = Secure/Common; B = for a migratory species, applies to the breeding population in the province; M = for a migratory species, rank applies to the transient (migrant) population; N = for a migratory species, applies to the non-breeding population in the province; U = status is uncertain in Saskatchewan.

b) Cornell Lab of Ornithology, 2023.

When the spatial extent was reduced to the LSA, of the initial 49 species, 29 were identified as potentially occurring within the LSA (Figure 6).

At the PSA extent, 13 wildlife SOMC have been historically observed within the PSA, provincially ranked as Apparently Secure (S4), Vulnerable (S3), Imperiled/Very Rare (S2), and Critically Imperiled/Extremely Rare (S1), Special Concern or Threatened under the SARA and COSEWIC (Table 3-11).

Incidental wildlife occurrences and suitable habitat presence was documented during the site visit and are included in Appendix F.

Table 3-11 Historic Wildlife Species of Management Concern Documented within the Project Study Area by SKCDC

COMMON NAME	SCIENTIFIC NAME	SKCDC RANK[(a)]	COSEWIC STATUS	*SARA* STATUS
bank swallow	*Riparia riparia*	S4B,S5M	Threatened	Threatened
barn swallow	*Hirundo rustica*	S4B	Special Concern	Threatened
bobolink	*Dolichonyx oryzivorus*	S5B	Special Concern	-
cooper's hawk	*Accipiter cooperii*	S4B, S2N, S2M	Not at Risk	-
goldenrod gall fly	*Eurosta solidaginis*	S3		
Harris's sparrow	*Zonotrichia querula*	SUB,S5M	Special Concern	Special Concern
northern leopard frog	*Lothibates pipiens*	S3	Special Concern	-
northern shrike	*Lanius borealis*	S1B,S4N, S4M		
osprey	*Pandion haliaetus*	S3B	-	-
pine grosbeak	*Pinicola enucleator*	S2B,S4N		
prairie falcon	*Falco mexicanus*	S3B, S3N	Not at Risk	-
rusty blackbird	*Euphagus carolinus*	S3B, SUN	Special Concern	Special Concern
yellow-banded bumble bee	*Bombus terricola*	S4	Special Concern	Special Concern

Notes:

a) Saskatchewan Conservation Data Centre Tracked Taxa Lists (SKCDC, 2023b).

S1 = Critically Imperiled/Extremely Rare; S2 = Imperiled/Very Rare; S3 = Vulnerable/Rare to Uncommon; S4 = Apparently Secure; S5 = Secure/Common; B = for a migratory species, applies to the breeding population in the province; M = for a migratory species, rank applies to the transient (migrant) population; N = for a migratory species, applies to the non-breeding population in the province; U = status is uncertain in Saskatchewan.

COSEWIC = Committee on the Status of Endangered Wildlife in Canada (Government of Canada, 2022); SARA = Species at Risk Act (Government of Canada, 2022); - = not assessed.

The EDI (2021) noted 56 migratory bird species, 20 mammal species, and three amphibian species during their 2019 field program. For a full list of wildlife observations made by EDI (2021) and WSP field ecologists during the site visit, either through incidental observations, Species Detection Surveys, or during remote camera surveys, see Appendix F. Some additional EDI (2021) wildlife observations have been summarized by target wildlife groups below.

Identified wildlife SOMC will inform of requirements of potential field assessments or pre-disturbance surveys that may be required prior to any improvements to the PSA. Provincial activity restriction guidelines may be applicable if SOMC are confirmed to be present in the PSA (MEnv 2017).

3.1.8.1 *MIGRATORY BIRD SPECIES*

Of the avian species observed, 14 SOMC were noted. SOMC are tracked by the SKCDC, designated by COSEWIC, and/or listed Special Concern or Threatened under the SARA (Government of Canada, 2022). Habitat within the SS noted by EDI (2021) included wetland, tame pasture, and native dominant grassland. The most recorded avian species identified during the EDI (2021) survey included clay-colored sparrow (*Spizella pallida*), red-winged

blackbird (*Agelaius pheoniceus*) and Western meadowlark (*Sturnella neglecta*), which are all commonly occurring species within the area. For a full list of migratory bird SOMC, please refer to Appendix F.

In addition, a Swainsons hawk stick nest *(Buteo swainsonii)* was documented by EDI in 2019 at the southern edge of the PSA, bordering the City Snow Storage Site. It was revisited during field reconnaissance in August 2023 and was deemed active by WSP Biologists.

3.1.8.2 *AMPHIBIAN SPECIES*

The three amphibian species identified by EDI (2021) were wood frog (*Lithobates sylvaticus*), boreal chorus frog (*Pseudacris maculata)*, and northern leopard frog (*Lithobates pipiens*). Of these, the northern leopard frog is listed as a tracked species in Saskatchewan, designated by COSEWIC, and as Special Concern under the SARA.

3.1.8.3 *MAMMALS*

Remote cameras (RC) were installed at ten locations (RC 01-10) by EDI, with an additional four locations (RC 11-14) established by Meewasin Valley Authority (MVA) starting in June 2019 for varying durations. According to the UH3 Natural Area Screening report, EDI defined a wildlife event as a single photo of one passing animal or a series of photos of a single animal or group of animals triggering the camera multiple times. Photos were analyzed to determine the number of animals per event by counting the number of animals within one photo or the number of animals in a series of photos.

The number of events per survey point ranged from 13 (RC 5) to 391 (RC 12). The total number of individual wildlife at each survey point ranged from 15 (RC 5) to 720 (RC12), and the average number of individual wildlife per day at each survey point ranged from 0.14 (RC 11) to 4.74 (RC12).

Overall, the RC study identified six mammal species within the portion of the PSA evaluated. These included white tailed deer *(Odocolieus virginanus)*, mule deer *(Odocoileus hemionus)*, coyote *(Canis latrans),* raccoon *(Procyon lotor)*, white-tailed jack rabbit *(Lepus townsendii)* and American beaver *(Castor canadensis)*. Mule deer were the most abundant species observed at 801 detections, followed by white-tailed deer at 667, coyote at 70, unknown deer species at 64 and white-tailed jackrabbit at 60.

3.1.8.4 *WILDLIFE MOVEMENT*

During the remote camera surveys completed in 2019 (EDI 2019), 33 recognizable deer were identified. Of those, 17 were identified on multiple cameras; based on their presence at different camera locations, the deer appeared to be bidirectionally moving in a west-to-east fashion between the Small Swale and Northeast Swale.

Overall, general wildlife passage through the PSA is fairly unrestricted based on the type of habitat present and limited number of barriers (e.g., roads, railways, utility lines). In terms of terrestrial mammals, the most frequently observed species utilizing the PSA were deer and coyote.

3.1.9 SPECIES OF INTEREST TO INDIGENOUS COMMUNITIES

The City of Saskatoon is located on Treaty 6 Territory and the Homeland of the Metis (City of Saskatoon, 2023c). Archaeological evidence at Wanskewin Heritage Park a site located approximately 1.5 kilometres north of the Small Swale) shows the general area occupied by Indigenous Communities t least 6,000 years ago (City of Saskatoon, 2023d). Over time, the Plains Cree, Saulteaux or Plains Ojibwe, Dakota, and the Nakoda or Assiniboine First Nation cultures have lived in the area now known as Saskatoon (City of Saskatoon, 2023d).

There are many species found within the Small Swale that have been used for medicine, construction, cooking, or ceremonial purposes. A select number of species and their purpose are detailed in Table 3-12. Note, this is not an exhaustive list.

Table 3-12 Select Vegetative Species of Interest to Indigenous Communities found at the Small Swale

COMMON NAME	SCIENTIFIC NAME	PURPOSE
Plains wormwood	*Artemesia campestris*	Used as a ceremonial plant and burned for incense[1].
Prairie turnip or Indian breadroot	*Psoralea esculaenta*	One of the most important wild food sources[2]

COMMON NAME	SCIENTIFIC NAME	PURPOSE
Saskatoon	*Amelanchier alnifolia*	The most important fruit for Indigenous people[2]
Sweetgrass	*Hierochloe odorata*	Used as a ceremonial plant for smudging, art, and basket weaving[3]
Wolfwillow	*Eleagnus commutata*	Seeds traditionally used for beading[4]

Notes:

1 Plants of the Western Boreal Forest and Aspen Parkland.

2 Traditional Plant Foods of Canadian Indigenous Peoples: Nutrition, Botany and Use.

3 The Boreal Herbal, Wild Food and Medicine Plants of the North.

4 Louis Riel Institute.

It is understood that during stakeholder consultation in the fall of 2023, local community experts will have an opportunity to provide a more detailed traditional knowledge and historical land uses account of the PSA to better guide the development of the NAMP.

3.1.10 SPECIES OF CONSERVATION OR RESTORATION INTEREST

The prevalence of native grasslands in good condition within the site provide a great opportunity to invest time and effort in appropriate restoration projects to further enhance these areas in the future. Two key species of restoration and conservation interest are crowfoot violet and rough fescue. Crowfoot violets have key associated pollinators, including skippers *(Hesperiidae sp)* and bumble bees *(Bombus sp.)* and are propagated easily through seed (Manitoba Museum, 2014). EDI counted a stand of approximately 225 plants, which is a sizeable population that can sustain a managed seed harvest. Alternatively, Plains rough fescue is slow to grow from seed but does well once established, so a vegetative propagation program is much better suited for this species (Slogan, 1997).

A confirmed wildlife species that is of interest as an SOMC within the PSA is the northern leopard frog. The life cycle of the northern leopard frog requires three distinct habitat types: deep and permanent waterbodies for over wintering, a variety of semi-permanent and permanent waterbodies such as wetlands for breeding, and moist upland meadows or grasslands for summer (Environment Canada, 2013). It is important for northern leopard frogs to have access to a corridor between these habitats to successfully complete their life cycle.

3.1.10.1 *THREATS*

According to the information reviewed, some of the key threats to the conservation and future sustainability of the PSA include, but are not limited to:

- Undesirable woody species management of European buckthorn and caragana will require a multi-year and integrated weed management program utilizing multiple control methods. European buckthorn alters soil properties which over time reduces the density and distribution of native species competitors (Heneghan et al., 2006), and it is dispersed easily through ecosystems by avian species. Caragana is a species which is resistant to many chemical and mechanical controls, often requiring multiple treatments to limit its spread as its seeds are unaffected by control methods and can quickly recolonize an area (Tree Canada).
- Leafy spurge *(Euphorbia esula)* produces a milky latex that is unpalatable to browsing ungulates or mammals and can produce blisters and swelling when contact is made (Invasive Species Council of BC, 2017).
- Common tansy *(Tanacetum vulgare)* can quickly outcompete native plants and produces a toxic compound that can harm cattle and wildlife when ingested (NCC, 2023).
- Although not detected within the LSA or PSA, wild boar *(Sus scrofa)* may become a serious threat. They are a destructive and elusive invasive species, expanding exponentially out of control on the Canadian prairies (Shewaga, 2021). They can cause severe damage to crops, riparian areas and other natural habitats through behaviours such as digging, rooting and wallowing. In addition, feral pigs are known to harass livestock and wildlife (Avila et al., 2022). While not observed within the Small Swale, they have the potential to pose a significant threat to user groups and the ecology of the area.

4 KNOWLEDGE GAPS

During the course of the baseline summary investigation, several areas where additional information will be required to inform the Small Swale NAMP were identified. The 'knowledge gaps' have been organized by Soils, Vegetation, Aquatics, and Wildlife

SOIL

- The Meewasin Valley-wide Resource Management Plan has an objective to work with the City of Saskatoon to develop a restoration plan and begin implementation various strategies to restore the snow dump located in the Small Swale by 2027. The current condtion of soil present is unknown; however, it can be assumed that there are contaminants (e.g., road salt) which have leached into the soil and possibly the groundwater. An in depth soil anaylysis should be conducted to confirm the presence and delinate the extent of any contamination plume prior to undertaken any site reclamation activites.

VEGETATION

- Detailed habitat classification and distribution do not currently exist for the entire PSA and should be further investigated to assist with future management objectives. The current scale of information is too coarse to set an appropriate baseline to track change once formal management has been initiated. With the current level of information, it will prove challenging to identify site-specific targets and constraints. For example:
  - Acquiring select historical imagery for the area will aid in boundary delineation for the identified natural assets.
  - Document and map the distribution of current nuisance and noxious weeds to facilitate current and future weed management planning.
  - Locate and identify SOMC previously listed or that are potentially in the PSA (using iNaturalist and local experts) and provide photographic documentation of specimen and surrounding habitat. Some records, as seen in Table 3-7, are historical (greater than 10 years old), and habitat may no longer exist to support these species (such as pale moonwort [*Botrychium pladdifum],* which was last observed in 1994).
  - Consider undertaking a targeted soil investigation to confirm the soil classifications noted in order to increase the probability of success when developing native restoration/enhancements and identifying areas of elevated erosion risk.
  - Consider undertaking detailed species inventories for vegetative features, with a targeted approach for SOMC, as detection will guide decision-making processes for the NAMP.
- Confirmation regarding the continued presence of the temporary snow storage facility and possible contamination resulting from the operation of this facility.

AQUATICS

- Water quality is currently unknown. Consider undertaking a water chemistry analysis (surface and groundwater) to develop a baseline water quality understanding for future use targeting any contamination run on or for the consideration of infrastructure planning and targeted restoration/rehabilitation (as required).
- Consider developing a drainage/climate resiliency plan to inform future trail/park infrastructure placement (if proposed) and expected pre-development run on to sustain the Small Swale.
- Water balance:
  - Native Plant Solutions (2019) has initiated an understanding of the current (watershed/catchments provide hydrological inputs to the various wetlands located within the PSA. It is understood that additional efforts will be employed in 2023 to further refine wetland condition, wetland edge/delineation, surrounding landscape condition/use, connectivity, and wetland classification. Spatial extents/locations for restoration/enhancement opportunities should be identified. In addition, future post-development possible inlet/outlet locations should be reviewed and verified on site to minimize post-development community changes that may result from appropriately locating future artificial run on/off interfaces. At best, nature inflow/outflow locations should be prioritized over other alternatives.

- The wetlands located within the PSA maybe be influenced by the Forest Farm Aquifer and present areas of surface expression (e.g., discharge). The level of influence this aquifer represents, in addition to refining the interaction with surface water should factor into a hydrological balancing evaluation process that should be developed as directed by the NAMP to inform future development with the noted watersheds. The process, at a minimum, should consider the use of hydraulic-hydrologic computer modelling software (e.g., PC-SWMM) to generate appropriate surface water management volumes that consider seasonal variability in order to mimic the current dynamic hydrological regime present in a post-development scenario.

WILDLIFE

- Confirm if moderate to high probability species listed are utilizing areas within the PSA as part of their natural lifecycle as direct management objectives may be required to sustain the confirmed species identified. At this time, the only species confirmed to occur in the PSA is northern leopard frog.
- Baseline information pertaining to medium- and large-sized terrestrial mammal use is limited in the documentation provided. Consider targeted surveys to develop a baseline understanding of habitat use and seasonal movement. This information is useful when considering infrastructure placement (e.g., trails, roads).
- Only male deer could be identified using remote camera photos and were monitored in summer 2019. Movement patterns from female and young of the year may differ from males. Consider additional remote camera surveys to develop a better understanding of wildlife movement patterns throughout each of the four seasons.
- Wild boar have not been detected within the LSA; however, regular communication should be made with the Canadian Wild Pig Research Project, and pre-emptive measures should be taken to ensure they do not inhabit the PSA.

5 CONCLUSION

WSP was retained by the City of Saskatoon to complete a literature and desktop environmental review of available information describing the present environmental condition of the portion of the Small Swale that resides within the City of Saskatoon and identify any data gaps required to facility the preparation of a future NAMP for this area.

The following highlights the dominant environmental features and SOMC that were noted or have the potential to occur in the PSA:

- The PSA consists of 6.6 ha (7.7%) Native Dominated Grassland, 21.8 ha (25.6%) Native Dominated Tame Grassland, 6.4 ha (7.5%) Tame Grassland, and 23.4 ha (27.5%) Wetlands.
- Four Nuisance and seven Noxious weed species have been identified in the PSA.
- 11 wetlands were identified within the Wetland PSA. The majority of the wetlands identified were Class III and Class V, encompassing 4.5 ha and 17.7 ha, respectively, of the Wetland Habitat Subcategory mapped.
- Three watersheds were identified by Native Plant Solutions that influence surface water inputs to the greater Small Swale. Of these three, two (Watershed B and C) provide surface water runoff to the wetlands located within the PSA.
- The Small Swale is believed to be linked to the Forest Farm Aquifer, and may influence the hydrology sustaining the wetlands located within the PSA.
- Based on the desktop review, five flora SOMC were identified with high potential (these species have either been confirmed or correlating preferred habitat exists) to be present in the PSA:
  - Crawe's sedge, wood lily (confirmed by EDI), few-flowered aster, plains rough fescue (confirmed by EDI), and crowfoot violet (confirmed by EDI).
- Based on the desktop review, 16 faunal SOMC were identified with high potential to be present in the PSA:
  - Baird's sparrow, barn swallow, common nighthawk, horned grebe, lesser yellow legs, loggerhead shrike, osprey, peregrine falcon, rusty blackbird, sharp-tailed grouse, short-eared owl, northern leopard frog (three locations confirmed by EDI), and American badger.
  - Invertebrates include the goldenrod gall fly *(Eurosta solidaginis),* monarch *(Danaus plexippus plexippus)*, and twice-stabbed lady beetle *(Chilocorus stigma)*.
- HABISask indicates there are 35 species found within the South Saskatchewan River. The PSA may indirectly influence fish and fish habitat; however, the nature of the hydrological linkages are still unknown. Passive deposition to the more hydrologically stable (e.g., semi-permanent) wetlands through methods such as mammals and avian species inadvertently moving eggs attached to their bodies (Villazonn, 2023) or after passing through their digestive system (Nuwer, 2020) may occur. However, it is unlikely that they would survive in the current conditions present (e.g., open water areas may freeze to the bottom and, as a result, have anoxic conditions overwinter).

These observations require consideration for future site design and site improvements.

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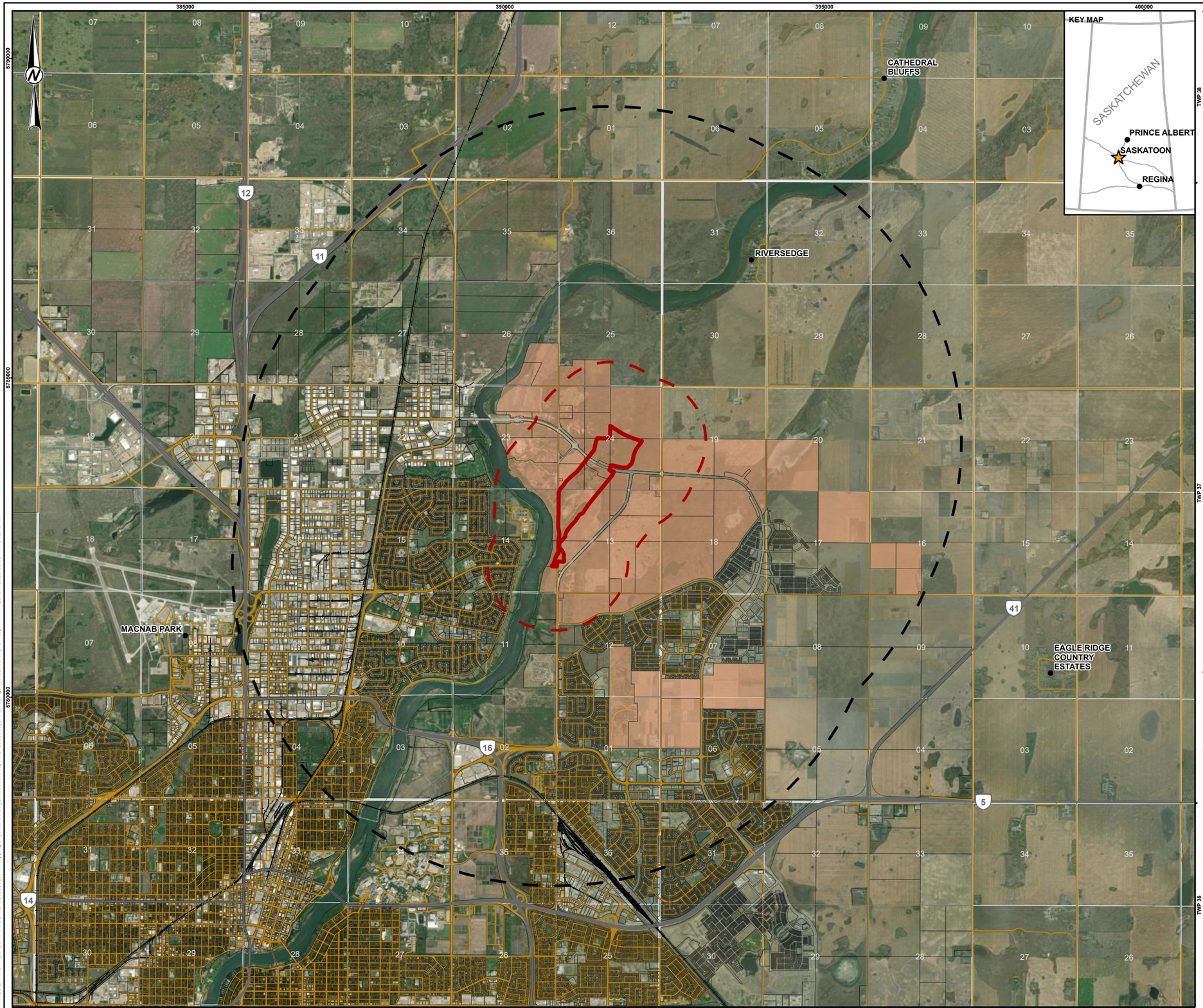
COMPLETE LIST OF CITY-SUPPLIED DOCUMENTS REVIEWED FOR THE PROJECT

- Management plan boundaries for the Small Swale and RSBBAA.
- Approved land use plans for adjacent areas (e.g., University Heights, Blairmore) found on the City's Sector Plan web page.
- Blairmore Natural Area Screening Final Report, 2022.
- Bylaw No. 9700 – Official Community Plan, 2020.
- City of Saskatoon Climate Adaptation Strategy:
  - Climate Projections and Possible Impacts (Part 1).
  - Corporate Climate Adaptation Strategy (Part 2).
- City of Saskatoon Contractor Environment Guidelines, 2019).
- City of Saskatoon Green Infrastructure Strategy, 2020.
- City of Saskatoon Pathways for an Integrated Green Network, 2022.
- City of Saskatoon Standard Construction Specifications, 2023.
- City of Saskatoon Wetland Policy (C09-041).
- Meewasin Northeast Policy, 2015.
- Meewasin Valley-wide Resource Management Plan, 2017.
- Montgomery Place Local Area Plan Final Report, 2018.
- Natural Areas Inventory for the City of Saskatoon, 2019.
- Natural Asset Inventory Dashboard, 2021.
- Natural Capital Asset Valuation Pilot Project, 2020.
- Northeast Swale Development Guidelines, 2012.
- Northeast Swale Resource Management Plan, 2013.
- Native Plant Solutions – Small Swale Study (draft report), 2023.
- UH3 Natural Area Screening Report, 2021.
- UH3 Natural Area Screening What We Heart Report, 2022.

APPENDIX

A FIGURES

LIST OF FIGURES



LEGEND

- POPULATED PLACE
- PRIMARY HIGHWAY
- LOCAL ROAD
- RAILWAY
- PARCEL BOUNDARY
- UNIVERSITY HEIGHTS DEVELOPMENT AREA
- PROJECT STUDY AREA
- LOCAL STUDY AREA
- REGIONAL STUDY AREA

DRAFT

0 1,200 2,400

1:60,000 METRES

REFERENCE(S)

PARCEL BOUNDARIES PROVIDED BY THE CLIENT, MAY 2023. IMAGERY COPYRIGHT © 20220626 ESRI AND ITS LICENSORS. SOURCE: VIVID-MAXAR. USED UNDER LICENSE, ALL RIGHTS RESERVED. BASE DATA MAY BE OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED OR IHS MARKIT CANADA LIMITED.PROJECTED COORDINATE SYSTEM: NAD 1983 UTM ZONE 13N

CLIENT
CITY OF SASKATOON

PROJECT
SMALL SWALE NATURAL AREA MANAGEMENT PLAN

TITLE
SITE LOCATION

CONSULTANT

wsp

YYYY-MM-DD	2023-08-03
DESIGNED	BN
PREPARED	LMS
REVIEWED	
APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25mm

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394000
5784000
5782000
TWP 37
RGE 05 W3M
RGE 04 W3M
27
26
25
30
23
24
19
14
13
18
11
12
07
South Saskatchewan River
SASKATOON

LEGEND

- PROJECT STUDY AREA
- VEGETATION LOCAL STUDY AREA
- LOCAL ROAD
- CLOSED CANOPY DECIDUOUS WOODLAND
- CROP LAND (CULTIVATED)
- DISTURBED/GRAVEL PIT
- DISTURBED/DEVELOPED
- HAY LAND (FORAGE)
- NATIVE DOMINANT GRASSLAND
- NATIVE DOMINANT/TAME GRASSLAND
- OPEN CANOPY DECIDUOUS WOODLAND
- SOUTH SASKATCHEWAN RIVER
- ROAD
- TALL SHRUB GRASSLAND
- TAME GRASSLAND
- WETLAND
- YARD SITE ABANDONED/TAME GRASSLAND
- YARD SITE ACTIVE
- <ALL OTHER VALUES>

DRAFT

0 400 800

1:20,000 METRES

REFERENCE(S)

PROJECTED COORDINATE SYSTEM: NAD 1983 UTM ZONE 13N

CLIENT
CITY OF SASKATOON

PROJECT
SMALL SWALE NATURAL AREA MANAGEMENT PLAN

TITLE
LAND COVER CLASSIFICATION

CONSULTANT

YYYY-MM-DD	2023-08-03
DESIGNED	BN
PREPARED	LMS
REVIEWED	
APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
CA0003383.0741	200	A	2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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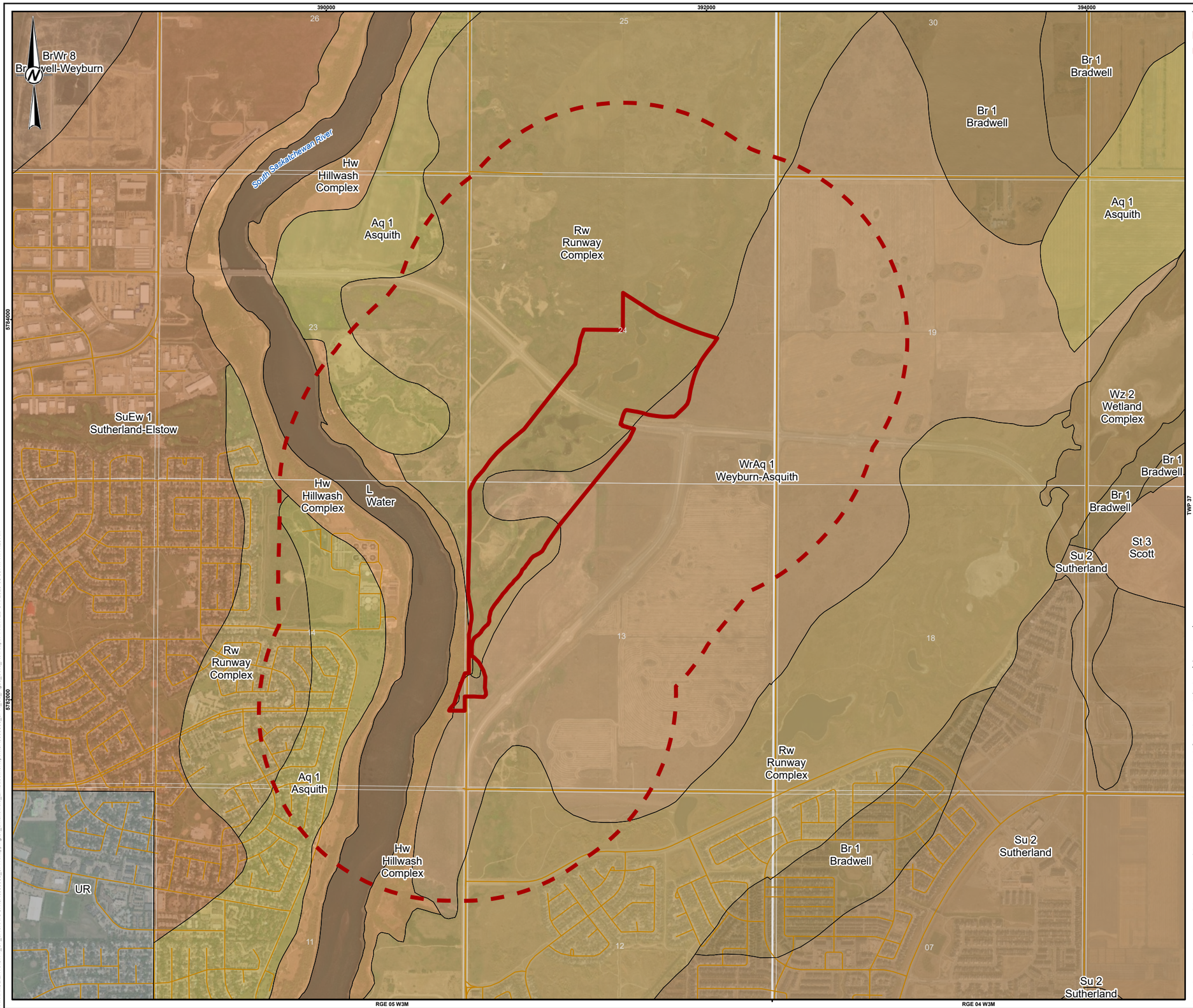

LEGEND

- PROJECT STUDY AREA
- SOILS LOCAL STUDY AREA
- LOCAL ROAD

SOIL ASSOCIATIONS

- ASQUITH
- BRADWELL
- BRADWELL-WEYBURN
- HILLWASH COMPLEX
- NONE - URBAN
- RUNWAY COMPLEX
- SCOTT
- SUTHERLAND
- SUTHERLAND-ELSTOW
- WATER
- WETLAND COMPLEX
- WEYBURN-ASQUITH

SYMBOL SEQUENCE

ASSOCIATION SYMBOL ← An 2 Allan → MAP UNIT

ASSOCIATION NAME

DRAFT

0 400 800

1:20,000 METRES

NOTE(S)

1. THE NUMBERS SHOWN WITH ASSOCIATION LABELS ARE TERMED MAP UNITS AND INDICATE DIFFERENT AND SPECIFIED COMBINATIONS OF SOIL SUBGROUP PROFILES WITHIN AN ASSOCIATION THAT ARE THE RESULT OF VARIATIONS IN TOPOGRAPHY, DRAINAGE OR ASPECT.

REFERENCE(S)

SOILS DATA OBTAINED FROM SASKATCHEWAN LAND RESOURCE UNIT - AGRICULTURE AND AGRI-FOOD CANADA, 2004. DIGITAL SOIL RESOURCE INFORMATION FOR AGRICULTURAL SASKATCHEWAN SKSISV2, 1:100,000 SCALE. IMAGERY COPYRIGHT © 20220626 ESRI AND ITS LICENSORS. SOURCE: VIVID-MAXAR. USED UNDER LICENSE, ALL RIGHTS RESERVED. BASE DATA MAY BE OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED OR IHS MARKIT CANADA LIMITED.PROJECTED COORDINATE SYSTEM: NAD 1983 UTM ZONE 13N

CLIENT
CITY OF SASKATOON

PROJECT
SMALL SWALE NATURAL AREA MANAGEMENT PLAN

TITLE
SOILS

CONSULTANT

wsp

YYYY-MM-DD	2023-08-03
DESIGNED	BN
PREPARED	LMS
REVIEWED	
APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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5752000
TWP 37
RGE 05 W3M
RGE 04 W3M

LEGEND

- PROJECT STUDY AREA
- VEGETATION LOCAL STUDY AREA
- LOCAL ROAD
- RAILWAY
- CLASS I WETLAND
- CLASS II WETLAND
- CLASS III WETLAND
- CLASS IV WETLAND
- CLASS V WETLAND
- ANTHROPOGENIC WETLAND

DRAFT

0 400 800

1:20,000 METRES

REFERENCE(S)

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CLIENT
CITY OF SASKATOON

PROJECT
SMALL SWALE NATURAL AREA MANAGEMENT PLAN

TITLE
WETLANDS CLASSIFICATION

CONSULTANT

YYYY-MM-DD	2023-08-03
DESIGNED	BN
PREPARED	LMS
REVIEWED	
APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
CA0003383.0741	200	A	4

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TWP 37
RGE 05 W3M
RGE 04 W3M
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LEGEND

- PROJECT STUDY AREA
- WILDLIFE LOCAL STUDY AREA
- LOCAL ROAD
- RAILWAY

- AMERICAN BADGER
- BANK SWALLOW
- BARN SWALLOW
- BLACK-NECKED STILT
- BOBOLINK
- BROAD-WINGED HAWK
- COMMON NIGHTHAWK
- COOPER'S HAWK
- GLAUCOUS GULL
- GOLDENROD GALL FLY
- HARRIS'S SPARROW
- HORNED GREBE
- LAKE STURGEON
- LESSER YELLOWLEGS
- LITTLE BROWN MYOTIS
- LOGGERHEAD SHRIKE
- MIGRATORY BIRD CONCENTRATION SITE
- MONARCH
- NORTHERN LEOPARD FROG
- NORTHERN SHRIKE
- OLIVE-SIDED FLYCATCHER
- OSPREY
- PEREGRINE FALCON
- PINE GROSBEAK
- PRAIRIE FALCON
- RED-HEADED WOODPECKER
- RUSTY BLACKBIRD
- SHARP-TAILED GROUSE
- SHORT-EARED OWL
- TOWNSEND'S SOLITAIRE
- TURKEY VULTURE
- WESTERN RED DAMSEL
- WHOOPING CRANE
- YELLOW RAIL
- YELLOW-BANDED BUMBLE BEE

DRAFT

0 400 800
1:20,000 METRES

NOTE(S)

1. THE INFORMATION DISPLAYED ON THIS MAP IS MADE AVAILABLE BY THE SASKATCHEWAN GOVERNMENT. THE GOVERNMENT OF SASKATCHEWAN MAKES NO GUARANTEE REGARDING THE ACCURACY OF THE INFORMATION. THIS INFORMATION IS UPDATED CONSISTENTLY AND THIS FIGURE IS A REPRESENTATION OF THE DATA ONLY FOR THE DATE INDICATED HERE: JUNE 2023.

REFERENCE(S)

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CLIENT
CITY OF SASKATOON

PROJECT
SMALL SWALE NATURAL AREA MANAGEMENT PLAN

TITLE
SPECIES OF MANAGEMENT CONCERN (WILDLIFE)

CONSULTANT
wsp

YYYY-MM-DD	2023-08-03
DESIGNED	BN
PREPARED	LMS
REVIEWED	
APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
CA0003383.0741	200	A	5

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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TWP 37
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RGE 04 W3M

LEGEND

- PROJECT STUDY AREA
- VEGETATION LOCAL STUDY AREA
- LOCAL ROAD

- BLUEFLAG
- BRISTLE-LEAVED SEDGE
- CRAWE'S SEDGE
- CROWFOOT VIOLET
- CURVED YELLOW-CRESS
- DWARF CLUBRUSH
- EARLY CINQUEFOIL
- FEW-FLOWERED ASTER
- HAIRY GERMANDER
- HOOKER'S BUGSEED
- HUDSON'S CINQUEFOIL
- LESSER FRINGED GENTIAN
- LITTLE YELLOW-RATTLE
- LOW WHITLOWWORT
- MACOUN'S GENTIAN
- MARSH FELWORT
- MENZIES' CATCHFLY
- MUCRONATE BLUE-EYED-GRASS
- NARROW-LEAVED WATER PLANTAIN
- PALE MOONWORT
- PLAINS ROUGH FESCUE
- PRAIRIE DUNEWORT
- RED BULRUSH
- ROCKY MOUNTAIN SEDGE
- SANDHILLS CINQUEFOIL
- SMALL YELLOW LADY'S SLIPPER
- SMOOTH WILD ROSE
- STRIPED CORAL-ROOT
- TALL BLUE LETTUCE
- UPLAND WHITE GOLDENROD
- WATER PIMPERNEL
- WOOD LILY

DRAFT

0 400 800

1:20,000 METRES

NOTE(S)

1. THE INFORMATION DISPLAYED ON THIS MAP IS MADE AVAILABLE BY THE SASKATCHEWAN GOVERNMENT. THE GOVERNMENT OF SASKATCHEWAN MAKES NO GUARANTEE REGARDING THE ACCURACY OF THE INFORMATION. THIS INFORMATION IS UPDATED CONSISTENTLY AND THIS FIGURE IS A REPRESENTATION OF THE DATA ONLY FOR THE DATE INDICATED HERE: JUNE 2023.

REFERENCE(S)

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CLIENT
CITY OF SASKATOON

PROJECT
SMALL SWALE NATURAL AREA MANAGEMENT PLAN

TITLE
SPECIES OF MANAGEMENT CONCERN (VEGETATION)

CONSULTANT

wsp

YYYY-MM-DD	2023-08-03
DESIGNED	BN
PREPARED	LMS
REVIEWED	
APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
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APPENDIX

B SITE PHOTOGRAPHS

Photo B-1: Looking east at Class II (temporary) wetland in the Small Swale PSA; June 14, 2023 (382388E, 5785692N)

Photo B-2: Looking west at Tame Pasture habitat type; June 14, 2023 (392379E, 5785686N)

Photo B-3: Looking east at Class II wetland in the PSA; June 14, 2023 (392386E, 5785556N)

Photo B-4: Looking north at Native Dominant / Tame Grassland habitat type; June 14, 2023 (392188E, 5784645N)

Photo B-5: Looking south at Class IV (semi-permanent) wetland in the PSA; June 14, 2023 (391955E, 5784288N)

Photo B-6: Looking east at Class V (permanent) wetland; June 14, 2023 (391829E, 5784249N)

Photo B-7: Looking east at Cultivated habitat type and Class II wetland; June 14, 2023 (390705E, 5783097N)

Photo B-8: Looking south at Class IV (semi-permanent) wetland in the PSA; June 14, 2023 (390705E, 5783097N)

Photo B-9: Looking east at Class IV wetland in the PSA; June 14, 2023 (390799E, 578639N)

Photo B-10: Looking south at snow dump area. Noted litter and garbage present; June 14, 2023 (391006E, 5783027N)

Photo B-11: Nest. Willet (*Tringa semipalmata*) and avocet (*Recurvirostra avosetta*) species were present in area but were not alarming at time of finding the nest. Possibly abandoned; Jue 14, 2023 (390995E, 5783053N)

APPENDIX

C HABITAT TYPE DESCRIPTIONS

HABITAT TYPE	DESCRIPTION
Crop Land	Land that is cultivated and/or seeded annually to produce grains, seeds or legumes
Disturbed/Developed	Land that is disturbed by construction activities either permanently or temporary
Disturbed/Gravel Pit	Gravel pit
Yard Site	Active residence
Yard Site Abandoned/Tame Grassland	Abandoned residence with idle introduced grass species
Hay Crop (Forage)	Land that is cut/mowed annually to produce livestock forage
Closed Canopy Deciduous Woodland	Dense deciduous tree cover with a thick overstory
Open Canopy Deciduous Woodland	Sparse deciduous tree cover with an open over story
Open Canopy Mixed Woodland	Sparse mixedwood (deciduous and coniferous) tree cover with an open over story
Tall Shrub Grassland	Grassland habitat dominated by Tall shrub (e.g., wolf willow) cover
Native Dominant Grassland	Land dominated by native grass, forb and shrub species that has not been cultivated, or historically broken land that has re-vegetated naturally with native species
Native Domiannt Grassland/Tame Grassland	Land that contains a relatively even mix or patchwork of native (grass, forb and shrub) and introduced (tame) grass species
Tame Grassland	Land that has a higher number of introduced species than native species because of encroachment or direct seeding
Wetland	Land that is saturated with water for a long enough period to promote wetland or aquatic proces as indicated by poorly drained soils, hdrophytic vegetation, and various kinds of biological activity which are adapted to a wet environment.

Source: EDI 2021

APPENDIX

D OBSERVED VEGETATION IN SMALL SWALE

COMMON NAME	SCIENTIFIC NAME	LIFEFORM	SKCDC RANK[(a)]
absinthe	*Artemisia absintha*	Forb	SNA
alfalfa	*Medicago sativa* ssp. *sativa*	Forb	SNA
alkali buttercup	*Ranunculus cymbalaria*	Forb	S4
alum root	*Heuchera richardsonii*	Forb	S4
American vetch	*Vicia americana*	Forb	S5
American wild strawberry	*Fragaria vesca*	Forb	S4
annual sunflower	*Helianthus annuus*	Forb	S4
awned wheatgrass	*Elymus trachycaulus* ssp. *subsecundum*	Graminoid	S5
balsam/black poplar	*Populus balsamifera*	Tree	S5
Baltic rush	*Juncus balticus*	Graminoid	S4
barnyard grass	*Echinochloa crusgalli*	Graminoid	SNA
beaked willow	*Salix bebbiana*	Shrub	S4
beautiful sunflower	*Helianthus laetiflorus* var. *subrhomboideus*	Forb	
black medic	*Medicago lupilina*	Forb	SNA
blue grama	*Bouteloua gracilis*	Graminoid	S5
blue lettuce	*Lactuca pulchella*	Forb	S4
blunt sedge	*Carex obtusata*	Graminoid	S5
bog violet	*Viola nephrophylla*	Forb	S4?
broad-leaved water-plantain	*Alisma triviale*	Forb	S4
Canada fleabane	*Conyza canadensis*	Forb	S4
Canada goldenrod	*Solidago canadensis* var. *canadensis*	Forb	S5
Canada thistle	*Cirsium arvense*	Forb	SNA
Canadian milk-vetch	*Astragalus canadensis*	Forb	S4
caragana	*Caragana arborescens*	Shrub	SNA
choke cherry	*Prunus virginiana*	Shrub	S5
cicer milk-vetch	*Astragalus cicer*	Forb	SNA
clubmoss	*Lycopodium sp.*	Forb	-
common broomweed	*Gutierrezia sarothrae*	Forb	S4
common cattail	*Typha latifolia*	Forb	S4
common dandelion	*Taraxacum officinale*	Forb	SNA
common horse-tail	*Equisetum arvense*	Forb	S5
common nettle	*Urtica dioica*	Forb	S5
common pepper-grass	*Lepidium densiflorum*	Forb	S4
common plantain	*Plantago major*	Forb	SNA
common scouring rush	*Equisetum hyemale* var. *affine*	Forb	S5
common tall sunflower	*Helianthus nuttallii*	Forb	S4
common yarrow	*Achillea millefolium*	Forb	S5

COMMON NAME	SCIENTIFIC NAME	LIFEFORM	SKCDC RANK[(a)]
creeping spike rush	*Eleocharis palustris*	Graminoid	S5
crested wheatgrass	*Agropyron cristatum*	Graminoid	SNA
Crowfoot violet	*Viola pedatifida*	Forb	S3
curly-cup gumweed	*Grindelia squarrosa*	Forb	SNR
dock	*Rumex sp.*	Forb	
dotted blazing-star	*Liatris punctata*	Forb	S5
early blue violet	*Viola adunca*	Forb	S5
early cinquefoil	*Potentilla concinna*	Forb	S4
early meadow rue	*Thalictrum venulosum*	Forb	S5
European buckthorn	*Rhamnus cathartica*	Shrub	SNA
everlasting species	*Antennaria sp.*	Forb	-
field bindweed	*Convolvulus arvensis*	Forb	SNA
field pussytoes	*Antennaria neglecta*	Forb	S4
flix-weed	*Descurainia sophia*	Forb	SNA
flodman's thistle	*Cirsium flodmanii*	Forb	S4
fowl manna grass	*Glyceria striata*	Graminoid	S4
gaillardia	*Gaillardia aristata*	Forb	S4
golden-bean	*Thermopsis rhombifolia*	Forb	S5
green foxtail	*Setaria viridis*	Graminoid	SNA
hairy golden-aster	*Heterotheca villosa*	Forb	S5
hairy umbrellawort	*Mirabilis hirsuta*	Forb	SNR
harebell	*Campanula rotundifolia*	Forb	S5
heart-leaved alexander	*Zizia aptera*	Forb	S4
horitcultural spruce (possibly blue spruce)	*Picea sp.*	Tree	-
horticultural pine (possibly scots pine)	*Pinus sp.*	Tree	-
Indian breadroot	*Psoralea esculenta*	Forb	S4
Indian hemp	*Apocynum cannabinum*	Forb	S4
June grass	*Koeleria macrantha*	Graminoid	S5
Kentucky bluegrass	*Poa pratensis*	Graminoid	SNA
kochia	*Kochia scoparia*	Forb	SNA
lamb's quarters	*Chenopodium album*	Forb	SNA
leafy spurge	*Euphorbia esula*	Forb	SNA
lesser duckweed	*Lemna minor*	Forb	S5
little bluestem	*Schizachyrium scoparium*	Graminoid	S4
long-fruited anemone	*Anemone cylindrica*	Forb	S4
low goldenrod	*Solidago missouriensis*	Forb	S5
low prairie rose	*Rosa arkansana*	Shrub	S5
Manchurian/Siberian elm	*Ulmus pumila*	Tree	SNA
Manitoba maple	*Acer negundo*	Tree	S5

COMMON NAME	SCIENTIFIC NAME	LIFEFORM	SKCDC RANK[(a)]
many-flowered aster	*Symphyotrichum ericoides*	Forb	S5
marsh ragwort	*Senecio congestus*	Forb	S4
marsh reed-grass	*Calamagrostis canadensis*	Graminoid	S4
marsh willow-herb	*Epilobium palustre*	Forb	S4
meadow blazing-star	*Liatris ligulistylis*	Forb	S4
mealy primrose	*Primula incana*	Forb	S4
milk-vetch species	*Astragalus sp.*	Forb	
moss phlox	*Phlox hoodii*	Forb	S5
mountain goldenrod	*Solidago spathulata* var. *neomexicana*		
narrow-leaved meadow sweet	*Spiraea alba*	Forb	S4
narrow-leaved puccoon	*Lithospermum incisum*	Forb	S4
needle and thread grass	*Hesperostipa comata* ssp. *comata*	Graminoid	S5
nodding thistle	*Carduus nutans*	Forb	SNA
northern bedstraw	*Galium boreale*	Forb	S5
northern wheatgrass	*Elymus lanceolatus* ssp. *lanceolatus*	Graminoid	S5
pale comandra	*Comandra umbellata*	Forb	S5
pasture sage	*Artemisia frigida*	Forb	S5
perennial sow-thistle	*Sonchus arvensis*	Forb	SNA
Philadelphia fleabane	*Erigeron philadelphicus*	Forb	S4
Plains Rough fescue	*Festuca hallii*	Graminoid	S3
Plains wormwood	*Artemisia campestris*	Forb	S5
prairie coneflower	*Ratibida columnifera*	Forb	S4
prairie crocus	*Anemone patens*	Forb	S5
prairie gentian	*Gentiana affinis*	Forb	S4
prairie muhly	*Muhlenbergia cuspidata*	Graminoid	S4
prairie onion	*Allium textile*	Forb	S4S5
prairie sage	*Artemisia ludoviciana*	Forb	S5
prairie selaginella/spikemoss	*Selaginella densa*	Forb	S4
purple prairie clover	*Dalea purpurea*	Forb	S5
pygmy flower	*Androsace septentrionalis*	Forb	S5
quack grass	*Agropyron repens*	Graminoid	SNA
rayless aster	*Symphyotrichum ciliatum*	Forb	S5
red goosefoot	*Chenopodium rubrum*	Forb	S4
reed canary grass	*Phalaris arundinacea*	Graminoid	S4
reflexed rock-cress	*Arabis holbelii*	-	-
rigid goldenrod	*Solidago rigida*	Forb	S4
round-leaved/firebelly hawthorn	*Crataegus chrysocarpa*	Shrub	S4

COMMON NAME	SCIENTIFIC NAME	LIFEFORM	SKCDC RANK[(a)]
Russian thistle	*Salsola kali*	Forb	SNA
saline shooting-star	*Dodecatheon pauciflorum*	Forb	S4
sand grass	*Calamovilfa longifolia*	Graminoid	S5
sandbar willow	*Salix interior*	Shrub	S4
saskatoon	*Amelanchier alnifolia*	Shrub	S5
scarlet gaura	*Gaura coccinea*	Forb	S4
sea-milkwort	*Lysimachia maritima*	Forb	S4
seaside arrow grass	*Triglochin maritima*	Graminoid	SNA
sheep fescue	*Festuca trachyphylla*	Graminoid	SNA
shepherd's purse	*Capsella burasa-pastoris*	Forb	SNA
silver-leaf psoralea	*Psoralea argophylla*	Forb	S5
silverleaf psoralia	*Pediomellum argophyllum*	Forb	S5
silverweed	*Potentilla anserina*	Forb	S4
skeleton weed	*Lygodesmia juncea*	Forb	S5
slender milk-vetch	*Astragalus flexuosus*	Forb	S4
slender wheatgrass	*Elymus trachycaulus*	Graminoid	S5
slough grass	*Beckmannia syzigachne*	Graminoid	S4
small-leaved pussytoes	*Antennaria parvifolia*	Forb	S4
smooth blue aster	*Symphyotrichum laeve*	Forb	S5
smooth brome	*Bromus inermis*	Graminoid	SNA
smooth scouring rush	*Equisetum laevigatum*	Forb	S4
spear-leaved goosefoot	*Monolepis nuttalliana*	Forb	S4
stinkweed	*Thlaspi arvense*	Forb	SNA
sweet grass	*Hierochloe odorata*	Graminoid	S5
thorny buffaloberry	*Sheperdia argentea*	Shrub	S4
thread-leaved sedge	*Carex filifolia*	Graminoid	S5
three flowered avens	*Geum triflorum*	Forb	S5
three-square bulrush	*Schoenoplectus pungens*	Graminoid	S4
trembling aspen	*Populus tremuloides*	Tree	S5
viscid/hard-stem bulrush	*Schoenoplectus acutus*	Graminoid	S5
water hemlock	*Cicuta maculata*	Forb	S4
water sedge	*Carex aquatilus*	Graminoid	S4
wavyleaf thistle	*Cirsium undulatum*	Forb	S4
western porcupine grass	*Hesperostipa curtiseta*	Graminoid	S5
western red lily	*Lilium philadelphicum*	Forb	S4
western snowberry	*Symphoricarpos occidentalis*	Shrub	S5
western water horehound	*Lycopus asper*	Forb	S4

COMMON NAME	SCIENTIFIC NAME	LIFEFORM	SKCDC RANK[(a)]
western wheatgrass	*Pascopyrum smithii*	Graminoid	S5
western wild bergamot	*Monarda fistulosa* var. *menthaefolia*	Forb	S4
white cinquefoil	*Potentilla arguta*	Forb	S4
white evening-primrose	*Oenothera nuttallii*	Forb	S5
white prairie/heath aster	*Symphyotrichum falcatum* var. *commutatum*	Forb	S5
white sweet-clover	*Melilotus alba*	Forb	SNA
wild barley	*Hordeum jubatum*	Graminoid	S5
wild blue flax	*Linum lewisii*	Forb	S5
wild licorice	*Glycyrrhiza lepidota*	Forb	S4
wild mint	*Mentha arvense*	Forb	SNA
wolf willow	*Eleagnus commutata*	Shrub	S4
wood's rose	*Rosa woodsii*	Shrub	S5
yellow alfalfa	*Medicago sativa* ssp. *falcata*	Forb	SNA
yellow goat's-beard	*Tragopogon dubius*	Forb	SNA
yellow sweet-clover	*Melilotus officinalis*	Forb	SNA

Notes:

a) Saskatchewan Conservation Data Centre Tracked Taxa Lists (SKCDC 2023a)

S4 = Apparently Secure; uncommon but not rare

S3 = Vulnerable / Rare to Uncommon; at moderate risk of extinction or extirpation due to restricted range, relatively few populations, recent and widespread declines, threats, or other factors.

S2 = Imperiled / Very Rare; at high risk of extinction or extirpation due to a very restricted range, very few populations, steep declines, threats or other factors

S1 = Critically Imperiled / Extremely Rare; at very high risk of extinction or extirpation due to extreme rarity, very steep declines, high threat level, or other factors

APPENDIX

E TRACKED VASCULAR PLANT SPECIES WITHIN THE SASKATOON PLAIN REGION

Tracked Vascular Plant Species in the Saskatoon Plain (K08)

COMMON NAME	*SCIENTIFIC NAME*	SKCDC RANK
American Bugseed	*Corispermum americanum var. americanum*	S3
Awned Cyperus	*Cyperus squarrosus*	S3
Blue Wild Rye	*Elymus glaucus ssp. glaucus*	S3
Blueflag	*Iris versicolor*	S1
Bristle-leaved Sedge	*Carex eburnea*	S3
Bristly Gooseberry	*Ribes oxyacanthoides var. setosum*	S2
Bushy Cinquefoil	*Potentilla supina ssp. paradoxa*	S3
California Amaranth	*Amaranthus californicus*	S2
Chaffweed	*Anagallis minima*	S3
Columbia Needlegrass	*Achnatherum nelsonii ssp. dorei*	S3
Crawe's Sedge	*Carex crawei*	S3
Crowfoot Violet	*Viola pedatifida*	S3
Dry Goosefoot	*Chenopodium desiccatum*	S3
Dwarf Clubrush	*Trichophorum pumilum*	S1
Early Cinquefoil	*Potentilla concinna var. concinna*	S2
Engelmann's Spike-rush	*Eleocharis engelmannii*	S3
False Spikenard	*Maianthemum racemosum ssp. amplexicaule*	S1
Few-flowered Aster	*Almutaster pauciflorus*	S3
Great Solomon's Seal	*Polygonatum biflorum var. commutatum*	S2
Hairy Bugseed	*Corispermum villosum*	S2
Hairy Germander	*Teucrium canadense var. occidentale*	S3
Hooker's Bugseed	*Corispermum hookeri var. hookeri*	S2
Hudson's Cinquefoil	*Potentilla hudsonii*	S2
Lesser Duckweed	*Lemna minor*	S1
Little Yellow-rattle	*Rhinanthus minor ssp. minor*	S3
Longstem Water-wort	*Elatine triandra*	S2
Low Whitlowwort	*Paronychia sessiliflora*	S3
Macoun's Gentian	*Gentianopsis virgata ssp. macounii*	S3

Marsh Felwort	*Lomatogonium rotatum var. fontanum*	S3
Menzies' Catchfly	*Silene menziesii*	S3
Mingan Moonwort	*Botrychium minganense*	S1
Mucronate Blue-eyed-grass	*Sisyrinchium mucronatum*	S3
Narrow-leaved Water Plantain	*Alisma gramineum*	S3
Northern Blue-eyed-grass	*Sisyrinchium septentrionale*	S3
Pale Moonwort	*Botrychium pallidum*	S1
Pallas' Bugseed	*Corispermum pallasii*	S2
Plains Rough Fescue	*Festuca hallii*	S3
Prairie Dunewort	*Botrychium campestre*	S3
Pursh's Milk-vetch	*Astragalus purshii var. purshii*	S3
Red Bulrush	*Blysmopsis rufa*	S3
Red-stemmed Cinquefoil	*Potentilla rubricaulis*	S3
Rocky Mountain Sedge	*Carex saximontana*	S3
Sandhills Cinquefoil	*Potentilla lasiodonta*	S2
Small Dropseed	*Sporobolus neglectus*	S2
Small Yellow Lady's Slipper	*Cypripedium parviflorum var. makasin*	S3
Smooth Hawk's-beard	*Crepis runcinata ssp. hispidulosa*	S1
Soft Wild Bergamot	*Monarda fistulosa var. mollis*	S3
Striped Coral-root	*Corallorhiza striata var. striata*	S3
Tall Blue Lettuce	*Lactuca biennis*	S3
Tall Bur-marigold	*Bidens frondosa*	S3
Upland white goldenrod	*Solidago ptarmicoides*	S3
Water pimpernel	*Samolus parviflorus*	SH
Yukon Silverweed	*Potentilla anserina ssp. yukonensis*	S2

Notes:

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S4 = Apparently Secure; uncommon but not rare

S3 = Vulnerable / Rare to Uncommon; at moderate risk of extinction or extirpation due to restricted range, relatively few populations, recent and widespread declines, threats, or other factors.

S2 = Imperiled / Very Rare; at high risk of extinction or extirpation due to a very restricted range, very few populations, steep declines, threats or other factors

S1 = Critically Imperiled / Extremely Rare; at very high risk of extinvtion or extirpation due to extreme rarity, very steep declines, high threat level, or other factors

APPENDIX

F OBSERVED WILDLIFE SPECIES

Observed Wildlife Species in the Small Swale

COMMON NAME	SCIENTIFIC NAME	SKCDC RANK[A]	COSEWIC STATUS	*SARA* STATUS
AMPHIBIANS				
Boreal corus frog	*Pseudacris maculata*	S5	Not at Risk	-
northern leopard frog	*Lithobates pipiens*	S3	Special Concern	*Special Concern*
wood frog	*Lithobates sylvaticus*	S5	-	-
BIRDS				
alder flycatcher	*Empidonax alnorum*	S5B	-	-
American avocet	*Recurvirostra americana*	S4B	-	-
American crow	*Corvus brachyrhynchos*	S5B, S4N	-	-
American goldfinch	*Spinus tristis*	S5B	-	-
American redstart	*Setophaga ruticilla*	S5B	-	-
American robin	*Turdus migratorius*	S4B	Special Concern	Threatened
American white pelican	*Pelecanus erythrorhynchos*	S5B	Not at Risk	-
American wigeon	*Mareca americana*	S5B	-	-
Baltimore oriole	*Icterus galbula*	S5B	-	-
barn swallow	*Hirundo rustica*	S4B	Special Concern	*Threatened*
bendire's thrasher	*Toxostoma bendirei*	-	-	-
black tern	*Chlidonias niger*	S5B	Not at Risk	-
black-billed magpie	*Pica hudsonia*	S5	-	-
blue jay	*Cyanocitta cristata*	S5	-	-
blue-winged teal	*Spatula discors*	S5B	-	-
Brewer's blackbird	*Euphagus cyanocephalus*	S5B, SUN	-	-
brown thrasher	*Toxostoma rufum*	S5B	-	-
brown-headed cowbird	*Molothrus ater*	S4B	Special Concern	Special Concern
Canada goose	*Branta canadensis*	S5B	-	-
clay-colored sparrow	*Spizella pallida*	S5B	-	-
common grackle	*Quiscalus quiscula*	S5B	-	-
common nighthawk	*Chordeiles minor*	S4B	Special Concern	*Special Concern*
common raven	*Corvus corax*	S5	-	-
common snipe	*Gallinago gallinago*	-	-	-
common yellowthroat	*Geothlypis trichas*	S5B	-	-
downy woodpecker	*Dryobates pubescens*	S5	-	-
eastern kingbird	*Tyrannus tyrannus*	S5B	-	-
gadwall	*Mareca strepera*	S5B	-	-
gray catbird	*Dumetella carolinensis*	S5B	-	-
gray partridge	*Perdix perdix*	SNA	-	-

Observed Wildlife Species in the Small Swale

COMMON NAME	SCIENTIFIC NAME	SKCDC RANK[A]	COSEWIC STATUS	*SARA* STATUS
house wren	*Troglodytes aedon*	S3B	Threatened	Threatened
killdeer	*Charadrius vociferus*	S5B	-	-
least flycatcher	*Empidonax minimus*	S5B	-	-
lesser scaup	*Aythya affinis*	S5B	-	-
loggerhead shrike	*Lanius ludovicianus excubitorides*	S3B	Threatened	*Threatened*
mallard	*Anas platyrhynchos*	S5B	-	-
mourning dove	*Zenaida macroura*	S1B, SNRM	Not at Risk	-
northern harrier	*Circus hudsonius*	S4B	Not at Risk	-
northern shoveler	*Spatula clypeata*	S5B	-	-
osprey	*Pandion haliaetus*	S3B	-	-
peregrine falcon	*Falco peregrinus anatum*	S1B, SNRM	Not at Risk	-
purple martin	*Progne subis*	S5B	-	-
red-eyed vireo	*Vireo olivaceus*	S5B	-	-
red-tailed hawk	*Buteo jamaicensis*	S3B, SUN	Special Concern	Special Concern
red-winged blackbird	*Agelaius phoeniceus*	S5B, SUN	-	-
ring-billed gull	*Larus delawarensis*	S5B	-	-
rock pigeon	*Columba livia*	S5	-	-
rusty blackbird	*Euphagus carolinus*	S3B, SUN	Special Concern	*Special Concern*
Savannah sparrow	*Passerculus sandwichensis*	S3B, S2N	Threatened	Special Concern
sedge wren	*Cistothorus stellaris*	S5B	Not at Risk	-
sharp-tailed grouse	*Tympanuchus phasianellus*	S5	-	-
short-billed dowitcher	*Limnodromus griseus*	SUB, S4M	-	-
short-eared owl	*Asio flammeus*	S3B, S2N	Threatened	*Special Concern*
song sparrow	*Melospiza melodia*	S5B	-	-
sora	*Porzana carolina*	S5B	-	-
spotted towhee	*Pipilo maculatus*	S5B	-	-
Swainson's hawk	*Buteo swainsoni*	S4B	--	--
tree swallow	*Tachycineta bicolor*	S5B	-	-
turkey vulture	*Cathartes aura*	S3B	-	-
vesper sparrow	*Pooecetes gramineus*	S5B	-	-
warbling vireo	*Vireo gilvus*	S3B	Special Concern	Special Concern
western meadowlark	*Sturnella neglecta*	S5B	-	-
willet	*Tringa semipalmata*	S4B	-	-

Observed Wildlife Species in the Small Swale

COMMON NAME	SCIENTIFIC NAME	SKCDC RANK[A]	COSEWIC STATUS	*SARA* STATUS
wilson's snipe	*Gallinago delicata*	S5B	-	-
yellow rail	*Coturnicops noveboracensis*	S3B	Special Concern	*Special Concern*
yellow warbler	*Setophaga petechia*	S5B	-	-
yellow-headed blackbird	*Xanthocephalus xanthocephalus*	S5B	-	-
MAMMALS				
coyote	*Canis latrans*	S5	-	-
mule deer	*Odocoileus hemionus*	S4	-	-
North American beaver	*Castor canadensis*	S5	-	-
raccoon	*Procyon lotor*	S5	-	-
red squirrel	*Sciurus vulgaris*	S5	-	-
white-tailed deer	*Odocoileus virginianus*	S4	-	-

APPENDIX

C ACTION SUMMARY

ACTIONS SUMMARY – SMALL SWALE

*TBD refers to Action categories which may be considered for each Strategy in the future yet are not applicable at this time.

Strategy #1: Baseline Collection & Data Management

ACTION #	ACTION	MEASUREMENT OF COMPLETION	ACTION PRIORITY	RESPONSIBILITY	PROGRESS
1.	**Data Collection** Perform data collection per the "Planning & Implementation" Action below.				
2.	**Planning & Implementation** 2.1 Baseline Collection: Develop and initiate plan with the intention to identify and complete baseline studies required to support the applicable objective or tasks outlined in the Natural Area Management Plan (NAMP). Targeted biophysical information collection should include, but is not limited to: detailed rare flora data such as exact population location(s), individual and population counts (a requirement for calculating the Shannon-wiener diversity index), general population spatial extents for tracking purposes, possible future enhancement areas, individual weed locations (by species), and spatial distribution across the entire site; species specific faunal surveys to capture more detailed information regarding presence of critical habitat present that may support all lifecycle stages of identified Species of Management Concern (SOMC), general movement to support current and future wildlife passage/connectivity needs, and identification of key habitat areas to assist in the conservation and subsequent monitoring of species of conservation concern (e.g., SOMC such as the northern leopard frog [*Lithobates pipens]*). Field investigation and baseline data collection will also need to support hydrological analysis and associated development planning as outlined in Appendix D.	Baseline studies complete.	Identification of baseline studies and plan to execute Short-term. Execution of baseline studies Med-term.		
	2.2 Data Management System: Establish collection, sharing and storage protocols for biophysical/monitoring data acquisition. Digital collection and storage should take into consideration the greater Meewasin Valley Authority initiative(s). Data sharing with applicable organizations, such as the Saskatchewan Conservation Data Centre, iMap Invasives and iNaturalist and should be considered in the collection methods employed. To maintain up to date datasets, uploads should occur routinely (minimum annually). Review data for SOMC's – protocol in place for detecting.	Data shared and stored in applicable databases.	Short-term.		
3.	**Financing** 3.1 Secure funding for all Activities as part of the Strategy at appropriate times during planning, implementation, and maintenance phases.	Funding secured.	Short-term.		
4.	**Partnerships & Community Stewardship Initiatives** 4.1 Establish and implement partnerships, such as Meewasin Valley Authority, to share and collect data.	Partnerships established, data collected and shared.	Mid-term.		
	4.2 Establish and implement community stewardship opportunities to collect and/or share data.	Community Stewardship initiatives established, data collected and shared.	Mid-term.		
5.	**Engagement Initiatives** 5.1 As part of engagement activities, consider sharing with the stakeholders the Baseline Collection and Data Management initiatives to provide transparency and cultivate opportunities for partnerships and community stewardship.	Plan(s) shared, and status regularly updated.	Long-term.		
6.	**Education, Training, and Research Initiatives** 6.1 Provide opportunities for educational, training, and research initiatives related to data collection. Data from initiatives should be collected as part of Data Management.	Educational, training, and research initiatives identified, planned for, initiated, and data managed.	Long-term.		
7.	**Monitoring, Maintenance, and Adaptive Management Initiatives** 7.1 Plan for, and undertake subsequent detailed biophysical inventories, at select permanent sampling locations established during baseline data collection initiatives to confirm site health and management trajectories.	Baseline studies and tasks specific monitoring completed and updated, as required.	Five-year frequency should be targeted. Long-term.		
8.	**Adherence to Laws and Guidelines**	All laws and guidelines adhered to.	In conjunction with all Actions.		

ACTION #	ACTION	MEASUREMENT OF COMPLETION	ACTION PRIORITY	RESPONSIBILITY	PROGRESS
	8.1 All Actions within the Strategy to adhere to the applicable guidelines standards, policies, and laws. This includes but is not limited to: the City of Saskatoon, the Meewasin Valley Authority, the Province of Saskatchewan, and the Government of Canada.				
9.	**Climate Change Mitigation Initiatives** 9.1 Coordinate with the City's Climate Action Team to define specific climate change mitigation initiatives that are needed to reduce climate-related risks to the site.	Climate mitigation measures understood and adhered to.	Short-term.		

Strategy #2: Policy, Urban Planning, and Enforcement

ACTION #	ACTION	MEASURE OF COMPLETION	ACTION PRIORITY	RESPONSIBILITY	PROGRESS
1.	**Data Collection** 1.1 Per Strategy #1.				
2.	**Planning & Implementation** 2.1 Land Acquisition: Promote greater resilience and resistance to urban development pressures in the Meewasin Valley that may be identified during current and future urban planning exercises through site expansion. An initial targeting map should be developed that highlights areas of interests in proximity to the site in order to inform the intent to acquire as lands becomes available, funds permitting. Should priority conservation lands be identified in close proximity to the site, consider expanding current boundary to include them. Acquire additional land in key locations that expand the ecological significance of the site. Initial areas to consider may include but are not limited to: available parcels on west and southwest edge of the site to buffer regional wildlife movement along the South Saskatchewan River; area directly north of McOrmond on eastern side of site where the existing property line jogs; the larger extent of the swale currently outside of City of Saskatoon boundaries.	Ongoing land acquisition.	Identification of target areas – Short term. Acquisition, funds and jurisdiction permitting. Long-term		
	2.2 Land Use Designation: Assess and designate site for applicable land use. To be used to guide future uses and management of the site, in conjunction with the recommendation of the NAMP.	Land use dedicated and managed accordingly.	Short-term.		
	2.3 Enforcement: Plan and implement the enforcement of the bylaws and prohibited uses of the site.	Bylaws are enforced.	Long-term.		
3.	**Financing** 3.1 Secure funding for all Activities as part of the Strategy at appropriate times during planning, implementation, and maintenance phases.	Funding secured.	In conjunction with applicable Activity.		
4.	**Partnerships & Community Stewardship Initiatives** 4.1 Educate and collaborate with future developers adjacent to the site, or between the site and other natural areas. Future adjacent developments/land use changes should be planned in accordance with the objectives set by this plan; and any current/ future planning policies developed for the general retention and sustainability of a natural area.	Partnerships established and future land use changes outside of the site are established in accordance with the NAMP.	At initiation of planning for off-site development.		
5.	**Engagement Initiatives** 5.1 Engage with the public regarding the land acquisition, land use designation, and enforcement of the bylaws with the intention to inform the public.	Public kept informed of changes to the site.	Long-term.		
6.	**Education, Training, and Research Initiatives** 6.1 Provide education or training where possible to engage the public to act responsibly and reinforce bylaws.	Education and training initiatives developed and implemented.	Mid-term.		
7.	**Monitoring, Maintenance, and Adaptive Management Initiatives** 7.1 Monitor success of initiatives.	Initiatives monitored and adjusted as required.	Long-term.		
8.	**Adherence to Laws and Guidelines** 8.1 Bylaws and recommended prohibited uses of the site to be enforced by the City of Saskatoon.	Bylaws are enforced.	Short-term.		
	8.2 All Actions within the Strategy to adhere to the applicable guidelines standards, policies, and laws. Including, but not limited to, the City of Saskatoon, the Meewasin Valley Authority, the Province of Saskatchewan, and the Government of Canada.	All laws and guidelines adhered to.	In conjunction with all Actions.		
9.	**Climate Change Mitigation Initiatives** TBD				

Strategy #3: Buffering of Adjacent Lands

ACTION #	ACTION	MEASURE OF COMPLETION	ACTION PRIORITY	RESPONSIBILITY	PROGRESS
1.	**Data Collection** TBD				
2.	**Planning & Implementation** 2.1 Buffering Initiatives On-Site: Plan and implement buffering initiatives on-site to protect the site from adjacent incompatible land uses. Buffering initiatives to consider mitigation of human disturbance, such as noise and sound pollution, unprotected access to the site, and run-off. Buffering measures to be in place prior to construction of adjacent incompatible land development. Buffering methods on site to consider a perimeter fence of wildlife friendly fencing, and strategic planting along the property line of the site.	Plan and implementation of buffering initiatives on-site.	Planning – Short-term. Implementation – Long-term/in tandem with future adjacent developments.		
3.	**Financing** 3.1 Secure funding for all Activities as part of the Strategy at appropriate times during planning, implementation, and maintenance phases.	Funding secured.	In conjunction with applicable Activity.		
4.	**Partnerships & Community Stewardship Initiatives** 4.1 Collaborate with adjacent developers and engage with stakeholders to identify, plan, and implement buffers off-site. The following buffering initiatives could be considered for implementation outside of the site: – Include a 'Greenway' between the site and future incompatible land-uses (such as the future UH3 development). Design recommended to follow that of the Northeast Swale. – An alley way, or access route, for future residents to use for access to back yards is recommended between the Greenway and the backyards to prevent homeowners from using the Greenway as an access route for such things as landscaping. – Should an alley way not be installed, it is recommended that the face of the houses is oriented towards the Small Swale, and the back yards of the houses are on the opposite side. – Light and sound pollution mitigation measures to be considered by off-site developments to reduce impact to the site. Lighting adjacent to the site should be dark-sky compliant. Consider planting trees along the Greenway to mitigate noise and light pollution. – Uncontrolled run-off into the site should be managed by the adjacent development.	Partnerships established and off-site buffers and mitigation measures in place.	Planning – Mid-term. Implementation – Long-term.		
5.	**Engagement Initiatives** 5.1 Engage per Action 6.				
6.	**Education, Training, and Research Initiatives** 6.1 Provide and maintain educational signage throughout the site to inform visitors and adjacent residents about the impacts they may have on the site, such as: signage on the impact of domestic pets on wildlife, spread of weeds, and herbicides.	Educational signage installed and maintained.	Infrastructure installed – Short term.		
	6.2 Consider developing fact sheet(s) series regarding conservation opportunities proposed and completed, implications regarding the use of impactful substances (e.g., herbicides and insecticides), invasive species identification and control (e.g., regulated weeds, damaging wildlife such as wild boars), risk of domestic animals to wildlife, and other applicable best management practices required to sustainably manage the site. Make available on City website or other platforms for public consumption.	Educational content provided to residents.	Maintained- Long-term.		
7.	**Monitoring, Maintenance, and Adaptive Management Initiatives** 7.1 Monitor the success of the Buffering Initiatives and threats posed by future off-site developments. Maintain the infrastructure. Adjust management techniques as required to mitigate threats.	On-site buffering initiatives maintained, monitored, and adapted as required.	Long-term.		
8.	**Adherence to Laws and Guidelines** 8.1 All Actions within the Strategy to adhere to the applicable guidelines standards, policies, and laws. Including, but not limited to, the City of Saskatoon, the Meewasin Valley Authority, the Province of Saskatchewan, and the Government of Canada.	All laws and guidelines adhered to.	In conjunction with all Actions.		

ACTION #	ACTION	MEASURE OF COMPLETION	ACTION PRIORITY	RESPONSIBILITY	PROGRESS
9.	**Climate Change Mitigation Initiatives** 9.1 Consider the effects of climate change at every opportunity, including when choosing materials for the Buffering Initiatives infrastructure.	Climate change considered in initiative.	In conjunction with planning.		

Strategy #4: Enhancement & Improvement

ACTION #	ACTION	MEASURE OF COMPLETION	ACTION PRIORITY	RESPONSIBILITY	PROGRESS
1.	**Data Collection** 1.1 Data collected per Strategy #1.				
2.	**Planning & Implementation** 2.1 Restoration/Reclamation: Plan and implement site-specific reclamation/restoration plans for the enhancement or improvement of the ecological communities. Planning to include: – Development of restoration framework, conceptual plan for restoration or reclamation activities, and master list of restoration opportunities to guide enhancement and improvement activities in accordance with the NAMP. Planning to consider: Reclaiming areas of existing degradation and poor health identified through baseline survey(s); Enhancing areas of fair or good health identified through baseline survey(s). – Development and implementation of detailed restoration/reclamation plans based on the framework, conceptual plan, and master list. Restoration/reclamation plans to include, but not limited to: – Specific restoration/reclamation locations. – Goals and objectives to meet the recommended per the defined Reference Ecosystem(s) and Restoration Feasibility in Section 5 – Conservation Plan. – Strategy for implementation. – Timeframe for execution. – Monitoring to confirm results. – Increasing quantity of native species in areas of inadequate representation. – Increasing size of native-dominant vegetation communities proportions and expanding patches where appropriate. – Supporting native wildlife habitat. – Reduction of non-native species. – Use of only native species in planting prescriptions. – Prioritize locally sourced seed and plant materials, where possible. – Consider the use of culturally significant native plants, where appropriate.	Restoration/reclamation framework, conceptual plan, master list, and detailed designs implemented.	Planning – Short-term. Implementation – Short-term.		
	2.2 Closure & Reclamation of the snow storage facility: Development remediation and removal as outlined in Appendix D: Small Swale: Snow Storage and Hydrological Influences on the Small Swale Wetland Sustainability Guidance. All work related to the closure and remediation of the snow storage facility to work in concert with Strategy #9 – Water Management.	Closure and reclamation of snow dump area.	Planning – Mid-term. Implementation – Long-term/in tandem with Strategy #9.		
3.	**Financing** 3.1 Secure funding for all Activities as part of the Strategy at appropriate times during planning, implementation, and maintenance phases.	Funding secured.	In conjunction with applicable Action.		
4.	**Partnerships & Community Stewardship Initiatives** 4.1 Continue to support the inter-agency native seed co-operative and native plant propagation program as described in the Meewasin Valley-wide Resource Management Plan (Meewasin, 2017).	Partnership and genetics secured.	Long-term		
	4.2 Cultivate volunteer opportunities to assist with initiatives, such as planting days.	Community stewardship opportunities engaged.	Long-term		
5.	**Engagement Initiatives** 5.1 As part of the planning, implementation, and monitoring for success, engage with stakeholders to gain feedback on restoration initiatives and success. Engagement throughout the construction phases is recommended to provide information and awareness of the planned activities.	Stakeholders engaged and aware of initiatives.	Mid-term.		
6.	**Education, Training, and Research Initiatives**		Long-term.		

ACTION #	ACTION	MEASURE OF COMPLETION	ACTION PRIORITY	RESPONSIBILITY	PROGRESS
	6.1 Plan and initiate an outreach program to raise awareness of restoration efforts, including signage, fact sheets, and educational opportunities.	Public educated about initiatives, and research initiatives in place.			
	6.2 Consider opportunities to conduct research projects with the University of Saskatchewan that may be linked to any enhancement or restoration opportunities developed.	Opportunities with the university identified and implemented.	Mid-term.		
7.	**Monitoring, Maintenance, and Adaptive Management Initiatives** 7.1 Success of restoration/reclamation initiatives monitored, maintained, and adaptively managed long-term.	Efforts are monitored, maintained, and adaptively managed.	Long-term.		
8.	**Adherence to Laws and Guidelines** 8.1 All Actions within the Strategy to adhere to the applicable guidelines standards, policies, and laws. Including, but not limited to, the City of Saskatoon, the Meewasin Valley Authority, the Province of Saskatchewan, and the Government of Canada.	All laws and guidelines adhered to.	In conjunction with all Actions.		
9.	**Climate Change Mitigation Initiatives** 9.1 Consider climate change mitigation measures when planning for restoration/reclamation activities, including such considerations as hardiness of plants for a changing climate, securing and/or sourcing native genetic material, drought tolerant plants.	Climate change mitigation measures considered in planning and management of the initiatives.	In conjunction with planning.		

Strategy #5: Invasive & Undesirable Species Management

ACTION #	ACTION	MEASUREMENT OF COMPLETION	ACTION PRIORITY	RESPONSIBILITY	PROGRESS
1.	**Data Collection** 1.1 Complete inventory of weed species in accordance with Strategy #1.	Data collected.	Short-term.		
2.	**Planning & Implementation** 2.1 IPM Plan: Develop and implement species-specific integrated pest management (IPM) plan for: – The reduction or elimination of provincially prohibited, noxious, and/or nuisance species that may be observed at any given time within the site. – The reduction of undesirable species that may be observed at any given time within the site. – The reduction of the impact and spread of invasive animal species (e.g., wild boar) as they are discovered near or in the site.	Plan developed. Implementation of plan.	Short-term. Mid-term.		
3.	**Financing** 3.1 Secure funding to develop IPM plans. Secure funding (annually) to conduct regular IPM screening, and targeted management.	Funding secured.	Following development of IPM Plan.		
4.	**Partnerships & Community Stewardship Initiatives** 4.1 Develop potential partnerships and community stewardship opportunities to implement and monitor the IPM plan(s), such as community invasive species removal events, or awareness campaigns.	Partnerships identified and initiated.	In conjunction with IPM Plan.		
5.	**Engagement Initiatives** 5.1 Engage with the stakeholders during the development, implementation, and monitoring of the IPM plans to capture the stakeholder's comments and concerns. Implement and monitor the success of the initiative.	Stakeholders engaged.	In conjunction with IPM Plan.		
6.	**Education, Training, and Research Initiatives** 6.1 Develop educational programs, training opportunities, and research opportunities to support the IPM Plan, such as: campaign to educate the public on the spread of weeds, informational signage posted within the site, and weed identification training provided.	Engagement and awareness of public.	In conjunction with IPM Plan.		
7.	**Monitoring, Maintenance, and Adaptive Management** 7.1 Undertake all invasive, nuisance, prohibited, noxious and/or undesirable species monitoring following data and sampling techniques in accordance with any established strategies generated by Meewasin and available industry accepted practices at the time of monitoring.	Ongoing monitoring, maintenance, and adaptive management.	Following implementation of IPM Plan.		
8.	**Adherence to Laws & Guidelines** 8.1 All Actions within the Strategy to adhere to the applicable guidelines standards, policies, and laws. Including, but not limited to, the City of Saskatoon, the Meewasin Valley Authority, the Province of Saskatchewan, and the Government of Canada.	Initiatives adhere to laws and guidelines.	In conjunction with IPM Plan.		
9.	**Climate Change Mitigation Initiatives** 9.1 Planning, implementation, monitoring, and management of the IPM initiatives to take potential Climate Change Mitigation Measures into account. For example, consider preparing for introduced invasive species which are naturally migrating to Saskatoon as the climate shifts.	Climate change mitigation measures initiated.	In conjunction with IPM Plan.		

Strategy #6: Natural Disturbance Regime Management

ACTION #	ACTION	MEASURE OF COMPLETION	ACTION PRIORITY	RESPONSIBILITY	PROGRESS
1.	**Data Collection** 1.1 Per Strategy #1.				
2.	**Planning & Implementation** 2.1 Natural Disturbance Plan: Develop a natural disturbance program detailing the frequency, percentage of disturbance and cycling of disturbed areas that includes conservation grazing, prescribed burning strategies or other industry accepted strategies to promote active nutrient cycling and thatch management. For example, the City should adopt the use of pre-established native conservation grazing program(s) or select prescribed burning practices promoted by Meewasin to introduce controlled natural disturbance(s) to maintain healthy native grassland and wetland communities located within the site.	Plan developed and implemented.	Planning – Short-term. Implementation – Mid-term.		
3.	**Financing** 3.1 Secure funding for all Activities as part of the Strategy at appropriate times during planning, implementation, and maintenance phases.	Funding secured.	In conjunction with applicable Activity.		
4.	**Partnerships & Community Stewardship Initiatives** 4.1 Consider partnerships and community stewardship initiatives to support the Natural Disturbance Plan, such as partnerships with local fire safety groups or Meewasin to educate the public on controlled burns.	Partnerships and community stewardship initiatives identified and initiated.	In conjunction with planning.		
5.	**Engagement Initiatives** 5.1 Engage the public prior to initiating natural disturbance regimes with the intention of education.	Public engaged.	In conjunction with planning.		
6.	**Education, Training, and Research Initiatives** 6.1 Educational program developed in conjunction to educate public on the need, frequency and expectations surrounding natural disturbance regime management for the site. Education should include what to expect and links to useful info on the disturbance management plan tools that may be employed, including but not limited to controlled fires, conservation grazing, and mechanical pruning/mowing.	Public educated on natural disturbance regimes.	In conjunction with planning.		
7.	**Monitoring, Maintenance, and Adaptive Management Initiatives** 7.1 Monitoring, maintenance, and adaptive management initiatives to be incorporated into a Natural Disturbance Plan and implemented per plan.	Ongoing monitoring, maintenance, and adaptive management.	In conjunction with planning.		
8.	**Adherence to Laws and Guidelines** 8.1 All Actions within the Strategy to adhere to the applicable guidelines standards, policies, and laws. Including, but not limited to, the City of Saskatoon, the Meewasin Valley Authority, the Province of Saskatchewan, and the Government of Canada.	All laws and guidelines adhered to.	In conjunction with all Actions.		
9.	**Climate Change Mitigation Initiatives** TBD				

Strategy #7: SOMC (Flora & Fauna) Management

ACTION #	ACTION	MEASURE OF COMPLETION	ACTION PRIORITY	RESPONSIBILITY	PROGRESS
1.	**Data Collection** 1.1 Per Strategy #1. Establish a baseline of the location and population extent of confirmed, rare, and species at risk (SAR) flora and fauna residing within the site to develop subsequent strategies for enhancement, or population maintenance.	Data collected.	Short-term.		
2.	**Planning & Implementation** 2.1 SOMC Plans: Once baseline data is available develop plans to enhance or maintain habitat for wildlife and identified SOMC through the integrated management approach established as part of the Meewasin Valley-wide Resource Management Plan (Meewasin, 2017). Plans should cover at a minimum, general wildlife use by birds, mammals, pollinators, amphibians; and specific natural infrastructure such as nesting and roosting places (if warranted). SAR-specific plans to consider all viable habitat for full life cycle support, if present and applicable.	Plans developed and implemented.	Planning – Short-term. Implementation – Mid-term.		
	2.2 Coordinate other tasks with SOMC objective(s) considered. All operational, maintenance, and plans executed on site adhere to any applicable restricted activity periods (RAP), nor accidently harm the SOMC or associated habitat(s). Establish offsets (e.g., temporary, or permanent buffers) to known SOMC based on known locations, mitigation methods, and prescribe work outside of the known RAPs if applicable when conducting the described.	SOMC restrictions included in all future planning.	In conjunction with other Actions and Strategies.		
3.	**Financing** 3.1 Secure funding to conduct baseline inventories, develop, execute, and undertake required monitoring for general and SAR-specific wildlife management plans.	Funding secured.	Mid-term.		
4.	**Partnerships & Community Stewardship Initiatives** 4.1 Community stewardship communities to be considered to monitor sightings of SOMC, and volunteer to educate the public on SOMC.	Community stewardship initiatives implemented.	Long-term.		
5.	**Engagement Initiatives** 5.1 See education.				
6.	**Education, Training, and Research Initiatives** 6.1 Educate adjacent land-users about the risks to SOMC, including that of letting pets roam freely.	Education and training initiatives implemented.	Long-term.		
	6.2 Consider training opportunities for volunteers to identify SOMC and collect data useful for the management of the plans.	Education and training initiatives implemented.	Long-term.		
7.	**Monitoring, Maintenance, and Adaptive Management Initiatives** 7.1 Monitor, maintenance, and adaptive management initiatives to be incorporated into SOMC plans and implemented per plan.	Ongoing monitoring, maintenance, and adaptive management.	In conjunction with planning.		
8.	**Adherence to Laws and Guidelines** 8.1 All Actions within the Strategy to adhere to the applicable guidelines standards, policies, and laws. Including, but not limited to, the City of Saskatoon, the Meewasin Valley Authority, the Province of Saskatchewan, and the Government of Canada.	All laws and guidelines adhered to.	In conjunction with all Actions.		
9.	**Climate Change Mitigation Initiatives** 9.1 Include climate change mitigation initiatives in future SOMC plans. Consider the effects of climate change on SOMC and potential mitigation measures.	Climate change mitigation measures identified and implemented.	In conjunction with planning.		

Strategy #8: Historically and Culturally Significant Species & Features Management

ACTION #	ACTION	MEASURE OF COMPLETION	ACTION PRIORITY	RESPONSIBILITY	PROGRESS
1.	**Data Collection** 1.1 Per Strategy #1. Complete general site inventory for culturally significant species and features, and historically significant features and artefacts.	Data collected.	Short-term.		
2.	**Planning & Implementation** 2.1 Cultural and Historical Plan: Develop and implement plan to identify, protect, and enhance culturally significant species and features, and historically significant features. Protect all archeological, paleontological, and historical artifacts and sites confirmed or assumed within the site. Fence area as required to limit disturbance. Should additional historically significant features be identified, they should be reviewed and protected as required.	Plans developed and implemented.	Planning – Short-term. Implementation – Short-term.		
3.	**Financing** 3.1 Secure funding for all Activities as part of the Strategy at appropriate times to support all the required planning, implementation, and maintenance phases.	Funding secured.	In conjunction with applicable Activity.		
4.	**Partnerships & Community Stewardship Initiatives** 4.1 Develop community stewardship initiatives in conjunction with engagement initiatives.	Community stewardship initiatives implemented.	Long-term.		
5.	**Engagement Initiatives** 5.1 Engage with appropriate Indigenous organizations to identify culturally significant considerations and desires for the site. Including, but not limited to culturally significant species, and desired use(s) of species.	Engagement complete.	Short-term.		
6.	**Education, Training, and Research Initiatives** 6.1 Plan and implement educational content to relay historical and cultural significance of the site to the public. Install recommended infrastructure, such as signage, funding permitting.	Education and training initiatives implemented.	Long-term.		
7.	**Monitoring, Maintenance, and Adaptive Management Initiatives** 7.1 Monitor, maintenance, and adaptive management initiatives to be incorporated into SOMC plans and implemented per plan.	Ongoing monitoring, maintenance, and adaptive management.	In conjunction with planning.		
8.	**Adherence to Laws and Guidelines** 8.1 All Actions within the Strategy to adhere to the applicable guidelines standards, policies, and laws. Including, but not limited to, the City of Saskatoon, the Meewasin Valley Authority, the Province of Saskatchewan, and the Government of Canada.	All laws and guidelines adhered to.	In conjunction with all Actions.		
9.	**Climate Change Mitigation Initiatives** 9.1 Explore the impacts of climate change on cultural and historically significant species and features. Adapt mitigation measures where possible.	Climate change mitigation measures identified and implemented.	In conjunction with planning.		

Strategy #9: Water Management

ACTION #	ACTION	MEASURE OF COMPLETION	ACTION PRIORITY	RESPONSIBILITY	PROGRESS
1.	**Data Collection** 1.1 Per Strategy #1. Determine and subsequently select a pre-development hydrological baseline for use in all future hydrological balancing activities.	Data collected.	Short-term.		
2.	**Planning & Implementation** 2.1 Stormwater Master Plan: Develop an overarching plan to provide clear guidance for any development occurring within the study area. The Plan will build on the work presented in the Technical Memorandum: *Ecological Assessment of the Small Swale Wetlands* prepared by Native Plant Solutions/Ducks Unlimited in 2023 and consider changes in the basin as noted in Appendix D. Planning must work in concert with Strategy #4, regarding the closure of the snow storage facility. The initial phase of plan development is expected to include the following: – Categorize the retention potential of all wetlands; – Conduct an analysis of predevelopment conditions; and – Select development targets for water quality as well as runoff rate, volume, and timing. The second phase of plan development is expected to include: – siting and sizing of stormwater management facilities and/or other infrastructure to accommodate development **and** meet selected targets; – Identification of wetlands to be retained, impacted or lost as a result of development;. – Post-development modeling to demonstrate that targets will be achieved; and – Formulation of adaptive management recommendations. Where viable, naturalized systems (e.g., naturalized stormwater facilities, naturalized channels and low impact development best management practices (LID BMPs)) must be implemented in lieu of conventional alternatives to enhance biodiversity, and support water quality and quantity targets. All infrastructure must incorporate appropriate safety measures (e.g., appropriate facility side slopes and signage) and ensure that standard operations and maintenance can be conducted with minimal disturbance in the natural area. Where viable, infrastructure should be sited outside of the current and future boundary of the natural area. Data collected as part of Strategy #1 should be used to inform adaptive management measures. Include the following requirement for all future infrastructure planning: All activities and installed infrastructure physically within 30m of identified wetlands located within the site or an identified catchment shall be undertaken pursuant the City of Saskatoon Wetland Policy and the guidance provided in **Appendix D.**	Plans developed and implemented.	Planning – Short-term. Implementation – Long-term.		
3.	**Financing** 3.1 Secure funding for all Activities not covered by the adjacent development(s) as part of the Strategy at appropriate times during planning, implementation, and maintenance phases.	Funding secured.	In conjunction with applicable Activity.		
4.	**Partnerships & Community Stewardship Initiatives** 4.1 Require developers to prepare detailed plans that maintain the pre-development hydrological inputs within the identified local catchments present outside of the site boundary. This objective should be undertaken in conjunction with removal of snow storage facility actions and any current or future planning activities undertaken in the mapped catchments illustrated in the *Ecological Assessment of the Small Swale Wetlands* prepared by Native Plant Solutions/Ducks Unlimited in 2023.	Collaboration with partners.	Long-term.		
5.	**Engagement Initiatives** 5.1 Engage with the stakeholders during the planning, implementation, and monitoring phases of the plans.	Engagement complete.	Short-term.		

ACTION #	ACTION	MEASURE OF COMPLETION	ACTION PRIORITY	RESPONSIBILITY	PROGRESS
6.	**Education, Training, and Research Initiatives** 6.1 Plan and implement educational content to relay historical and cultural significance of the site to the public. Install recommended infrastructure, such as signage, funding permitting.	Education and training initiatives implemented.	Long-term.		
7.	**Monitoring, Maintenance, and Adaptive Management Initiatives** 7.1 Monitor, maintenance, and adaptive management initiatives to be incorporated into water management plans and implemented per plan.	Ongoing monitoring, maintenance, and adaptive management.	In conjunction with planning.		
8.	**Adherence to Laws and Guidelines** 8.1 Include the following requirement for all future infrastructure planning: All activities and installed infrastructure physically within 30m of identified wetlands located within the site or an identified catchment shall be undertaken pursuant the City of Saskatoon Wetland Policy.	All laws and guidelines adhered to.	In conjunction with all Actions.		
	8.2 All Actions within the Strategy to adhere to the applicable guidelines standards, policies, and laws. Including, but not limited to, the City of Saskatoon, the Meewasin Valley Authority, the Province of Saskatchewan, and the Government of Canada.	All laws and guidelines adhered to.	In conjunction with all Actions.		
9.	**Climate Change Mitigation Initiatives** 9.1 Explore the impacts of climate change on the wetlands and stormwater systems. Adapt mitigation measures where possible.	Climate change mitigation measures identified and implemented.	In conjunction with planning.		

Strategy #10: Ecological Connectivity Management

ACTION #	ACTION	MEASURE OF COMPLETION	ACTION PRIORITY	RESPONSIBILITY	PROGRESS
1.	**Data Collection** 1.1 Per Strategy #1. Complete a targeted wildlife movement inventory for species that may have habitat ranges that encapsulate lands beyond the site (e.g., ungulates, and most mid to large sized predators). Data collected should inform future infrastructure and neighborhood planning within and adjacent to the site.	Data collected.	Short-term.		
2.	**Planning & Implementation** 2.1 Intra Connectivity Plan: Develop and implement intra-connectivity plan to protect and enhance intra-connectivity for wildlife and vegetation within the site. Consider intra-connectivity impacts when undertaking infrastructure installations planned within the site. Future activities should consider: – Avoiding known wildlife habitat for identified SOMC. – Proximity to well-used game trails located within the site. – Limited use of infrastructure and hardscape in areas of small mammals and anuran use. – Infrastructure orientation to reduce barrier impact to sensitive areas frequented by small mammals and anurans. – Avoid and at worse case, limit habitat fragmentation.	Plans developed and implemented.	Planning – Short-term. Implementation – Mid-term.		
	2.2 Inter-Connectivity Plan: Develop and implement an inter-connectivity plan to assist the migration of wildlife between the Small Swale and other natural areas within Saskatoon and the Meewasin Valley. Understand and subsequently rehabilitation and/or protects current and future wildlife movement linkages within, and to retained natural features located in the greater Meewasin Valley adjacent to the site, this includes but is not limited to the Northeast Swale, the remaining Small Swale ecological extents beyond the City boundary, and the South Saskatchewan River and associated river valley habitat. Evaluate roads, including but not limited to, McOrmond Drive, South Grid Road, and Central Avenue as barriers to wildlife movement. If a barrier effect is confirmed, appropriate mitigation measures should be employed to reduce the barrier effect (e.g., appropriate-sized species considered wildlife passages, curb modifications, strategic vegetation plantings, speed limit considerations, etc.) following mitigation strategies/methods described in barrier mitigation guides such as the *Wildlife Passage Engineering Design Guidelines* (City of Edmonton, 2010) and *Managing and Enhancing Terrestrial Road Ecology* (Patriquin *et al.* 2020). Develop inter-connectivity plan in conjunction with adjacent landowners (e.g., UH3) for inter-connectivity between the site and other retained natural areas within Meewasin Valley. Current and future plan(s) should consider: – Regional wildlife-specific movement patterns in the Meewasin Valley that may include the site. – Evaluation and subsequently installation of 'wildlife' connections (if required) along the South Saskatchewan River to the site. – Evaluate the need and subsequently develop (if required) wildlife connections through the future UH3 development to maintain post-development 'movement' between the site and the Northeast Swale. Identification and subsequent mitigation of current and future impacts to wildlife movement that Central Avenue may represent in a post development landscape	Plans developed and implemented.	Planning – Short-term. Implementation – Mid-term.		
3.	**Financing** 3.1 Secure funding for all Activities as part of the Strategy at appropriate times during planning, implementation, and maintenance phases.	Funding secured.	In conjunction with applicable Activity.		
4.	**Partnerships & Community Stewardship Initiatives** 4.1 Develop community stewardship initiatives in conjunction with engagement initiatives.	Community stewardship initiatives implemented.	Long-term.		

ACTION #	ACTION	MEASURE OF COMPLETION	ACTION PRIORITY	RESPONSIBILITY	PROGRESS
5.	**Engagement Initiatives** 5.1 Engage stakeholders and adjacent developers during the planning stages.	Engagement complete.	Short-term.		
6.	**Education, Training, and Research Initiatives** 6.1 Educate the public on ecological connectivity, provide training opportunities for such things as data collection, and allow for research opportunities.	Education, training, and research initiatives implemented.	Long-term.		
7.	**Monitoring, Maintenance, and Adaptive Management Initiatives** 7.1 Monitor, maintenance, and adaptive management initiatives to be incorporated into Ecological Connectivity plans and implemented per plan.	Ongoing monitoring, maintenance, and adaptive management.	In conjunction with planning.		
8.	**Adherence to Laws and Guidelines** 8.1 All Actions within the Strategy to adhere to the applicable guidelines standards, policies, and laws. Including, but not limited to, the City of Saskatoon, the Meewasin Valley Authority, the Province of Saskatchewan, and the Government of Canada.	All laws and guidelines adhered to.	In conjunction with all Actions.		
9.	**Climate Change Mitigation Initiatives** 9.1 Explore the impacts of climate change on Ecological Connectivity. Adapt mitigation measures where possible.	Climate change mitigation measures identified and implemented.	In conjunction with planning.		

Strategy #11: Human Use Programming

ACTION #	ACTION	MEASURE OF COMPLETION	ACTION PRIORITY	RESPONSIBILITY	PROGRESS
1.	**Data Collection** 1.1 Per Strategy #1.	Data collected.	Short-term.		
2.	**Planning & Implementation** 2.1 Human-Use Plan: Develop and implement human-use plan which is complimentary to the Conservation Targets. Human-use plan to be in the form of a Conceptual and Detailed Design plans. Plans to include: Required infrastructure, programming, and maintenance considerations. Implementation of the plans to consider the implications to the Conservation Targets and provide mitigation measures to reduce or eliminate negative impacts. Human use programming is recommended to include: – Controlled site access improvements, including perimeter fencing. – Circulation route & nodes. – Gathering area. – Lookout. – Communications programming (i.e. signage). – Site furniture, including waste receptacles and seating.	Plans developed and implemented.	Planning – Short-term. Implementation – Long-term/in tandem with adjacent developments. Perimeter fence should be implemented in the short-term.		
3.	**Financing** 3.1 Secure funding for all Activities as part of the Strategy at appropriate times during planning, implementation, and maintenance phases.	Funding secured.	In conjunction with applicable Activity.		
4.	**Partnerships & Community Stewardship Initiatives** 4.1 Develop community stewardship initiatives in conjunction with engagement initiatives.	Community stewardship initiatives implemented.	Long-term.		
5.	**Engagement Initiatives** 5.1 Engage stakeholders and adjacent developers during the planning stages.	Engagement complete.	Short-term.		
6.	**Education, Training, and Research Initiatives** 6.1 Educate the public on ecological connectivity, provide training opportunities for such things as data collection, and allow for research opportunities.	Education, training, and research initiatives implemented.	Long-term.		
7.	**Monitoring, Maintenance, and Adaptive Management Initiatives** 7.1 Monitor, maintenance, and adaptive management initiatives to be incorporated into Human-Use plans and implemented per plan.	Ongoing monitoring, maintenance, and adaptive management.	In conjunction with planning.		
8.	**Adherence to Laws and Guidelines** 8.1 All Actions within the Strategy to adhere to the applicable guidelines standards, policies, and laws. Including, but not limited to, the City of Saskatoon, the Meewasin Valley Authority, the Province of Saskatchewan, and the Government of Canada.	All laws and guidelines adhered to.	In conjunction with all Actions.		
9.	**Climate Change Mitigation Initiatives** 9.1 Explore the impacts of climate change on Ecological Connectivity. Adapt mitigation measures where possible.	Climate change mitigation measures identified and implemented.	In conjunction with planning.		

APPENDIX

D HYDROLOGY MEMO

SMALL SWALE

SNOW STORAGE AND HYDROLOGICAL INFLUENCES ON THE SMALL SWALE WETLAND SUSTAINABILITY GUIDANCE

Client: City of Saskatoon
Prepared by: WSP Canada Inc.
Date: 22 December 2023

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Historically, the wetlands located in the Small Swale within and extending beyond the City of Saskatoon (the City) limits have been heavily influenced by changing historical land uses such as gravel extraction between 2002-2006, snow storage and subsequent discharge of snowmelt from 1997 to present day; and the installation of McOrmond Drive in 2016[1]. Each additional land use has introduced cumulative changes to the local catchment/watersheds that support the wetlands. These activities have influenced the current hydrological regime (e.g., nature of hydrological cycling, restrictions/release of flow, augmentations to base flow, changes to surface flow inputs/outputs).

It is understood that, prior to Native Plant Solutions (NPS) developing the *Technical Memorandum: Ecological Assessment of the Smale Swale Wetlands*[1](NPS Report), little was known about the current surficial hydrological cycling, the nature and extent of the local catchments, and their overall interaction within their greater watersheds. Due to the efforts undertaken by NPS, there is a good foundational understanding of the current local catchments influencing each wetland identified within the Small Swale (Watersheds A, B and C[1]), and Small Swale extents specific to the City limits (e.g., Watersheds C and portions of B[1]). However, this is only one aspect of surface water input within the Small Swale. Within the City limits, changing land uses such as the introduction of the snow storage facility in the late 90s have complicated the pre-development hydrology narrative.

As suggested by NPS, an overall wetland mitigation plan should be developed to guide future land use changes within the wetlands' subwatersheds that are in (or will be added to) the City management boundary of the Small Swale.

The following sections outline key elements regarding the post-development hydrological evaluation that should be considered in the development of the Wetland Mitigation Plan.

1 SNOW STORAGE FACILITY

The remediation of the snow storage facility is a long-term goal of the City and the Meewasin Valley Authority. Although the immediate cessation of use and subsequent rehabilitation/remediation will remove a potential contamination vector into a natural system, it will also alter the current wetland hydrology which has been directly influenced by decades of artificial snowmelt contributions.

As such, the following guidance should be considered when developing the snow storage remediation strategy and future storm water management planning for adjacent urban development.

1.1 SOIL CONTAMINATION – IDENTIFICATION, DELINEATION, AND CORRECTIVE ACTION PLANNING

The remediation of the snow storage facility should follow a series of steps that initiate with an exploration phase to determine the furthest spatial extent of possible impact, targeted surveys to analyse the nature

[1] Native Plant Solutions – Ducks Unlimited. (2023). *Technical Memorandum: Ecological Assessment of the Small Swale Wetlands*.

of the impact, and a remediation plan/strategy developed based on the first two phases following the Saskatchewan Environmental Quality Guidelines Endpoints Tier 1 – Tier 3 process.

1.1.1 EXPLORATION PHASE

For initial understanding regarding the extent of the area to be remediated, it is recommended that the following surveys are completed:

- An EM31 and EM38 survey to determine anomalies present on site with elevated values.
- A detailed topographic survey onsite to determine surface water pathway for spring melt drainage, and yearly rain runoff pathways.

1.1.2 TARGETED SURVEYS

Once these initial surveys have been completed, a soil sampling program for analysis of detailed salinity should be developed. This program, in discussion with the Ministry of Environment, should include, but is not limited to the following:

- A site-specific sampling program including various depths and locations that would be based on results from the previous surveys.
- Analysis of the findings utilizing the Saskatchewan Ministry of Environment Discharge and Discovery parameters.

1.1.3 REMEDIATION STRATEGY

The final stage is actual remediation/risk management, this stage should include a detailed strategy of removal and/or risk management for future site use of the various impacted areas identified. Depending on the analytical results and inputs from the Ministry of Environment, the site could be broken up into separate management zones that may vary in effort required to achieve determined endpoints. For example, dig and dump should be considered as a last resort. Soils with elevated values might be repurposed in other locations within the City boundaries, examples could be used at the landfill for their daily cover, used in road construction or other construction projects, or potentially for sanding winter roads.

A linkage with other restoration efforts being proposed within or in the vicinity of the current snow storage extent should considered, where appropriate.

1.2 ARTIFICIAL SNOWMELT INPUTS

Due to the presence of elevated snow melt, the wet features that once may have been predominately seasonal marsh complexes with a matrix of temporary wet meadow flood plains have expanded and into semipermanent, permanent, open water and deep marsh basins with a larger matrix of season marsh and temporary marsh flood fringes after the repeated storage and the subsequent release of concentrated snow melt. It is anticipated that:

- The presence of the snow storage facility has stabilized the wetland water supply due to a ‘longer than typical’ baseflow for a period after natural spring freshet.
- Snow melt introductions are likely mimicking the hydrology of a much larger watershed, with a more protracted spring freshet (i.e. water inputs continue in the summer months, similar to that experienced for wetlands in-line with creeks). The resulting impact is that the wet features will remain will experience longer durations of submergence within the emergent zones of the wetlands.

2 ACCOMMODATION OF FUTURE DEVELOPMENT

Some impacts to the wetland system are unavoidable, but the measures and recommendations discussed herein can assist with limiting this impact. Catchment impacts, such as changes in land uses, topography, increases in impermeable surface areas, and the artificial accumulation and release of stormwater within a wetland catchment will result in a degree of change to the extent and class of a wetland. Available mitigation techniques range from the use of treatment cells, ponds, and low impact development (LID) features to engineered solutions that includes weirs and/or pumps to control timing of inputs and outputs.

NPS (2023) have provided a solid foundation for developing a plan to mitigate the impact upon the various wetlands within the Small Swale. To inform future decision making, it is recommended that an overarching stormwater master plan be developed in conjunction with the wetland mitigation plan for the watershed areas within the greater Small Swale. As outlined below, this plan would need to consider the following:

- Define “predevelopment” conditions. Understanding and maintaining (or restoring) pre-development hydrology is a critical component of successfully preserving wetland function. As nearly all landscapes have undergone some degree of alteration, selecting a target pre-development condition will influence stormwater management approach. For example, deciding whether to preserve baseline conditions vs. restoring to a true pre-disturbance scenario (or some intermediate case) will result in very different management recommendations.
- Conduct field investigations address data gaps and characterize baseline conditions, as needed. As it may be cost-prohibitive to collect data at every wetland, the plan will need to carefully consider wetland selection for monitoring. For example, it would be advisable to include at least one wetland that is impacted by runoff from the snow storage facility and at least one wetland that is isolated from it. Data collection may include but is not limited to:
    - Water quality monitoring;
    - Water level monitoring via the use of a remote level logger that provides a continuous record of water level fluctuations throughout the course of the season;
    - Vegetation monitoring to define current wetland edge and characterize whether/how wetland communities may have shifted in response to recent hydrological changes (e.g. completion of transects at select wetlands);
    - Wetland bathymetry;
- Evaluate wetland value and categorize wetlands according to retention potential. This should consider multiple factors (NPS 2023) such as ecological value, social value, site constraints and ease of preservation.
- Quantify relative contribution of groundwater inputs to any wetlands to be retained.

- Conduct pre-development modelling to inform and establish targets for any lands earmarked for development. This should include clear targets for water quality as well as runoff rate, volume and timing.
- Locate and size stormwater management facilities needed to achieve discharge targets. Where possible, incorporate naturalized facilities and Low Impact Development Best Management Practices (LID BMPs) to promote improved water quality.
- Clearly identify whether the snow storage facility will be retained at its current location and what measures will be in place to address quality and quantity impacts of the addition (or removal) of snowmelt runoff.
  For example, if the preferred baseline for future land use changes will be the post-snow storage influenced wetland extents and classifications, the following should be considered:
    - A quantitative analysis to determine the approximate volume, rate of release and duration of baseflow into the adjacent wetland complex should be completed prior to any land use changes associated with adjacent development. This analysis should also confirm which wetlands are currently being influenced by the artificial introduction of snow melt. Records on the volumes of snow stored onsite would be useful in the determining the potential volume snowmelt derived water inputs.
    - The artificial volume and release parameters associated with snow melt should be factored into any post development land use changes that will impact snow melt influenced wetlands.
    - To mitigate a delay or break in the required surficial inputs currently sustaining the various wetlands influenced by the snowmelt. The cessation of snow storage and subsequent loss of snow melt could be staged with the development of any stormwater management facilities directing stormwater runoff to the various wetlands to mitigate the loss of snow melt inputs. Without staging, it should be understood that a period of drying would occur in the years prior to the introduction of supplemental water inputs. Depending on the period of delay, a shift in riparian vegetation composition, size and ultimately wetland class (i.e., based on the Stewart & Kantrud Classification System[2]) could result.
- Where viable, conduct post-development modelling to demonstrate that targets will be achieved.
- Where appropriate, identify infrastructure required to retain/manage high value wetlands.
- Formulate recommendations for monitoring and adaptive management within the Small Swale area.

Note that the above noted work could be conducted in two phases with the first phase focusing on predevelopment analysis and the selection of targets and the second phase focused on the post-development scenario.

[2] Stewart, R.E. and H.A. Kantrud. (1971). Classification of Natural Ponds and Lakes in the Glaciated Prairie Region. Bureau of Sport Fisheries and Wildlife, U.S. Fish and Wildlife Service, Washington, D.C., USA. Resource Publication 92. 57 pp.

APPENDIX

E ECOLOGICAL CONNECTIVITY MEMO

SMALL SWALE

ECOLOGICAL CONNECTIVITY EVALUATION FRAMEWORK

Client: City of Saskatoon
Prepared by: WSP Canada Inc.
Date: 22 December 2023

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1 ECOLOGICAL CONNECTIVITY

Maintaining wildlife movement freely throughout the site by 2035 is a goal of the Natural Area Management Plan (NAMP). Thus, gaining an understanding of intra- and inter-ecological connections and subsequently maintaining or enhancing these connections will be critical to effectively managing wildlife movement, biodiversity, ecosystem services, and habitat use in the context of current and future land use changes that may occur.

Overall wildlife connectivity through and around the Smale Swale is relatively permeable as a result of the primarily grassland habitat and lack of development. However, several existing landscape barriers have a high probability of negatively impact wildlife movement to and through the site such as McOrmond Drive and South Grid Road.

According to the information available at the time of NAMP production, wildlife frequenting the site include migratory birds, amphibians, and large- and medium-sized mammals. The most common terrestrial mammals with home ranges that would encompass lands beyond the site were deer species *(Odocoileus sp)* and coyotes *(Canis latrans)*.

Generally, wildlife movement or connectivity management typically encompass the requirements of individual species or 'target groups' (groups of animals with similar needs). Therefore, the following general framework has been developed to initially understand and then plan for wildlife inter- and intra-connections.

1.1 WILDLIFE CONNECTIVITY UNDERSTANDING AND IMPLEMENTATION FRAMEWORK

Ecological connectivity should follow a series of general steps that include a targeted baseline investigation; identification of project-specific sources where locations within the site may need connectivity maintenance, repair or enhancement; A constructability analysis based on baseline information (e.g., appropriate species or target wildlife groups); implementation and of connectivity mitigation measures identified; and finally monitoring of the mitigations implemented (Figure 1-1).

The general framework detailed below for undertaking wildlife connectivity management has been adapted from the *Wildlife Passage Engineering Design Guidelines for the City of Edmonton (*Stantec 2010) and professional experience.

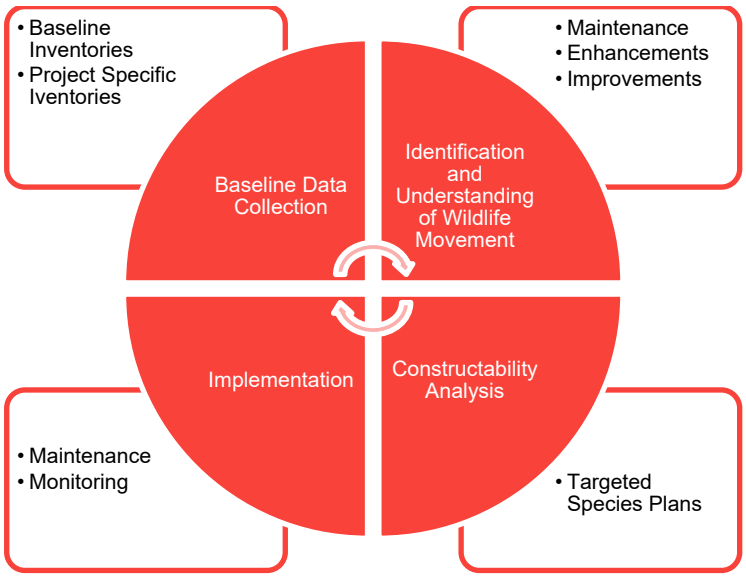

Figure 1-1 Framework for the Small Swale Conceptual Plan

1.1.1 STEP 1: BASELINE DATA COLLECTION

Baseline data collection is a critical first step to understand general movement patterns and identifying specific species or wildlife groups that may be impacted by a current or future project initiative. This step is also invaluable when determining or confirming possible impacts from current or future barrier effects such as existing/future roads or land use changes. Overall, baseline data collection is comprised of several subsets including:

- Identifying species present in a defined area.
- Identifying species movement patterns.
- Literature review of identified species regarding species' habitat requirements and movement/migration behaviors.
- Classifying the type of barrier (e.g., transportation infrastructure and user speed, temporal volume pattern).
- Evaluating changes in land use around the site from a movement restriction standpoint.

Tools used to identify species, as well as behavioral movement, include but are not limited to: wildlife remote cameras, snow- and mud-track surveys, interactive lighting assessments, and road-kills and/or wildlife-vehicle collisions datasets (if available).

1.1.2 STEP 2: IDENTIFICATION AND UNDERSTANDING OF WILDLIFE MOVEMENT

After collection of baseline information has occurred, the data will require interpretation to extrapolate areas of high wildlife movement/use, the nature of use (e.g., dominant species or species group(s)), and determine target sites for connectivity maintenance or enhancements.

If the landscape allows, efforts toward maintaining or enhancing intra-connectivity should be directed toward pre-existing movement corridors or areas of high wildlife use.

1.1.3 STEP 3: CONSTRUCTABILITY ANALYSIS

Wildlife movement (e.g., crossing) structure recommendations are generally selected to target a single species, an animal grouping (e.g., large mammals, medium-sized mammals, amphibians, birds, etc.), or multiple animal/animal groups to maintain connections for unrestricted movement. The design should consider several aspects such as the nature of the species behavior (prey verses predator groups), size of the species, relative size of the design group, home range extents, habitat requirements (aquatic or terrestrial), sightlines and topography. If a target area that may be currently impacting (e.g., McOrmond Drive) or proposed in the future has been determined to support multiple species or animal groups, it is typically recommended to design passage mitigation for the largest species group (e.g., large terrestrial mammals if present) that has been confirmed and then incorporate design features that support the movement of smaller species groups (as required). Passage mitigation can be in multiple forms including, but not limited to the following:

- Considerate placement of infrastructure to avoid or bypass identified high-use areas or known movement corridors.
- Posting signage to allow the use of trails or other amenities only during certain hours in a day/month/season (if required).
- Restoring degraded areas to decrease identified movement barriers.
- Reduced speed limits, limit the type of use via signage or physical alterations (e.g., speed bumps, curb extensions etc.).
- Public education.
- Altered lighting to mitigate avoidance behaviors.
- Passage structures (tunnels, culverts, overpasses/underpasses.
- Curb ramps.
- Noise barriers.
- Wildlife fencing.
- Targeted landscaping.

The most current and industry accepted passage/movement mitigation guides and frameworks should be consulted when designing passage/connective mitigation measures. Mitigation methods that have been monitored and demonstrated effective for maintaining or enhancing ecological connectivity should always be considered first. Available guidelines such as those found in Patriquin et al. (2020) and Stantec (2010) should be examined at the pre-planning phase when considering maintaining or enhancing wildlife movement for the site.

1.1.4 STEP 4: IMPLEMENTATION

The installation of wildlife connectivity maintenance or enhancement measures has a wide range of costs and subsequent success. For example, the cost of installing education signage can be significantly less than the cost of developing passage specific infrastructure (e.g., culverts, overpasses, or underpasses). However, the positive impact on preserving connectivity or wildlife movement is typically less when attempting to manipulate human behaviour verses controlling wildlife movement.

As a result, a cost-benefit analysis to weigh the monetary expenditure of the chosen connectivity mitigation system against applicable variables such as the frequency of actual use (e.g., was a crossing hot spot/movement corridor identified, or were only opportunistic or anecdotal species noted) and the expected lifetime and effectiveness of the structure has incredible merit and should be considered for each project undertaken.

A thoughtful review of the various options available will also avoid improperly implemented crossing systems that may have the potential for greater or unexpected consequences than the potential benefits they may promote. For example:

- Fences installed spanning over great distances may lead to a funneling effect if escape routes, such as one-way gates or jump-outs, are not also considered in the planning (City of Edmonton 2010).
- The use of signage when the installation of appropriate passage infrastructure may limit the desirable outcome and only result in short term benefits and miss out on the opportunity for a greater long term positive outcome.

Once a proper cost-benefit optioning analysis has been prepared, the preferred option should be selected based on an appropriate vetting process (e.g., stakeholder engagement, City review etc.).

In addition to the consideration of sound connectively mitigation selection, all wildlife movement mitigation strategies implemented should consider applicable provincial and federal approval application requirements, avoiding excess erosion in the interim and during operation; applying appropriate soil conservation strategies during construction; minimizing impacts of dewatering and always consider maintaining hydrological connections; limiting vegetation removal wherever possible; using native vegetation for any rehab or restoration requirements; avoiding construction during ecologically sensitive timeframes that may apply; incorporating site waste management during construction and operation (if required), and avoiding excess noise during construction and subsequent operation.

1.1.5 STEP 5: MONITORING

Similar to baseline data collection, monitoring programs are a key requirement to developing successful wildlife movement maintenance and enhancements. Project monitoring is discussed in greater detail in Section 8 of the NAMP and Section 6 of the Concept Plan. However, as it pertains to wildlife movement management, monitoring measures may include wildlife cameras, snow- and mud-tracking, and radio telemetry equipment.

1.2 CURRENT AND FUTURE CONSIDERATIONS

Examples of potential sources of current and future connectivity concerns within and adjacent to the site, their impact on the permeability of general wildlife movement, and suggested actions to manage movement restrictions are summarized in Table 1. However, managing ecological connectivity should be considered an adaptable process as new movement challenges arise with changes to infrastructure and adjacent land use(s), and as a greater understanding of the local connectivity landscape develops. As illustrated in Figure 1-1, the framework is cyclical and should be continually informed with updated information as movement/wildlife use data becomes available, if land use change around the perimeter of the site, and as any infrastructure is established within.

Implemented measures have the potential to influence ecological connectivity both positively and negatively, as such they should be well thought out to determine long term influences prior to their initiation. This framework should be considered a starting point and provides a general process to follow when developing ecological connectivity management strategies and should be considered when undertaking any modifications to the site; changes with adjacent land uses; or determining/modifying local and regional transportation corridors in proximity to retained natural features.

Table 1 Known Potential Sources Of Barriers To Wildlife Connectivity and Potential Impact On The Permeability Of The Landscape.

SOURCES OF POTENTIAL BARRIERS	POTENTIAL IMPACT ON HABITAT PERMEABILITY	ACTION[1]
Recreational use - Trails - Parking areas - Gathering spaces	-Introduction of undesirable species. -Existing illegal uses, such as dumping and hunting. -Future irresponsible recreational uses (i.e. off-trail use, vehicular use, etc.). -Concentrated human use	Data Collection Planning & Implementation Education, Training, and Research Initiatives Monitoring, Maintenance, and Adaptive Management Initiatives
Infrastructure - Snow storage/ future and current storm water facilities	-Existing Snow Storage Facility. -Existing materials storage facility. -Impermeable barriers, such as fences and walls. -Alterations to the physical structure of wetlands and watercourses, riparian edges. -Reduced water quality Installation of new stormwater management facilities maintenance/operation possible enhancement of existing ones	Data Collection Planning & Implementation Monitoring, Maintenance, and Adaptive Management Initiatives Adherence to Laws and Guidelines
Existing and future transportation Routes - McOrmond Drive - Central Avenue - South Grid Road - Future Saskatoon Freeway	-High-risk wildlife movement barriers, such as existing or proposed transportation routes adjacent to, or bisecting the site. -Future development along the perimeter of the site. -Loss of inter-connection between the site and future or current retained natural areas located in the greater Meewasin Valley.	Data Collection Planning & Implementation Financing Monitoring, Maintenance, and Adaptive Management Initiatives Adherence to Laws and Guidelines
Land use changes - University Heights	- Future development along the perimeter of the site. -Loss of inter-connection between the site and future or current retained natural areas located in the greater Meewasin Valley	Data Collection Planning & Implementation Monitoring, Maintenance, and Adaptive Management Initiatives Financing Adherence to Laws and Guidelines

[1] NAMP Report (2023) Appendix C: Action Summary – Small Swale

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APPENDIX

F CITIZEN SCIENCE DATA

SMALL SWALE

ADDITIONAL CITIZEN SCIENCE OBSERVATIONS

Client: City of Saskatoon
Prepared by: WSP Canada Inc.
Date: 22 December 2023

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1 CITIZEN SCIENCE DATA

Additional floral and faunal SOMC were observed on site through citizen science. Citizens, mainly member of the Swale Watchers, who participated in data collection were engaged and mainly utilized eBird to document species. eBird is a citizen science app and website developed by the Cornell Lab of Ornithology and National Audubon Society to record, share, and explore bird observations worldwide. Key features include observation recording, global databases, species identification, personal birding records, and maps and hotspots. This platform was preferred for data collection as the app is commonly used for citizen science activities in Saskatoon, and citizens are, thus, being familiar with the platform's use and interface.

These observations came from the following sources:

- ebird: A citizen science app and website developed by the Cornell Lab of Ornithology and National Audubon Society to record, share, and explore bird observations worldwide. Key features include observation recording, global databases, species identification, personal birding records, and maps and hotspots.
- iNaturalist: A citizen science app and website designed to record and share observations of plants, wildlife, fungi, and other organisms. For an observation on iNaturalist to reach a 'Research Grade' status, the following aspects need to apply:
    - Observation contains a valid date, location, and photo/sound .
    - Community needs to review and agree to the ID (minimum of two agreeing ID's required)

The species listed in Table 1 and 2 were observed by visitors or nature groups (e.g., Swale Watchers) but were not verified.

1.1 VEGETATION

The following vegetation species were observed. These are potential records that are unverified and are therefore not included in the NAMP report or the baseline summaries.

Table 1 Flora SOMC observed by Citizen Science

COMMON NAME	SCIENTIFIC NAME	SKCDC RANK[(a)]
hairy germander	*Teucrium canadense var. occidentale*	S3
marsh feltwort	*Lomatogonium rotatum var. fontanum*	S3
red elderberry	*Sambucus racemosa*	S2

(a) Saskatchewan Conservation Data Centre Tracked Taxa Lists (SKCDC, 2023c).

1.2 WILDLIFE

The following wildlife species were observed from mainly eBird. These are potential records that are unverified and are therefore not included in the main part of the NAMP report or the baseline summaries.

Table 1-2 Floral SOMC observed by Citizen Science

COMMON NAME	SCIENTIFIC NAME	SKCDC RANK[(A)]	COSEWIC STATUS[(B)]	SARA STATUS[(C)]	COMMENTS
bobolink	*Dalichonyz oryzivorus*	S5B	Special Concern	-	Observed – June 2021
common nighthawk	*Chordeiles minor*	S4B	Special Concern	Special Concern	Observed – August 2019
Harris's sparrow	*Zanotrichia querula*	SUB, S5M	Special Concern	Special Concern	Observed - October 2016
horned grebe	*Podiceps auratus*	S5B	Special Concern	Special Concern	Observed – June 2023
lesser yellowlegs	*Tringa flavipes*	S4B	Threatened	-	Observed – August 2021
little brown myotis	*Myotis lucifugus*	S4B, S4N	Endangered	Endangered	High likelihood
peregrine falcon	*Falco peregrinus*	S1B, SNRM	Not at Risk	-	Observed – September 2019
red-necked phalarope	*Phalaropus lobatus*	S4B, S3M	Special Concern	Special Concern	Observed – May 2022
Sprague's pipit	*Anthus spragueii*	S3B	Threatened	Threatened	Auditory – June 2019
Western tiger salamander	*Ambystoma mavortium*	S4	Special Concern	Special Concern	Observed 2022 at Peggy Mckercher
yellow rail	*Coturnicops noveboracensis*	S3B	Special Concern	Special Concern	Auditory – May 2019

(a) Saskatchewan Conservation Data Centre Tracked Taxa Lists (SKCDC, 2023c).
S1 = Critically Imperiled/Extremely Rare; S2 = Imperiled/Very Rare; S3 = Vulnerable/Rare to Uncommon; S4 = Apparently Secure; S5 = Secure/Common; B = for a migratory species, applies to the breeding population in the province; M = for a migratory species, rank applies to the transient (migrant) population; N = for a migratory species, applies to the non-breeding population in the province; U = status is uncertain in Saskatchewan.
COSEWIC = Committee on the Status of Endangered Wildlife in Canada (Government of Canada, 2022); SARA = Species at Risk Act (Government of Canada, 2022); - = not assessed.