RICARDO RANCH
AREA STRUCTURE PLAN
Ecological Inventory

Prepared for:
Genesis Land Development
Brookfield Residential, and
Mr. Sandy Soutzo

Prepared by:
Stantec Consulting Ltd.

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Stantec

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EXECUTIVE SUMMARY

This Ecological Inventory has been conducted by Stantec on behalf of Genesis Land Development, Brookfield Residential, and Mr. Sandy Soutzo, for approximately 560 ha of land located within Sections 9-22-29-W4M, 10-22-29-W4M, 11-22-29-W4M, 16-22-29-W4M, 4-22-29-W4M and 3-22-29-W4M in southeast Calgary, Alberta. It is bound to the south by the Bow River and to the west by Deerfoot Trail SE. The Ricardo Ranch Area Structure Plan Area is included within the *Southeast Planning Area Regional Policy Plan*.

The Ricardo Ranch Area Structure Plan Area has historically been used for agricultural purposes and pasture. The predominant features include the Bow River valley comprising of an escarpment, floodway and flood fringe associated with the Bow River in the southern portion of the lands.

The purpose of this Ecological Inventory is to provide an inventory and assessment of baseline conditions, to inform policies and guidelines for the future Area Structure Plan. An assessment of current land use, landscape condition, hydrological features, soils characteristics, vegetation communities, wildlife usage, and wildlife habitat present was completed. Site analysis is based on information gathered during field surveys in 2017 and 2018.

The terrain consists of flat to slightly undulating topography in the northern portion, an escarpment associated with the Bow River valley, and flat fluvial terrain adjacent to the Bow River. A total of forty-one (41) wetlands were identified including Temporary Marshes, Temporary Slope Marshes, Seasonal Marshes and Seasonal Slope Marshes. Fifty-six (56) ephemeral drainages and one (1) intermittent stream were identified in addition to the fluvial channels associated with the Bow River. Three (3) Anthropogenic Ponds were also identified.

No federally regulated rare plant species were observed; however, one (1) Provincially tracked species, western false gromwell (*Lithospermum occidentale*), was observed throughout the Ricardo Ranch Area Structure Plan Area during all field surveys.

A total of eighty-eight (88) wildlife species were observed during field surveys, including eighteen (18) species of management concern. Areas with the highest quality of wildlife habitat suitable for multiple species and species groups are areas associated with the fluvial channels on the east portion of the lands, and lands adjacent to the Bow River. A great blue heron colony and bank swallow colony were observed; both are species of management concern.

Areas of highest environmental significance are located along the escarpment, as well as on the east portion of the lands associated with the fluvial channels and flood fringe. These areas provide the greatest habitat potential for wildlife species of management concern, highest densities of tracked and watched species, and are the most important for watershed management and future health of the Bow River.

ABBREVIATIONS

AARD ..... Alberta Agriculture and Rural Development
ABMI ..... Alberta Biodiversity Monitoring Institute
ACIMS ..... Alberta Conservation Information Management System
AEP ..... Alberta Environment and Parks
AESCC ..... Alberta Endangered Species Conservation Committee
AESRD ..... Alberta Environment and Sustainable Resource Development
AGRASID ..... Agricultural Region of Alberta Soil Inventory Database
ALSA ..... Alberta Land Stewardship Act
AMSL ..... Above Mean Sea Level
AMWI ..... Alberta Merged Wetland Inventory
ANPC ..... Alberta Native Plant Council
ASP ..... Area Structure Plan
AWA ..... Alberta Wildlife Act
AWCS ..... Alberta Wetland Classification System
BIA ..... Biophysical Impact Assessment
CESCC ..... Canadian Endangered Species Conservation Council
CMRB ..... Calgary Metropolitan Region Board
COSEWIC ..... Committee on the Status of Endangered Wildlife in Canada
CWCS ..... Canadian Wetland Classification System
DAS ..... Digital Aerial Survey
DEM ..... Digital Elevation Model
DFO ..... Fisheries and Oceans Canada
EI ..... Ecological Inventory
ESA ..... Environmentally Significant Area
FWMIS ..... Fish and Wildlife Management Information System
GPS ..... Global Position System
GVI ..... Grassland Vegetation Inventory
IBA ..... Important Bird Area
IDP ..... Intermunicipal Development Plan
KWBZ ..... Key Wildlife Biodiversity Zone
MBCA ..... Migratory Birds Convention Act
MD ..... Municipal District
NPA ..... Navigation Protection Act
SARA ..... Species at Risk Act
SOMC ..... Species of Management Concern
SSRP ..... South Saskatchewan Regional Plan

1.0 INTRODUCTION

Stantec was retained by Genesis Land Development, Brookfield Residential, and Mr. Sandy Soutzo to complete an Ecological Inventory (EI) for the Ricardo Ranch Area Structure Plan (ASP) Area located within sections 9-22-29-W4M, 10-22-29-W4M, 11-22-29-W4M, 16-22-29-W4M, 4-22-29-W4M and 3-22-29-W4M in southeast Calgary, Alberta (the Plan Area).

The EI provides an overview of existing environmental features within the Plan Area. It includes an inventory and evaluation of existing conditions within the Plan Area, including soil characteristics and surface geology, surface hydrology, existing vegetation communities, species and areas of management concern, and general wildlife habitat and usage.

This EI provides biophysical data to support the planning of the Area Structure Plan and future development of the Plan Area. The scope of this EI follows the framework and requirements set out by the City of Calgary's *Ecological Inventory Framework: Area Structure Plans* (City of Calgary 2016). The Ecological Inventory Report Checklist is included in **Appendix A**.

1.1 DESCRIPTION AND BACKGROUND

The Plan Area includes approximately 560 ha of land within sections 9-22-29-W4M, 10-22-29-W4M, 11-22-29-W4M, 16-22-29-W4M, 4-22-29-W4M and 3-22-29-W4M in southeast Calgary (**Figure 1.0**). The Plan Area is bound to the south by the Bow River and to the west by Deerfoot Trail SE. The Plan Area is part of Cell "E" of *Southeast Planning Area Regional Policy Plan* (City of Calgary Land Use Planning & Policy 2004).

The predominant features within the Plan Area include the Bow River valley comprising of an escarpment, floodway and flood fringe associated with the Bow River in the southern portion of the Plan Area. The Bow River Valley is of regional significance, serving as a natural corridor.

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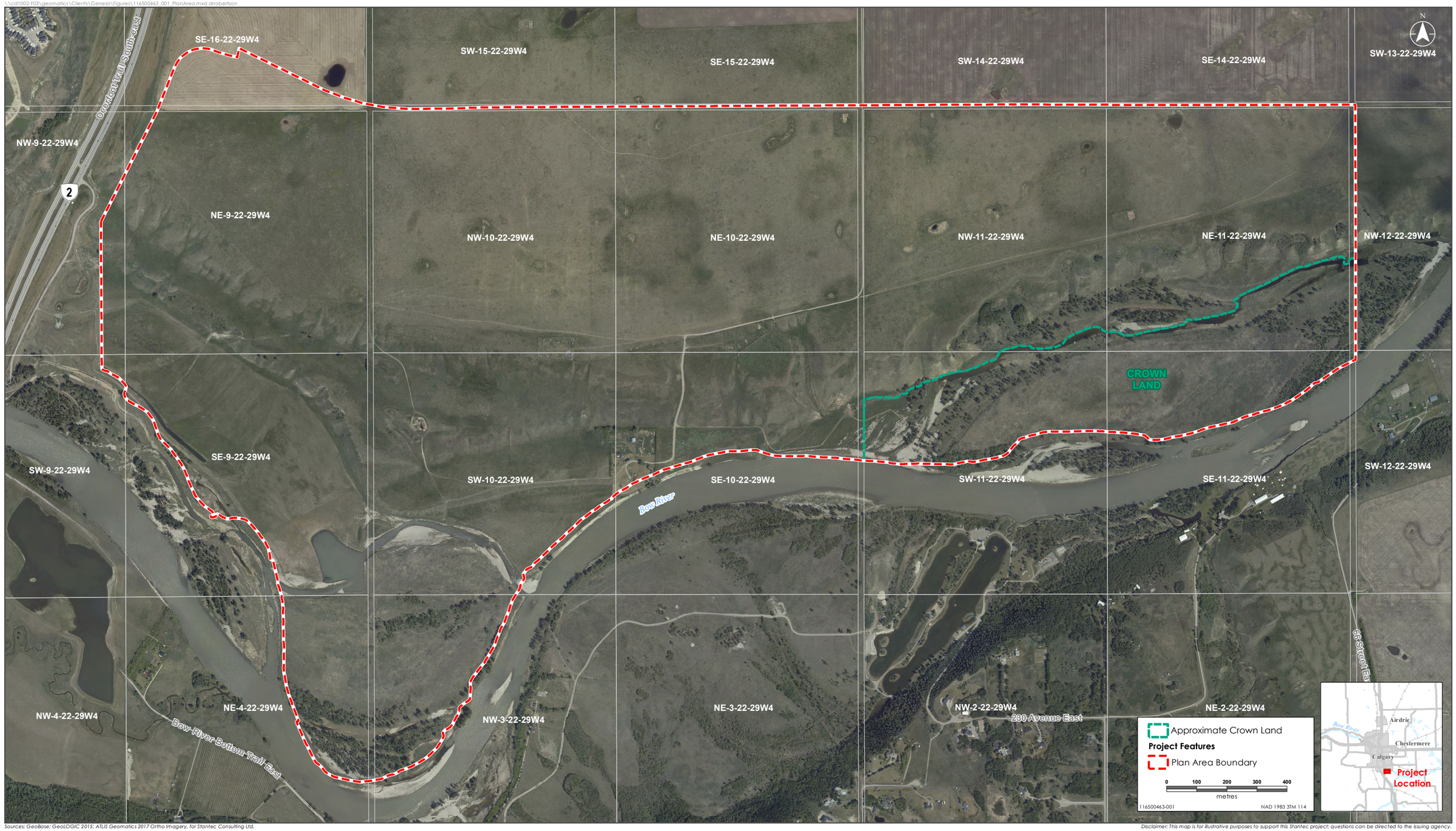

Sources: GeoBase; GeoLOGIC 2015; ATLIS Geomatics 2017 Ortho Imagery, for Stantec Consulting Ltd.

Disclaimer: This map is for illustrative purposes to support this Stantec project; questions can be directed to the issuing agency.

Site Location and Plan Area Boundaries

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RICARDO RANCH AREA STRUCTURE PLAN
ECOLOGICAL INVENTORY

Figure 1.0

2.0 PLANNING CONTEXT

The legislation and policy framework that will guide the work with the Plan Area include, but is not limited to, the following legislation, regional plans, and local policies.

2.1 LEGISLATION

2.1.1 MIGRATORY BIRDS CONVENTION ACT

The *Migratory Birds Convention Act* (MBCA) (Government of Canada 1994), as administered by the Federal Minister of the Environment, has the authority of control over migratory birds within Canada, territorial waters of Canada adjacent to any province or territory, and all provinces and territories within Canada. The purpose of the MBCA and *Migratory Birds Regulations* (Government of Canada 2017a) is to protect and conserve migratory birds and their nests. The *Migratory Birds Regulations* state that without the authorization of a permit, the disturbance, destruction, or taking of a nest, egg, nest shelter, eider duck shelter or duck box of a migratory bird; or, possessing a migratory bird, carcass, skin, nest or egg of a migratory bird are prohibited. The MBCA and *Migratory Birds Regulations* also prohibit the deposition of substances harmful to migratory birds in waters or areas frequented by migratory birds or in a place from which the substance may enter such waters or such an area. The MBCA protects most migratory birds in Canada, and most birds that are not protected under the MBCA are protected by the *Alberta Wildlife Act*.

2.1.2 SPECIES AT RISK ACT

The *Species at Risk Act* (SARA) (Government of Canada 2002), as administered by the Federal Minister of the Environment and Climate Change Canada, has the authority of control over species at risk on federally regulated lands in Canada. SARA serves several purposes: to prevent the extirpation or extinction of wildlife species; to provide recovery strategies for species that are extirpated, endangered, and threatened due to human activity; and to manage species of special concern so they do not become threatened or endangered.

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) is an independent body of experts that nominates and evaluates candidate species at risk, and assigns each candidate species a risk category. Species designated by COSEWIC as being at risk are reported to the Canadian government whereupon the Minister of Environment and Climate Change determines which of these species shall be officially listed and given legal protection. Under the SARA, it is prohibited to kill, injure, harass, destroy the residence of, destroy the critical habitat of, capture or take an individual designated as extirpated, endangered, or threatened on federally regulated lands. While these prohibitions do not apply on non-federal lands (i.e., the Plan Area), a species listed under SARA may still be protected under the MBCA and the AWA.

2.1.3 NAVIGATION PROTECTION ACT

The *Navigation Protection Act* (Government of Canada 2012) is the result of a legislative amendment to the *Navigable Waters Protection Act* (Government of Canada 1985b) and came into force on April 1, 2014. Transport Canada authorizes and regulates any interference with the public right of passage over navigable waters through the authority of the Navigation Protection Program. The primary goal of the *Navigation Protection Act* (NPA) is to regulate works and obstructions that risk the interference of navigation in scheduled navigable waters. A Scheduled Navigable Water is one included on the List of Scheduled Waters under the NPA and focuses on waters that support busy commercial or recreation-related navigation.

A Notice to the Minister of Transport is required for all work on Scheduled navigable waters or waters owned by owners who have opted-in under the NPA. With the exception of a Minor Works Order, Notice must be provided for proposed construction, placement, alteration, repair, build, remove or decommission of a work regardless of permanency in relation to a scheduled navigable water. When the assessment of impacts determines the work is likely to substantially interfere with navigation, an Application for Approval is required.

The Bow River is the only scheduled navigable waters and waterways found in Calgary.

2.1.4 FISHERIES ACT

The *Fisheries Act* (Government of Canada 1985a) focuses on the protection of the sustainability and productivity of commercial, recreational, and Aboriginal fisheries and their habitats through enhanced compliance and protection. Historically, productivity of fish and fisheries are threatened by habitat degradation and loss, flow alterations, aquatic invasive species, overexploitation, and pollution. The Fisheries Protection Program maintained by Fisheries and Oceans Canada (DFO) and its collaborative partners are responsible for the review of projects to determine effects on fish and fish habitat.

Proposed projects and proponents are required under the *Fisheries Act* to avoid causing serious harm to fish and fish habitat unless authorized, defined as the death of fish or any permanent alteration to, or destruction of, fish habitat. Projects with the potential to obstruct fish passage, modify flow or result in the entrapment of fish may also qualify as causing serious harm to fish. Proponents are responsible for avoiding and mitigating for serious harm when able. When unable to completely avoid or mitigate serious harm to fish or fish habitat, projects will require authorization from the Minister of Fisheries and Oceans in order to proceed (Government of Canada 2013).

2.1.5 ALBERTA WILDLIFE ACT

In Alberta, wildlife is regulated under the *Alberta Wildlife Act* (AWA) and the Alberta Wildlife Regulation. The AWA states that "a person shall not willfully molest, disturb, or destroy a house, nest, or den of a prescribed wildlife or beaver dam in prescribed area at prescribed times". In

addition, the AWA protects species listed as endangered and threatened and the Alberta Wildlife Regulation lists species considered endangered or threated (Government of Alberta 2000a). Before Species are officially listed by the Government of Alberta, the Alberta Endangered Species Conservation Committee (AESCC) recommends officially designating Alberta species as endangered, threatened, special concern, data deficient, or in process (AESCC 2015).

2.1.6 ALBERTA WEED CONTROL ACT

Weeds are invasive species that spread easily, are difficult to manage and have the potential to degrade habitats, reduce biodiversity, increase erosion, start wildfires, and reduce property value and productivity of land. The Alberta *Weed Control Act* protects from the economic and invasive losses caused by Noxious weeds or Prohibited Noxious weeds through enforcement standards for control (Government of Alberta 2008). Within Alberta, Noxious weeds are widely distributed and difficult to eradicate while Prohibited Noxious weeds are not currently found in Alberta or found in low numbers and locales where eradication is possible. As per the *Weed Control Regulation* and the Alberta *Weed Control Act*, plants designated as a Noxious weed must be controlled and Prohibited Noxious weeds must be destroyed (Government of Alberta 2010).

2.1.7 ALBERTA LAND STEWARDSHIP ACT

The *Alberta Land Stewardship Act* (ALSA) was established in 2009 and aims to provide a legal basis for regional land-use planning addressing the future needs of Albertans to manage growth, while respecting existing property rights (Government of Alberta 2009). The ALSA balances economic, environmental, and social objectives of future growth, providing opportunities to plan for the needs of current and future Albertans. Sustainable development and cumulative effects of human endeavours are considered by the ALSA, and coordination of decision-makers are emphasized. The ALSA is governed by the *Alberta Land Stewardship Regulation*, which provides clear rules for Albertans for the implementation of regional plans under the land-use framework (Government of Alberta 2011a).

2.1.8 PUBLIC LANDS ACT

The *Public Lands Act* (Government of Alberta 2000b), as administered by the Provincial Minister of the Environment, claims title to beds and shores of all permanent and naturally occurring bodies of water and all naturally occurring rivers, streams, watercourses, and lakes. Under the *Public Lands Act*, proposed works affecting public land must be granted approval by the Minister.

2.1.9 WATER ACT

The *Water Act* (Government of Alberta 2000c), as administered by the Government of Alberta, identifies all natural water bodies within the Province of Alberta as Crown Property and defines regulations pertaining to rights, restrictions, and resource management in relation to all water resources within provincial boundaries. The *Water Act* also addresses the disposition, diversion, or alteration of any natural water body within Alberta, which may or may not impact water flows, wetlands, and the aquatic environment. Any activities or alterations to the land, either temporary or permanent, including stream diversions, which influence or interfere with water quantity and quality within the Province of Alberta, requires statutory authorization.

2.1.9.1 ALBERTA WETLAND POLICY

In 2013, the Alberta Government released the *Alberta Wetland Policy* (Government of Alberta 2013) under the Alberta *Water Act* with the goal to conserve, restore, protect, and manage Alberta's wetlands to sustain the benefits they provide to the environment, society, and the economy. The new policy focuses on conserving and restoring wetlands of the highest value. The relative value concept recognizes that not all wetlands are of equal value and the wetland mitigation options pursued will reflect the differences in relative wetland value.

2.2 PLANS AND POLICIES

2.2.1 SOUTH SASKATCHEWAN REGIONAL PLAN

The South Saskatchewan region has experienced significant population growth in the past 10 years, notably in the urban areas where additional growth is expected. The *South Saskatchewan Regional Plan* (SSRP) outlines the responsibilities municipalities have for planning and development to ensure land is available for residential, commercial, industrial, and municipal infrastructure (Government of Alberta 2017c). The SSRP was amended in February 2017 and includes two major components: a Strategic Plan and an Implementation Plan.

The Strategic Plan states the vision, outcomes, and strategic directions for the region, including advancing watershed management, promoting efficient use of land and inclusion of Aboriginal peoples in land-use planning. The Implementation Plan consists of objectives and strategies to achieve the vision and outcomes that municipalities must account for in their plans, policies, and decision-making. Although the provisions in the Strategic Plan and the Implementation Plan are not intended to have legal binding effects, they are statements of policy to guide the management of activities and priorities while maintaining and monitoring the cumulative effects of human endeavor.

The SSRP recognizes the need for economic, social and municipal growth and encourages a careful balance of both development and conservation, where lands are efficiently and thoughtfully planned to minimize the overall area taken up by development. The SSRP

encourages utilizing land use planning strategies to anticipate and accommodate future community development needs, while maintaining sensitivity to environmental conservation and biodiversity.

On a regional scale, the objectives of biodiversity and ecosystems as outlined by the SSRP include:

- the terrestrial and aquatic biodiversity, long-term ecosystem health and resiliency should be maintained;
- intact grasslands habitat is sustained, including management of risk associated with invasive species and the creation of new and expanded conservation areas;
- watershed management, surface water and headwater protection be a priority for water supply and quality, and should include appropriate flood management practices;
- improvement of management practices for wetland areas and riparian lands, including minimizing sedimentation of water bodies and the continued encouragement for municipalities and land developers to create and implement best management practices;
- biodiversity and healthy, intact, functioning ecosystems continue to provide a range of benefits to communities in the region; and
- strategies are implemented to encourage stewardship and conservation on private land such as development and piloting of regionally appropriate conservation tools.

2.2.2 THE CALGARY METROPOLITAN REGION BOARD

The Ricardo Ranch ASP will be reviewed for conformance as part of the Calgary Metropolitan Region Board (CMRB) governance structure and emerging Interim Growth Plan. The province has established the CMRB to help ensure regional collaboration and coordinated decision making.

The mandate of growth management board is to:

- Promote the long-term sustainability of the region;
- Ensure environmentally responsible land-use planning, growth management and efficient use of land;
- Develop policies regarding the coordination of regional infrastructure investment and service delivery;
- Promote the economic well-being and competitiveness of the regions; and
- Develop policies outlining how the Board shall engage the public on the Growth Plan and Servicing Plan.

The CRMB will achieve this by developing a regional Growth Plan and Servicing Plan that will guide integrated planning and service delivery throughout the region. Growth Management Boards will use a Regional Evaluation Framework that they create to ensure that statutory plans align with the goals and principles agreed to in the Growth Plan.

The CMRB is required to prepare a Growth Plan that addresses the following objectives:

- to promote an integrated and strategic approach to planning for future growth in the Calgary Metropolitan Region;
- to identify the overall development pattern and key future infrastructure investments that would:
  - best complement existing infrastructure, services and land uses in the Calgary Metropolitan Region;
  - best complement the desired scale of development and community visions across the Calgary Metropolitan Region;
  - best address efficient and cost-effective growth and development; and
  - maximize benefits to the Calgary Metropolitan Region,
- to coordinate decisions in the Calgary Metropolitan Region to sustain economic growth and ensure strong communities and a healthy environment, and
- to promote the social, environmental and economic well-being and competitiveness of the Calgary Metropolitan Region.

The Ricardo Ranch ASP will be evaluated against the Interim Growth Plan which is anticipated to be released by September 2018.

2.2.3 OUR SHARED BOUNDARY – AN INTERMUNICIPAL DEVELOPMENT PLAN

The Ricardo Ranch ASP contains lands that are identified within the City of Calgary and Municipal District (M.D.) of Foothills Intermunicipal Development Plan (IDP). The City of Calgary and the M.D. of Foothills are committed to working together to ensure that the areas surrounding their shared boundary are planned and developed in a way that is sensitive to the needs of both municipalities. The IDP also provides each municipality with an understanding of the other's general plans for accommodating growth and development into the future, enabling a coordinated approach that will benefit both Calgary and Foothills.

As such, the Ricardo Ranch ASP will be circulated to the MD of Foothills (Foothills County) and reviewed by the Calgary /Foothills Intermunicipal committee and evaluated for conformance to this plan.

Note: The MD of Foothills is in the process of changing their name to Foothills County.

2.2.4 CITY OF CALGARY NATURAL AREA MANAGEMENT PLAN

The primary role of the *Natural Area Management Plan* (City of Calgary Parks 1994) is to ensure the long-term viability and public use of the City of Calgary's natural environments. City of Calgary Parks recognizes the value of natural habitat, relative to the healthy environmental and social functioning of the City of Calgary. Through appropriate resource management techniques, City of Calgary Parks will maintain and/or reclaim significant natural habitat types and their relevant ecological associations.

2.2.5 CITY OF CALGARY OPEN SPACE PLAN

The *City of Calgary Open Space Plan* (City of Calgary Parks 2003) strives to protect and enhance green spaces within the City of Calgary. Objectives outlined within the Plan include providing a sustainable and biodiverse open space system that represents the natural ecosystem of the Calgary region.

The goal of the *Open Space Plan* is to protect and enhance green spaces within the City of Calgary. The protection and preservation of Environmentally Significant Areas (ESAs) and cultural resources adjacent to watercourses is encouraged. Where erosion control measures are required along riverbanks, any solutions suggested should be both environmentally and aesthetically appropriate.

2.2.6 CALGARY RIVER VALLEYS PLAN

The *Calgary River Valleys Plan* (City of Calgary City & Community Planning Division 1984) aims to establish an approach to the development, use and conservation of Calgary's rivers, creeks, and their adjacent lands.

The plan includes strategies to reduce potential flood damage, address recreation and improvement of water quality, enhance the riparian and riverine environment, implement public awareness, and develop compatible guidelines for development. General recommendations of the *Calgary River Valleys Plan* include preserving existing species, communities and habitat as well as encourage compatible recreational uses for the enjoyment and benefit of all citizens.

2.2.7 CITY OF CALGARY RIPARIAN STRATEGY

Riparian areas are the transitional areas between upland and aquatic ecosystems that perform a variety of functions. The *Riparian Strategy: Sustaining Healthy Rivers and Communities* (City of Calgary 2014) was developed to provide strategic direction for the protection, restoration and management of riparian areas within Calgary.

The guiding principle of the Riparian Strategy focuses on recognizing the value of riparian ecosystems in decision-making using integrated systems approach to monitoring and management.

2.2.8 OUR BIODIVERCITY STRATEGIC PLAN

Our BiodiverCity; Calgary's 10-year Biodiversity Strategic Plan is a biodiversity initiative guiding the protection, development and management principles of Calgary's parks and ecosystems (City of Calgary Parks 2015). Guiding principles of this plan are to increase ecological literacy, resilience, collaboration and integration.

By 2025, the *BiodiverCity Strategic Plan* strives to:

- evaluate landscapes and set targets for conservation;
- restore 20% of Calgary's current open space to increase biodiversity; and
- identify invasive species in Calgary's open space and complete strategies for their management.

To support the strategic plan, potential implementation strategies have been identified including the use of design elements such as green roofs and living walls, protection of corridors, design of wildlife crossings and barriers, topsoil conservation, salvage and relocation of vegetation and habitats, and design development guidelines. These elements may be implemented into the design and architecture of developments and communities to support the increased biodiversity of urban spaces within Calgary (City of Calgary Parks 2015).

2.2.9 SOUTHEAST PLANNING AREA REGIONAL POLICY PLAN

The Southeast Planning Area Regional Policy Plan encompasses approximately 2,280 ha of land in Calgary's southeast, and is expected to serve as a primary growth corridor for the southeast quadrant of the city (City of Calgary Land Use Planning & Policy 2004). The Regional Policy Plan is intended to provide an overview of guidelines for a series of are structure plans that will be prepared, one of which is the Ricardo Ranch Area Structure Plan. The plan addresses the sequencing of area structure plans and identifies regional-level land use and transportation components.

The Ricardo Ranch ASP Lands are located within "Cell E" of the Southeast Planning Regional Policy Plan and includes community planning area and the Bow River valley. The slope and escarpment areas have been identified as highly significant, while the valley bottom grasslands are of lower quality (City of Calgary Land Use Planning & Policy 2004). The Southeast Planning Regional Policy Plan was taken into consideration just the preparation of this EI.

3.0 ENVIRONMENTAL SETTING

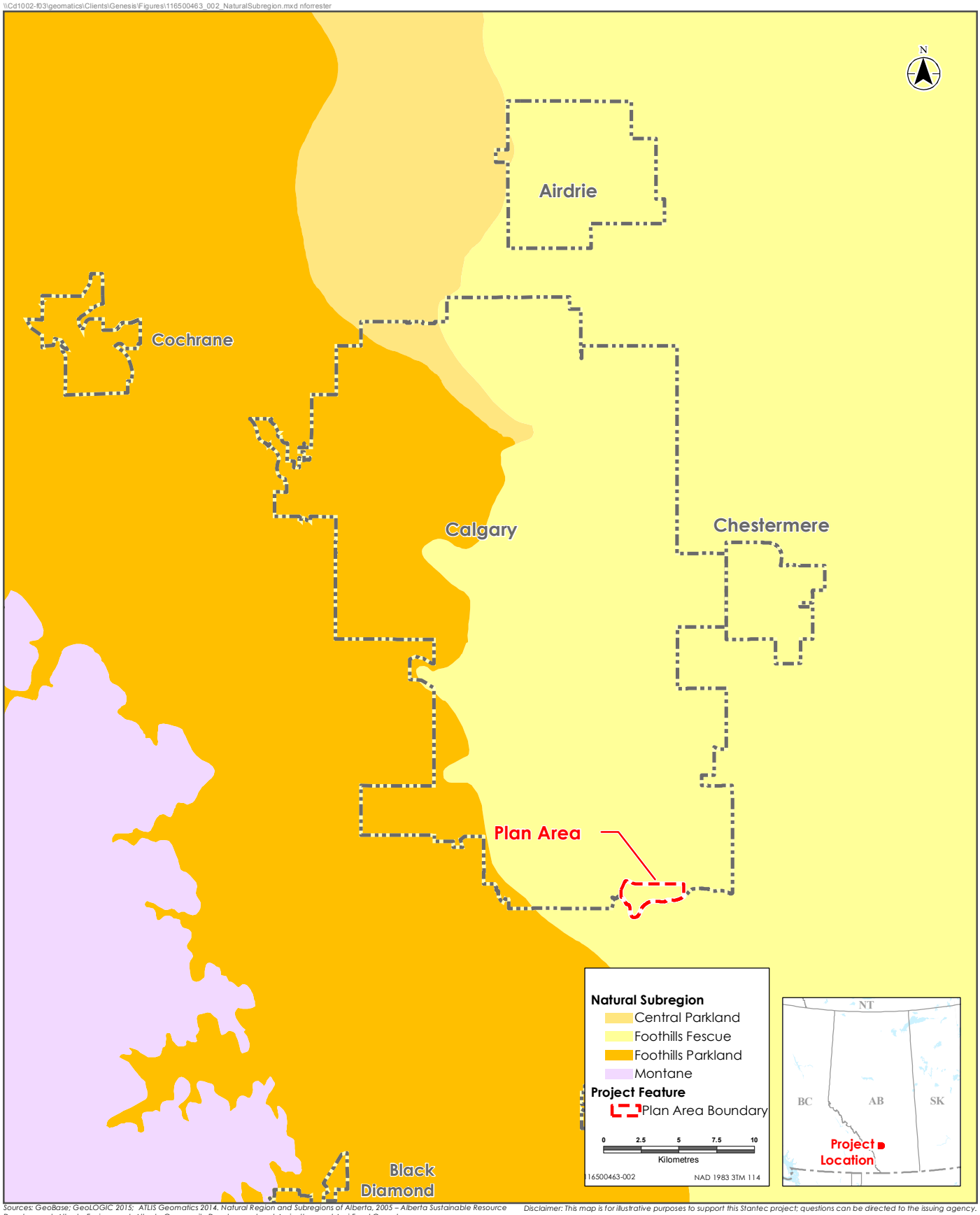
The Ricardo Ranch ASP Area is located within the transition area between the Foothills Fescue Natural Subregion and the Foothills Parkland Natural Subregion (**Figure 2.0**). Although the Plan Area is located within the transition zone, ecosystems and land cover was more representative of the Foothills Parkland Natural Subregion rather than the Foothills Fescue Natural Subregion due to the proximity of the Bow River.

3.1 FOOTHILLS PARKLAND NATURAL SUBREGION

The Foothills Parkland Natural Subregion occupies a narrow transitional band between the Foothills Fescue Natural Subregion to the east and the Montane Natural Subregion to the west. The Foothills Parkland Subregion is characterized by variable climate affected by the mountains to the west, boreal landscapes to the north, and prairies to the east. In the Foothills Parkland Natural Subregion, rolling to hilly landscape is typical and is generally heavily dissected by small streams. Elevations range from 1025 m above mean sea level (AMSL) north of Calgary to about 1400 m AMSL in the Porcupine Hills, with the average elevation of around 1250 m AMSL (Natural Regions Committee 2006).

Three natural vegetation types are found on the rolling to hilly topography of the Foothills Parkland Subregion including the Foothills fescue grasslands, willow shrublands and aspen forests.

Vegetation typical of the Foothills Parkland Natural Subregion includes Foothills rough fescue (*Festuca campestris*), bluebunch fescue (*Festuca idahoensis*), and needle-and-thread grass (*Stipa comata*) communities on well to rapidly drained Black Chernozems. Tree and shrub communities are concentrated on north facing slopes and valley bottoms where moisture is higher. Typical tree species include balsam poplar (*Populus balsamifera*), aspen (*Populus tremuloides*), and white spruce (*Picea glauca*). Common understory species include snowberry (*Symphoricarpos albus*), saskatoon (*Amelanchier alnifolia*), white meadowsweet (*Spiraea betulifolia*), creamy peavine (*Lathyrus ochroleuchus*) and star-flowered Solomon's seal (*Maianthemum stellatum*) (Natural Regions Committee 2006).



Natural Subregions

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Figure 2.0

4.0 ECOSYSTEM AND LAND COVER CLASSIFICATION

To support the ecological assessment of ecosystem and land cover classifications, a desktop review was completed using provincial databases, existing literature, and historical aerial photographs and ecosystem and land cover classifications were mapped the following the provincial Grassland Vegetation Inventory (GVI).

4.1 HISTORICAL AERIAL PHOTOGRAPHS

Current and historical aerial photographs were selected representing both wet and dry years throughout the available record based on precipitation data from the *Alberta Climate and Atlas Maps* (Alberta Agriculture and Forestry 2018) and the *Alberta Palmer Drought Severity Index* from data gathered at the Priddis Slough Weather Station (Agriculture and Agri-Food Canada 2017).

Table 1.0 is a summary of historical aerial photographs selected and the relative precipitation conditions for each year. **Appendix B** shows the historical aerial photographs selected.

TABLE 1.0 – HISTORICAL AERIAL PHOTOGRAPH REVIEW

Photograph Date	Palmer Drought Severity Index	Growing Season Precipitation	Notes[1]
Unknown Month 1948	-	-	• No precipitation data was available for 1948; however, it appears to be a near normal year. • Wetlands in the northern portion of the Plan Area appears to contain water. • Rural residence established in this photograph. • Much of the northern portion of the lands are used for agricultural cropland.
April 1950	-	-	• No precipitation data was available for 1950; however, it appears to be a wetter year. • Wetlands in the northern portion of the Plan Area appears to contain water. • Much of the northern portion of the lands are used for agricultural cropland.
September 1962	-	Low	• All wetlands appear to be dry in this photograph. • Portions of the northern Plan Area are used for agricultural cropland. • Fluvial channels in the southeast portion of the Plan Area appear to contain water.

Photograph Date	Palmer Drought Severity Index	Growing Season Precipitation	Notes[1]
June 1974	Slightly Wet	Moderately Low	• Wetlands in the northern portion of the Plan Area appear to contain water. • Rural roadways appear to be more established than in previous photographs. • Evidence of livestock and grazing is observed in the northeastern portion of the Plan Area.
July 1982	Slightly Wet	Near Normal	• Most wetlands are visible, with some seasonal marsh wetlands appearing to contain water. • Fluvial channels on the eastern portion of the Plan Area appear to contain water but only in small portions.
May 1996	Slightly Wet	Moderately Low	• All wetlands are observed under flooded conditions and most appear to contain water. • Evidence of livestock grazing is observed throughout the Plan Area. • Large anthropogenic pond (A03) is created on the southwest portion of the Plan Area, and a narrow anthropogenic pond (A02) also appears along the southwestern boundary of the Plan Area.
July 2001	Mild Drought	Very Low	• All wetlands appear to be dry in this photograph. • W03 appears to have been modified into a dugout. • Large anthropogenic pond (A03) is present with access roads. • Water is present within fluvial channels on the eastern portion of the Plan Area, but only occur in small pools.
Unknown Month 2005	Very Wet to Extremely Wet	Wettest	• Most wetlands appear to be dry in this photograph; a few wetlands in the north portion of the Plan Area appear to contain small amounts of water. • Large anthropogenic pond (A03) is present with access roads. • Water is present within fluvial channels on the eastern portion of the Plan Area.
Unknown Month 2010	Moderately Wet	Near Normal	• Wetlands in the northern portion of the Plan Area appear to contain water. • Fluvial channels on the eastern portion of the Plan Area appear to contain water. • Evidence of livestock grazing and agricultural usage present on the landscape.

Photograph Date	Palmer Drought Severity Index	Growing Season Precipitation	Notes[1]
June 2012	Very Wet	Near Normal	• Some wetlands in the northern portion of the Plan Area appear to contain water. • Fluvial channels on the eastern portion of the Plan Area appear to contain water. • Evidence of livestock grazing and agricultural usage present on the landscape.
June 2013	Slightly Wet	High	• This photograph shows the landscape during the 2013 flood event. Flooded areas are consistent with the flood hazard mapping. • The fluvial channels on the eastern portion of the Plan Area are flooded, as well as the anthropogenic pond (A03) and areas south of the escarpment.
July 2014	Incipient Wet Spell	Moderately Low	• All wetlands are visible on the landscape; however, only some on the northern portion contain water. • New fluvial channels previously not observed are present in this photograph. These channels connect the large anthropogenic pond to the Bow River and were a result of the 2013 flood event. • Gravel and other deposits not previously present are visible in this photograph.
May 2017	-	Near Normal	• All wetlands are visible; however, only a few wetlands in the northern portion appear to contain water. • Fluvial channels on the eastern portion of the Plan Area are flooded.

"-" – Dash indicates no precipitation data available.
[1] – For biophysical features, refer to **Figures 3.0** and **4.0** for wetland IDs, delineations and land cover Site Types.

4.2 GRASSLAND VEGETATION INVENTORY

4.2.1 METHODS

A high-level desktop review of existing GVI mapping was completed prior to field surveys. In addition to the provincial data on existing land polygons, each polygon has been refined and additional polygons added to capture natural features using a modified minimum mapping unit size of 0.05 ha, in accordance with the *Ecological Inventory Framework* (City of Calgary 2016).

Field surveys to verify ecosystem and land cover classifications determined through desktop review were completed on June 12, 14, 16, 19, 21 and 30, and July 6, 7, 19, 20 and 28, 2017. The appropriate land cover classifications were selected based on site characteristics such as soil regime, topography, slope orientation, plant species present and the vegetation cover that

occurs within the Plan Area. Classifications followed guidelines outlined within the *Grassland Vegetation Inventory Specifications* (Government of Alberta 2011b).

Where possible, one (1) or more representative survey sites were chosen for each land cover feature encountered. Each survey site was assessed for percent cover of vascular species, non-vascular species, litter, bare ground, and water. Species and dominance of species found within each survey site were also documented.

4.2.2 RESULTS AND DISCUSSION

A total of twelve (12) ecosystem and land cover classes were identified for the Plan Area. A summary table detailing each land cover class is shown in **Table 2.0**. A list of vegetation species and percentage cover identified at each survey site is in **Table C-1** in **Appendix C.** The location of survey sites as well as ecosystem and land cover classification mapping are illustrated in **Figure 3.0**.

TABLE 2.0 – ECOSYSTEM AND LAND COVER CLASSIFICATION

Primary Class	Land Class or Sub-Class	Site Type	Approximate Area (ha)
Native/ Natural	Lentic	Lentic (Temporary) – LenT	2.7
Native/ Natural	Lentic	Lentic (Seasonal) – LenS	7.6
Water	Lentic	Lentic (Open Water) – LenW	2.5
Water	Lotic	Lotic (River) – LtcR	12.5
Native/ Natural	Lotic	Lotic (Deciduous) – LtcD	35.4
Native/ Natural	Lotic	Lotic (Herbaceous) – LtcH	16.6
Native/ Natural	Upland	Overflow – Ov	57.9
Native/ Natural	Upland	Loamy – Lo	74.5
Native/ Natural	Upland	Thin Breaks – TB	69.5
Anthropogenic	Crop	Crop (Non-Irrigated) – CN	9.1
Anthropogenic	Tame Pasture	Tame Pasture or Hay (Non-Irrigated) – PN	256.6
Anthropogenic	Settled	Rural – Ru	13.8

4.2.2.1 LENTIC

The Lentic land sub-class is categorized into Temporary, Seasonal, Semi-permanent to Permanent, Alkali, and Open Water. Within the Ricardo Ranch ASP Area, the Temporary, Seasonal, and Open Water Site Types were observed to correspond with waterbody or wetland permanence and hydrology.

The Lentic (Temporary) – LenT classification includes Temporary Marsh and Temporary Slope Marshes. Lentic (Seasonal) – LenS includes Seasonal Marsh and Seasonal Slope Marsh wetlands.

Lentic (Open Water) – LenW includes Anthropogenic Ponds. Refer to **Section 5.1.2** for details on the wetlands and waterbodies observed.

4.2.2.2 LOTIC (RIVER)

The Lotic (River) – LtcR Site Type is characterized by open water generally associated with river activity that is wider than 20 m. The LtcR Site Type is diverse and can be used to describe anthropogenic features such as canals and channels greater than 20 m wide (Government of Alberta 2011b). Within the Ricardo Ranch ASP Area, the LtcR Site Type occurs within a large fluvial channel associated with the 2013 flood event.

Vegetation within the LtcR Site Type is sparse, with most land cover consisting of bare ground, gravel and cobbled substrates (**Photo 4.1**). Coarse fluvial deposits, gravel bars, and deposits are present. Due to the frequent flooding and disturbance within this Site Type, vegetation establishment is minimal and mostly consists of weedy or invasive species. Within the Ricardo Ranch ASP Area, this Site Type was observed with the highest density of Regulated Noxious Weeds (**Section 6.0**).

Ground cover species observed include smooth brome (*Bromus inermis*) and Kentucky bluegrass (*Poa pratensis*) in areas where consistent vegetation cover was observed.

PHOTO 4.1: VIEW NORTH OF LOTIC (RIVER) – LTCR WITHIN THE PLAN AREA

4.2.2.3 LOTIC (DECIDUOUS)

The Lotic (Deciduous) – LtcD Site Type is characterized by Manitoba maple (*Acer negundo*) or aspen poplar making up more than 25 trees per ha and are successfully reproducing, or deciduous trees other than Manitoba maple or aspen poplar having a greater than 25% combined canopy cover (Government of Alberta 2011b). Within the Ricardo Ranch ASP Area, the LtcD Site Type occurs at the valley bottom along the southern edge of the boundary, and north of the Bow River (**Photo 4.2**).

The canopy cover within LtcD is dominated by balsam poplar (*Populus balsamifera*) and aspen (*Populus tremuloides*) at an approximate density of 70 - 85%. Shrubs were observed in low densities throughout and include buckbrush (*Symphoricarpos occidentalis*), saskatoon, silverberry (*Elaeagnus commutata*) and prickly rose (*Rosa acicularis*). The dominant ground cover includes smooth brome, western porcupine grass (*Hesperostipa curtiseta*), Kentucky bluegrass, western wheat grass (*Pascopyrum smithii*) and northern bedstraw (*Galium boreale*). There is an abundant variety of species in trace amounts throughout the LtcD and include wild vetch (*Vicia americana*), tall goldenrod (*Solidago altissima*), fairybells (*Prosartes trachycarpa*), timothy (*Phleum pratense*), Bicknell's geranium (*Geranium bicknellii*), prairie onion (*Allium textile*), harebell (*Campanula rotundifolia*), wild strawberry (*Fragaria virginiana*), gaillardia (*Gaillardia aristata*) and wild bergamot (*Monarda fistulosa)*.

PHOTO 4.2: VIEW SOUTHWEST OF LOTIC (DECIDUOUS) – LTCD WITHIN THE PLAN AREA

4.2.2.4 LOTIC (HERBACEOUS)

The Lotic (Herbaceous) – LtcH Site Type occurs in lotic habitats that does not fit into Lotic River, Lotic Coniferous, Lotic Deciduous or Lotic Shrub Site Types. LtcH can represent a range of cover including areas bare of vegetation to 100% graminoid and forb cover (Government of Alberta 2011b). Within the Plan Area, the LtcH occurs in an area of frequent flooding north of the Bow River. Disturbance due to flooding has lead opportunistic noxious weeds and invasive species to establish in dense pockets within this Site Type.

Trees and shrubs observed within this Site Type include balsam poplar and buckbrush. Due to the frequent flooding associated with the Bow River, species observed within this Site Type are generally hydrophytic (**Photo 4.3**). The dominant ground cover within the community include smooth brome, absinthe wormwood (*Artemisia absinthium*), dog mustard (*Erucastrum gallicum*), Kentucky bluegrass, reed canary grass (*Phalaris arundinacea*), wire rush (*Juncus balticus*), water sedge (*Carex aquatilis*), woolly sedge (*Carex pellita*), small bottle sedge (*Carex utriculata*), common cattail (*Typha latifolia*), small-fruited bulrush (*Scirpus microcarpus*), creeping spike-rush (*Eleocharis palustris*) and meadow horsetail (*Equisetum pratense*). Trace amounts of purple-stemmed aster (*Symphyotrichum puniceum var. puniceum*), common great bulrush (*Schoenoplectus tabernaemontani*), great bulrush (*Schoenoplectus acutus var. acutus*) and arum-leaved arrowhead (*Sagittaria cuneata*) were also observed.

PHOTO 4.3: VIEW SOUTH OF LOTIC (HERBACEOUS) – LTCH WITHIN THE PLAN AREA

4.2.2.5 OVERFLOW - OV

The Overflow – Ov Site Type typically occurs below steeper valley slopes and at valley bottoms associated with lotic sites. Overflow sites are typically higher and dryer than lotic sites and generally flood less than once every ten years (Government of Alberta 2011b). Within the Plan Area, the Overflow – Ov Site Type occurs along the valley bottom at slightly higher elevation than the lotic sites, but are still subject to flooding due to the flat topography (**Photo 4.4**). In addition to flood water from the Bow River, this Site Type will also receive run off during times of heavy rainfall from the valley slopes to the north.

Very few trees were observed within this Site Type, shrubs observed include buckbrush, shrubby cinquefoil (*Dasiphora fruticosa*), silverberry, and saskatoon. The dominant ground cover within the community includes smooth brome, Kentucky bluegrass, Columbia needle grass (*Achnatherum nelsonii sp. dorei*) and western porcupine grass. Other groundcover species observed include common yarrow (*Achillea millefolium*), harebell, smooth fleabane (*Erigeron glabellus*), wild strawberry, gaillardia, northern bedstraw, common annual sunflower (*Helianthus annuus*), wild blue flax (*Linum lewisii*), star-flowered Solomon's-seal and wild bergamot.

PHOTO 4.4: VIEW WEST OF OVERFLOW - OV WITHIN THE PLAN AREA

4.2.2.6 LOAMY - LO

The Loamy – Lo Site Type is associated with undulating to hummocky landscapes and contains soils that are loam, silt, clay, sandy, or a combination of those (Government of Alberta 2011b). Within the Plan Area, the Loamy - Lo Site Type occurs at the top of the valley escarpment, in areas that were not historically used for agricultural activities, but are not as steep in topography as the Thin Breaks – TB Site Type. Due to decreased disturbance in this area, the species observed consist of a higher density of native vegetation than other areas within the Plan Area (**Photo 4.5**).

Very few trees were observed within this Site Type, shrubs observed include buckbrush and prickly rose. The dominant ground cover within this Site Type include western porcupine grass and Kentucky bluegrass. Other groundcover species observed include smooth brome, common yarrow, golden bean (*Thermopsis rhombifolia*), crested wheatgrass (*Agropyron cristatum*), purple milk vetch (*Astragalus agrestis*), hairy fleabane (*Erigeron pumilus*), alfalfa (*Medicago sativa*), blue grama (*Bouteloua gracilis*), pasture sagewort (*Artemisia frigida*), Indian breadroot (*Pediomelum esculentum*), gaillardia and common goat's-beard (*Tragopogon dubius*).

PHOTO 4.5: VIEW SOUTHWEST OF LOAMY – LO SITE TYPE WITHIN THE PLAN AREA

4.2.2.7 THIN BREAKS - TB

The Thin Break - TB Site Type is associated moderate to steep valley slopes including slumps and plains with thin surficial sediments (Government of Alberta 2011b). These areas can be partially vegetated, with thin or eroded and immature soils or failed slopes. Within the Plan Area, the TB Site Type occurs along the entire escarpment within the Bow River valley, where the slopes are moderate to steep. Bare ground and slope failures were observed within this Site Type, and ephemeral and intermittent drainages were observed to run perpendicular to the slope along the entire escarpment. In areas of groundwater seepage, slope marshes were observed. For additional information on waterbodies and wetlands, see **Section 5.1.2**. The species composition of TB varied from mostly native in steeper areas to non-native dominance in moderately sloped or gently sloped areas.

Shrubs observed include shrubby cinquefoil, buckbrush, silverberry, prickly rose, and saskatoon. The dominant ground cover within the TB Site Type include smooth brome, western porcupine grass, Kentucky bluegrass. In rocky outcrops with a dry regime, low sedge (*Carex duriuscula*), western wheat grass, green needle grass (*Nassella viridula*) and western porcupine grass was observed. Other species observed in trace amounts include scarlet butterflyweed (*Oenothera suffrutescens*), owl-clover (*Orthocarpus leteus*), silky perennial lupine (*Lupinus sericeus*), tufted fleabane (*Erigeron caespitosus*) and blue grama.

PHOTO 4.6: VIEW EAST OF BARE GROUND ON OUTCROP WITHIN THIN BREAK - TB SITE TYPE

4.2.2.8 TAME PASTURE OR HAY (NON-IRRIGATED) - PN

The Tame Pasture or Hay (Non-irrigated) - PN Site Type is an anthropogenic land class that represents areas of grasses or legumes used for grazing of livestock (**Photo 4.7**). The land may have been seeded with hay species, but rely on rainfall for growth as the lands are not irrigated. Within the Ricardo Ranch ASP Area, the PN Site Type occurs in the entire northern half of the lands, as well as in the west portion where cattle were observed to be grazing on disturbed and modified grassland. The agricultural influence of these areas has resulted in a modified composition of non-native or invasive species.

Vegetation species observed within PN include buckbrush, shrubby cinquefoil, smooth brome, Kentucky bluegrass, timothy, golden bean, yellow sweet-clover (*Melilotus officinalis*), white sweet-clover (*Melilotus alba*), common goat's-beard, wild vetch, common yarrow, small-leaved everlasting (*Antennaria parvifolia*), pasture sagewort, prairie sagewort (*Artemisia ludoviciana*), purple milk vetch, showy locoweed (*Oxytropis splendens*), early yellow locoweed (*Oxytropis sericea*), red clover (*Trifolium pratense*), white clover (*Trifolium repens*), common dandelion (*Taraxacum officinale*), black medick (*Medicago lupulina*), common plantain (*Plantago major*) and alfalfa.

PHOTO 4.7: VIEW SOUTH OF TAME PASTURE OR HAY (NON-IRRIGATED) - PN SITE TYPE

4.2.2.9 CROP (NON-IRRIGATED) – CN

The Crop (Non-irrigated) – CN Site Type is an anthropogenic land class that describes land cover for areas that are used for agricultural activities involving the seeding, tillage, and harvesting of row crop. Within the Ricardo Ranch ASP Area, historical aerial photographs show that much of the northern portions of the Plan Area were once agricultural cropland; however, at present, only the northwestern corner of the Plan Area is currently used for crops.

4.2.2.10 RURAL - RU

The Rural – RU Site Type is an anthropogenic land class that describes areas with persons living in sparsely populated lands lying outside urban areas, where vegetation surface cover has been removed or altered by human activity (**Photo 4.8**).

Within the Ricardo Ranch ASP Area, several areas are classified as RU due to their anthropogenic nature and altered land cover. These areas include farmsteads, buildings, and well-established cattle trails and roadways.

PHOTO 4.8: VIEW OF FARMSTEAD WITHIN RURAL - RU SITE TYPE

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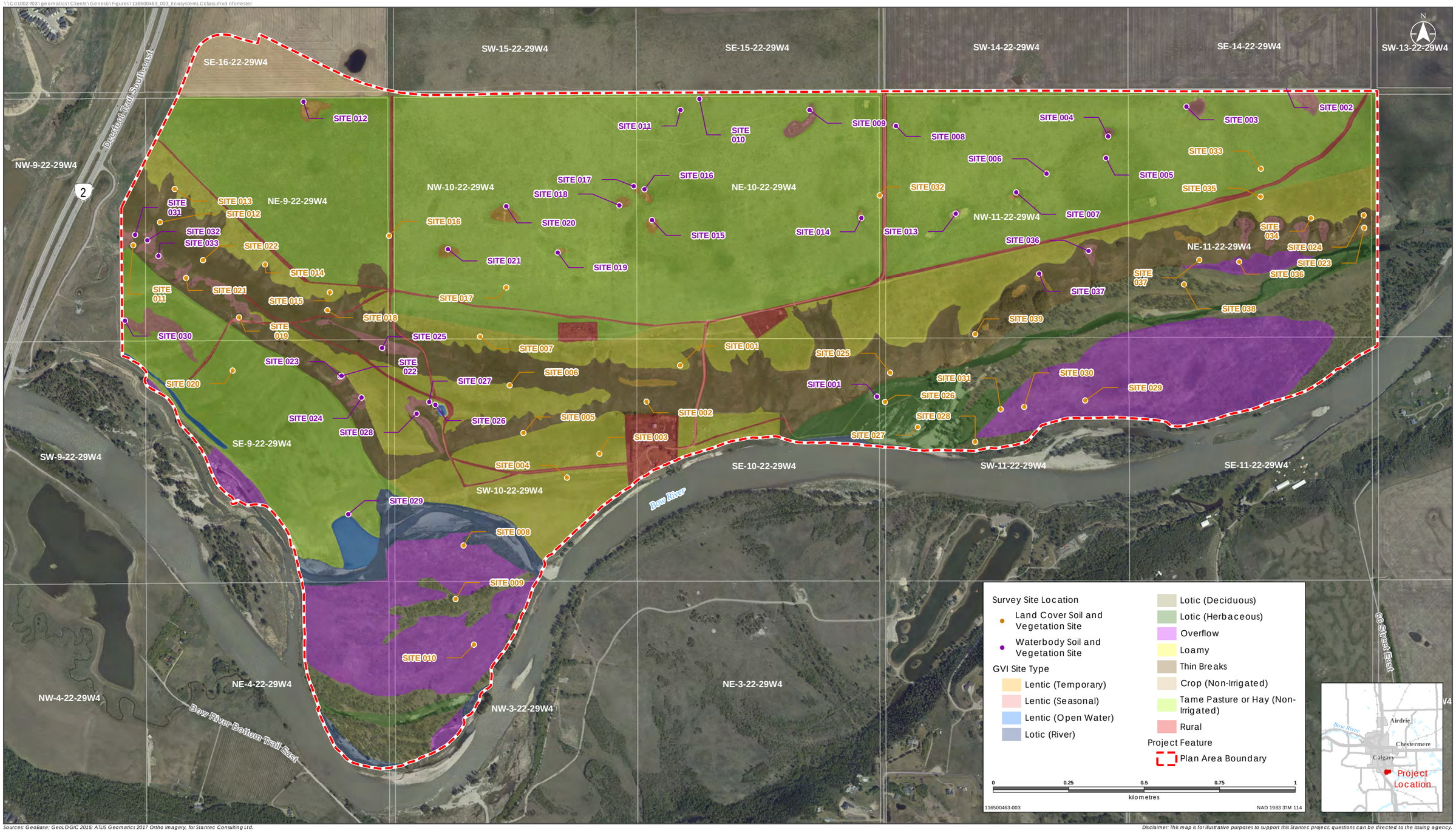

Sources: GeoBase; GeoLOGIC 2015; ATLIS Geomatics 2017 Ortho Imagery, for Stantec Consulting Ltd.

Disclaimer: This map is for illustrative purposes to support this Stantec project; questions can be directed to the issuing agency.

Ecosystem and Land Cover Classification

Stantec

RICARDO RANCH AREA STRUCTURE PLAN
ECOLOGICAL INVENTORY

Figure 3.0

5.0 WATER RESOURCES

Approximately 1% of the Foothills Fescue Natural Subregion and Foothills Parkland Natural Subregion are occupied by water, mostly found in the major rivers. The Bow River is the largest watercourse, and the very few lakes that do occur are typically small. Wetlands are uncommon and are mostly confined to depressions and potholes in undulating to hummocky terrain. Seepage frequently occurs on lower slopes (Natural Regions Committee 2006).

5.1 DESKTOP REVIEW

A desktop review of hydrogeology, existing watercourses, watershed, true aquatic habitats, wetlands, riparian area, and Crown ownership of waterbodies was completed for the Ricardo Ranch ASP Area.

5.1.1 BOW RIVER WATERSHED

The Ricardo Ranch ASP Area is located within the Bow River Watershed within the Upper Bow River Sub-basin. The *Bow River Watershed Management Plan* is a guidance document to ensure lands associated with the watershed are managed sustainably and responsibly to support healthy ecosystems with economic, aesthetic and recreational opportunities (Bow River Basin Council 2012).

The stretch of Bow River within the Plan Area is determined to be of high sensitivity and of critical importance to the rest of the watershed. To ensure the long-term management of the area, land use designations should be developed to strategically conserve significant wildlife, vegetation, and geological features and communities, as well as to properly manage the wide variety of industrial, commercial, and recreational activities on the landscape (Bow River Basin Council 2012).

5.1.2 FLOOD HAZARD MAPPING

The Flood Hazard Map was created by the City of Calgary and the Province of Alberta to provide a visual representation of where floodways, flood fringes and overland flow zones are located within the City of Calgary. These areas are calculated for a 1:100 year flooding event and are identified to inform development decisions and building design guidelines in order to ensure public safety. Categories of flood potential are defined based on proximity to the river, water flow and potential for destruction. The Floodway and Flood Fringe comprise the Flood Hazard Area.

- **Floodway**: the area where flows are deepest, fastest and most destructive, typically including the main channel of a major stream and its adjacent banks. Development is discouraged within the floodway.

- **Flood fringe**: the area directly outside of the floodway where water is generally shallower and flows more slowly. New development may be permitted; however, designs should be flood-proofed.

Portions of the Ricardo Ranch ASP Area are within the floodway and flood fringe of the Bow River as shown on **Figure 4.0**.

The activities, infrastructure and land use that can occur in the Flood Hazard Area varies depending on the conditions of the site and proposed project. Flood potential and mitigative strategies should be considered during the development of ASP policies and guidelines.

5.1.3 BOW RIVER MORPHOLOGY STUDY

A geomorphic assessment of the Bow River at Ricardo Ranch ASP Area was completed by Golder Associates Ltd. in July 2018. The assessment discusses the potential for channel avulsion, meander width, erosion rate, sediment accumulation and slope failure likelihood along the valley wall.

For detailed methods and results, please refer to the *Bow River Morphology Study* (Golder Associates Ltd. 2018)

5.1.4 CROWN OWNERSHIP OF WATERBODIES

A request to determine Crown ownership of waterbodies within the Ricardo Ranch ASP Area was submitted to the Water Boundaries group within AEP on September 15, 2017. A response was received on September 20, 2017 confirming that the Bow River and several fluvial channels associated with the Bow River are Crown-owned (**Figure 4.0**). AEP indicated that no wetlands within the Plan Area are Crown-owned, and the fluvial channels associated with the Anthropogenic Pond A03 have also not been claimed as *Public Lands Act* has specific protocols surrounding situations where natural flood events alter lands. A copy of the correspondence is available upon request.

Any disturbance to Crown-owned waterbodies will require *Public Lands Act* approval in addition to a *Water Act* approval.

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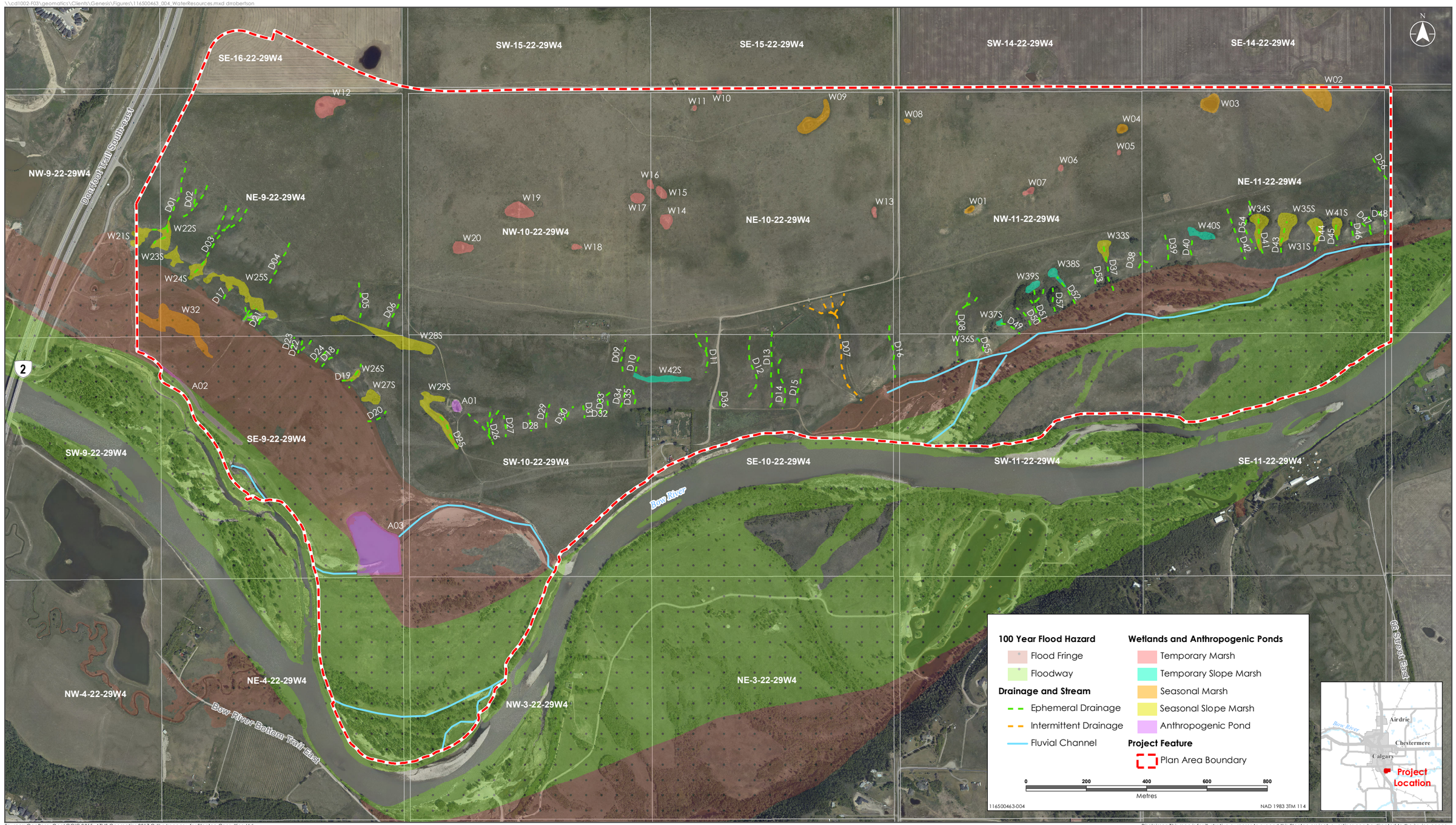

Sources: GeoBase; GeoLOGIC 2015; ATLIS Geomatics 2017 Ortho Imagery, for Stantec Consulting Ltd.

Disclaimer: This map is for illustrative purposes to support this Stantec project; questions can be directed to the issuing agency.

Water Resources

Stantec

RICARDO RANCH AREA STRUCTURE PLAN
ECOLOGICAL INVENTORY

Figure 4.0

5.2 WETLANDS

5.2.1 METHODS

Wetland boundaries were delineated on desktop and verified using a Trimble® Handheld Global Position System (GPS) Unit and mapped by observing surface water presence, hydrophytic vegetation, wetland soil indicators (redox and/or gleying) and geomorphology of the landscape. Wetlands within the Plan Area have been classified in accordance with the *Alberta Wetland Classification System* (AWCS) (Government of Alberta 2015) as well as using *Classification of Natural Ponds and Lakes in the Glaciated Prairie Region* (Stewart and Kantrud 1971).

Classification of wetlands is based on ecological differentiation and distinguished by the vegetation zone occurring in the central or deepest part of the wetland. Classification of the overall wetland is assigned by deepest vegetation zone occupying more than 5% of the wetland area for Stewart and Kantrud, and more than 25% for the AWCS.

Wetland hydrology indicators were assessed qualitatively by observing whether surface water was present, looking for evidence of recent saturation or ponding, and observing the surrounding topography. Quantitative measurements of hydrological indicators include water depth and depth to saturation (depth at which soil pores are saturated).

5.2.2 RESULTS AND DISCUSSION

A total of forty-one (41) wetlands were identified within the Ricardo Ranch ASP Area. Out of the 41 wetlands identified, twenty (20) are Temporary Marsh (Class II Temporary Pond) wetlands, and twenty-one (21) are Seasonal Marsh (Class III Seasonal Pond) wetlands.

Twenty (20) wetlands were identified to have slope marsh characteristics unique to the escarpment and have been designated with the addition of "slope" to the wetland classification following the definitions from the *Canadian Wetland Classification System* (CWCS; National Wetlands Working Group 1997). Slope Marsh wetlands are temporary or seasonal features that are fed by a spring, seep, or otherwise have groundwater influences where the water table is mid-slope. These groundwater-fed marshes are uncommon within Alberta, but are widely acknowledged in Canada and described within the CWCS.

A summary of the wetlands is detailed in **Table 3.0** and they are shown on **Figure 4.0**.

TABLE 3.0 – WETLANDS SUMMARY

Wetland ID	Legal Location	Stewart and Kantrud Classification	AWCS	Slope Wetlands	Area within Plan Area (ha)
W01	NW-11-22-29-W4M	Class III Seasonal Pond	Seasonal Marsh	-	0.07
W02	NE-11-22-29-W4M	Class III Seasonal Pond	Seasonal Marsh	-	0.49
W03*	NE-11-22-29-W4M	Class III Seasonal Pond	Seasonal Marsh	-	0.31

Wetland ID	Legal Location	Stewart and Kantrud Classification	AWCS	Slope Wetlands	Area within Plan Area (ha)
W04	NW-11-22-29-W4M	Class III Seasonal Pond	Seasonal Marsh	-	0.10
W05	NW-11-22-29-W4M	Class II Temporary Pond	Temporary Marsh	-	0.02
W06	NW-11-22-29-W4M	Class II Temporary Pond	Temporary Marsh	-	0.03
W07	NW-11-22-29-W4M	Class II Temporary Pond	Temporary Marsh	-	0.07
W08	NW-11-22-29-W4M	Class III Seasonal Pond	Seasonal Marsh	-	0.03
W09	NE-10-22-29-W4M	Class III Seasonal Pond	Seasonal Marsh	-	0.48
W10	NE-10-22-29-W4M	Class II Temporary Pond	Temporary Marsh	-	0.02
W11	NE-10-22-29-W4M	Class II Temporary Pond	Temporary Marsh	-	0.02
W12	NE-9-22-29-W4M	Class II Temporary Pond	Temporary Marsh	-	0.49
W13	NE-10-22-29-W4M	Class II Temporary Pond	Temporary Marsh	-	0.05
W14	NE-10-22-29-W4M	Class II Temporary Pond	Temporary Marsh	-	0.17
W15	NE-10-22-29-W4M NW-10-22-29-W4M	Class II Temporary Pond	Temporary Marsh	-	0.11
W16	NW-10-22-29-W4M	Class II Temporary Pond	Temporary Marsh	-	0.06
W17	NW-10-22-29-W4M	Class II Temporary Pond	Temporary Marsh	-	0.13
W18	NW-10-22-29-W4M	Class II Temporary Pond	Temporary Marsh	-	0.05
W19	NW-10-22-29-W4M	Class II Temporary Pond	Temporary Marsh	-	0.39
W20	NW-10-22-29-W4M	Class II Temporary Pond	Temporary Marsh	-	0.23
W21S	NE-9-22-29-W4M NW-9-22-29-W4M	Class III Seasonal Pond	Seasonal Marsh	Slope	0.20
W22S	NE-9-22-29-W4M	Class III Seasonal Pond	Seasonal Marsh	Slope	0.32
W23S	NE-9-22-29-W4M	Class III Seasonal Pond	Seasonal Marsh	Slope	0.19
W24S	NE-9-22-29-W4M	Class III Seasonal Pond	Seasonal Marsh	Slope	0.22
W25S	NE-9-22-29-W4M	Class III Seasonal Pond	Seasonal Marsh	Slope	0.74
W26S	SE-9-22-29-W4M	Class III Seasonal Pond	Seasonal Marsh	Slope	0.08
W27S	SE-9-22-29-W4M	Class III Seasonal Pond	Seasonal Marsh	Slope	0.20
W28S	SE-9-22-29-W4M SW-10-22-29-W4M NE-9-22-29-W4M	Class III Seasonal Pond	Seasonal Marsh	Slope	0.84
W29S	SW-10-22-29-W4M	Class III Seasonal Pond	Seasonal Marsh	Slope	0.62
W31S	NE-11-22-29-W4M	Class III Seasonal Pond	Seasonal Marsh	Slope	0.27
W32	NW-9-22-29-W4M NE-9-22-29-W4M SE-9-22-29-W4M	Class III Seasonal Pond	Seasonal Marsh	-	1.29
W33S	NW-11-22-29-W4M	Class III Seasonal Pond	Seasonal Marsh	Slope	0.22

Wetland ID	Legal Location	Stewart and Kantrud Classification	AWCS	Slope Wetlands	Area within Plan Area (ha)
W34S	NE-11-22-29-W4M	Class III Seasonal Pond	Seasonal Marsh	Slope	0.36
W35S	NE-11-22-29-W4M	Class III Seasonal Pond	Seasonal Marsh	Slope	0.44
W36S	SW-11-22-29-W4M	Class II Temporary Pond	Temporary Marsh	Slope	0.004
W37S	NW-11-22-29-W4M	Class II Temporary Pond	Temporary Marsh	Slope	0.04
W38S	NW-11-22-29-W4M	Class II Temporary Pond	Temporary Marsh	Slope	0.14
W39S	NW-11-22-29-W4M	Class II Temporary Pond	Temporary Marsh	Slope	0.12
W40S	NE-11-22-29-W4M	Class II Temporary Pond	Temporary Marsh	Slope	0.20
W41S	NE-11-22-29-W4M	Class III Seasonal Pond	Seasonal Marsh	Slope	0.16
W42S	SW-10-22-29-W4M SE-10-22-29-W4M	Class II Temporary Pond	Temporary Marsh	Slope	0.37
				Total Wetland Area within the Ricardo Ranch Lands (ha):	**13.74**

- Dash indicates wetlands with no assigned slope descriptor.
* - Wetland 03 was observed to have been modified to a dugout in historical aerial photographs.

5.2.2.1 TEMPORARY MARSH

A total of fourteen (14) Temporary Marsh wetlands were identified within the Ricardo Ranch Lands during desktop review and field assessments on June 14, 16, 19 and 21, 2017. These wetlands typically only retain water for short periods of time after heavy precipitation (**Photo 5.1**).

Within the Ricardo Ranch ASP Area, Temporary Marsh wetlands were exclusively observed in the northern portion of the Plan Area in flat and slightly undulating terrain, and were heavily impacted by grazing and cattle usage. Many of the Temporary Marsh wetlands were observed with signs of cattle pugged soils, and most were observed to be dry during field assessments in June.

Species observed in Temporary Marsh wetlands include smooth brome, awned sedge (*Carex atherodes*), Kentucky bluegrass, reed canary grass and short-awned foxtail (*Alopecurus aequalis*). Canada thistle, a Regulated Noxious Weed, was commonly observed within these wetlands in trace to low densities (**Section 6.0**).

PHOTO 5.1: VIEW NORTH OF W12, A TEMPORARY MARSH IN THE NORTHERN PORTION OF THE PLAN AREA

5.2.2.2 TEMPORARY SLOPE MARSH

A total of six (6) Temporary Slope Marsh wetlands were observed within the Ricardo Ranch ASP Area during field assessments on June 14, 16, 19 and 21, 2017. In addition to a temporary permanency and an assemblage of hydrophytic vegetation resembling a marsh wetland, these slope marshes receive additional hydrological input from groundwater sources that is more consistent than precipitation alone. The slope marshes were observed to occupy wet seepage areas where groundwater discharges along the escarpment (**Photo 5.2**). Despite the groundwater input, no standing water was present during the surveys, and overall permanence of the wetlands were determined to be temporary.

Within the Ricardo Ranch ASP Area, the Temporary Slope Marsh wetlands were observed in association with trees and shrubs, as these areas retained moisture more consistently, encouraging shrub and tree growth over time. Woolly sedge, wire rush, northern reed grass (*Calamagrostis stricata* ssp. *inexpansa*), common horsetail (*Equisetum arvense*), and beaked willow (*Salix bebbiana*) were common species observed within these wetlands.

Common toadflax (*Linaria vulgaris*), great burdock (*Arctium lappa*), Canada thistle, and perennial sow-thistle (*Sonchus arvensis*) are Regulated Noxious Weed species observed within the Temporary Slope Marsh wetlands (**Section 6.0**).

PHOTO 5.2: VIEW NORTHWEST OF W38S, A TEMPORARY SLOPE MARSH SHOWING VEGETATION AND SLOPE

5.2.2.3 SEASONAL MARSH

A total of seven (7) Seasonal Marsh wetlands were identified within the Plan Area during desktop review and field assessment on June 14, 16, 19 and 21, 2017. The seasonal permanence of these wetlands suggest that they typically contain standing water for some or most of the growing season (**Photo 5.3**).

Within the Ricardo Ranch Lands, Seasonal Marsh wetlands were observed in the northern portion of the Plan Area in flat and slightly undulating terrain, in similar pothole landscapes to Temporary Marshes, and showed evidence of being impacted by grazing and cattle.

Species observed in Seasonal Marsh wetlands in the north portion of the Plan Area include awned sedge, slough grass (*Beckmannia syzigachne*), short-awned foxtail, Kentucky blue grass, reed canary grass, wire rush, creeping spike-rush and water smartweed (*Persicaria amphibia*). Other species present include prostrate knotweed (*Polygonum aranastrum*) and woolly sedge. Canada thistle, great burdock, and common toadflax are Regulated Noxious Weed species observed within these wetlands (**Section 6.0**).

One Seasonal Marsh wetland (W32) was observed in the south portion of the Study Area (**Photo 5.4**). This wetland is in an area that was identified to be previously disturbed by gravel mining operations that has lowered the elevation of the area. Additionally, stormwater infrastructure has been constructed adjacent to Deerfoot Trail west of this wetland, and these disturbances may have impacted the hydrology of this wetland. W32 was dominated by wire rush, woolly sedge, and fowl bluegrass (*Poa palustris*). Other species observed include needle spike-rush, awned sedge, small bottle sedge (*Carex utriculata*), common plantain (*Plantago major*), wild vetch (*Vicia americana*), common dandelion (*Taraxacum officinale*), and white clover (*Trifolium repens*). Tall buttercup (*Ranunculus acris*), perennial sow-thistle, and Canada thistle are Regulated Noxious Weed species observed within this wetland (**Section 6.0**).

PHOTO 5.3: VIEW WEST OF W09, A SEASONAL MARSH IN THE NORTHERN PORTION OF THE PLAN AREA

PHOTO 5.4: VIEW NORTHEAST FROM CENTER OF W32

5.2.2.4 SEASONAL SLOPE MARSH

A total of fourteen (14) Seasonal Slope Marsh wetlands, with unique seepage and groundwater characteristics, were observed within the Ricardo Ranch ASP Area during field assessments on June 14, 16, 19 and 21, 2017. In addition to a seasonal permanency, these wetlands receive additional hydrological input from groundwater sources that is more consistent than precipitation alone. Common characteristics of the seasonal slope marsh wetlands include hummocky microrelief, and soggy, saturated soils with organic components.

Within the Ricardo Ranch ASP Area, the Seasonal Slope Marsh wetlands were observed along the escarpment in areas where seepage and groundwater discharge contribute to the overall hydrology of the wetland (**Photos 5.5** and **5.6**). Shrub and tree growth are present due to the higher amounts of moisture in these areas. Hummocky micro-relief was observed within these wetlands, associated with consistent water movement. Standing and slow flowing water were observed within these wetlands during field assessment (**Photo 5.7**). Woolly sedge, wire rush, creeping spike-rush, fowl bluegrass, fowl manna grass (*Glyceria striata*), water birch (*Betula occidentalis*), willow species, water sedge, golden sedge (*Carex aurea*), and green sedge (*Carex viridula*) were observed within these wetlands.

Perennial sow-thistle and Canada thistle are Regulated Noxious Weed species observed within the Seasonal Slope Marsh wetlands (**Section 6.0**).

PHOTO 5.5: VIEW SOUTHWEST OF W27S, A SEASONAL SLOPE MARSH WITH HUMMOCKY TERRAIN

PHOTO 5.6: VIEW SOUTHEAST OF SLOPED TERRAIN AND UPLAND TRANSITION NEAR W26S

PHOTO 5.7: VIEW OF HUMMOCKY MICRO-RELIEF TERRAIN AND STANDING WATER IN W26S

5.2.3 ALBERTA MERGED WETLAND INVENTORY

The Alberta Merged Wetland Inventory (AMWI) is a desktop database of wetland distribution in Alberta based on aerial imagery modelling using a combination of SPOT, Landsat imagery and orthophotography. The AMWI depicts wetlands within Alberta classified to Alberta Wetland Classification System (AWCS) at the major class level of marsh, swamp, bog, fen and open water. The intent of the AMWI is to describe and evaluate the status of wetlands on a regional level to inform planning decisions (Government of Alberta 2017).

A search of the AMWI database was completed prior to field surveys to identify potential wetlands within the Ricardo Ranch ASP Area and target areas for detailed survey. The AMWI identified numerous marsh wetlands throughout the the Plan Area including A03 (**Section 5.4**).

Upon field verification and historical aerial photograph review, A03 was determined to be anthropogenic in nature, created in a previously upland area, rather than a natural wetland that has been modified. Soils observed at A03 included sandy compositions that are not characteristics of marsh wetlands in Alberta.

Given the limitations of AMWI, no slope wetlands were identified within the database prior to field surveys; however, the field surveys identified the presence of these features (**Sections 5.2.2.2** and **5.2.2.4**).

5.3 DRAINAGES AND STREAMS

5.3.1 METHODS

Stream and drainage classification followed the *Pre-Application Requirements for Formal Dispositions* (Government of Alberta 2017b). This system classifies streams and drainages based on physical characteristics of channel presence and width into one of four categories:

- **Ephemeral drainages** have no defined channel. Water flow occurs only during and immediately following rainstorms;
- **Intermittent streams** have some channel development with non-terrestrial vegetation and a defined channel less than 0.7 m wide. Water flow occurs primarily during spring runoff and following heavy rain, or may be maintained by small springs;
- **Small permanent streams** have well defined banks and channel, with a channel width ranging from 0.7 m to 5 m often located in small valley bottoms and in bench floodplain development. Water flow is present throughout most to all of the year; and
- **Large permanent streams** are major streams or rivers that have well defined flood plains, banks and channel, with a channel width greater than 5 m, often located in large valley bottoms. Water flow is present permanently under normal circumstances.

Streams and drainages were identified prior to field assessment using LiDAR, previous desktop studies (Intelligent Futures 2017), and topography, and were verified during field assessment. When applicable, evidence of erosion, hydrophytic vegetation, and surface water were noted.

5.3.2 RESULTS AND DISCUSSION

A total of fifty-six (56) ephemeral drainages and one (1) intermittent stream were identified within the Richard Ranch ASP Area during desktop review and field assessments on June 14, 16, 19 and 21, 2017. Fluvial channels associated with the Bow River were also observed and described below.

5.3.2.1 EPHEMERAL DRAINAGE

Ephemeral drainages have no defined channel and are usually situated within a topographically low area or between two topographically high points (**Photo 5.6**). Water found in an ephemeral drainage typically only flows during or immediately following a large precipitation event or during snowmelt.

Within the Plan Area, fifty-six (56) ephemeral drainages were identified. These ephemeral drainages were associated with the sloped escarpment area, and were typically found in small valleys between two topographically high points on the landscape. Some ephemeral drainages were associated with slope wetlands, where seepage occurs at a higher point on the slope and runs down-slope along the ephemeral drainage to a flatter marsh area where the water pools. Within the east portion of the Plan Area, the drainages were frequently associated with

treestands and shrubby vegetation (**Photo 5.9**); whereas on the west portion of the Plan Area, drainages were more consistent with grassland landscapes (**Photo 5.8**).

PHOTO 5.8: VIEW SOUTH OF EPHEMERAL DRAINAGE ON WEST SIDE BETWEEN TWO HIGH POINTS

PHOTO 5.9: VIEW WEST OF EPHEMERAL DRAINAGES ON EAST SIDE WITH TREED AND SHRUBBY VEGETATION

5.3.2.2 INTERMITTENT STREAM

Intermittent streams are characterized by a narrow channel less than 0.7 m wide and are situated within a topographically low area or between two topographically high points. Water flow occurs primarily during spring runoff and following heavy rain, or may be maintained by springs. Intermittent drainages often have evidence of erosion or slumps that have occurred over time, but may not necessarily contain flowing water consistently.

Within the Plan Area, one (1) intermittent stream was identified with a channel width of approximately 0.5 m (**Photo 5.10**). A culvert was observed at the top of the slope with riprap and debris (**Photo 5.11**). No flowing or standing water was observed within the intermittent stream; however, evidence of erosion was present.

PHOTO 5.10: VIEW SOUTH OF INTERMITTENT STREAM WITH DEFINED CHANNEL

PHOTO 5.11: VIEW SOUTH OF CULVERT AND RIPRAP AT THE TOP OF THE SLOPE

5.3.2.3 FLUVIAL CHANNELS

Fluvial channels are historical stream segments resulting from the natural meandering of large streams and drainages that have since been separated from the main channel (**Photo 5.12**). Fluvial channels typically form at locations where substrates are weakest, and in combination with large velocity flow rates (such as a flash flood event). After formation, these channels often contain standing or slow-moving water from flooding, and are frequently still hydrologically connected to the main channel through groundwater or during times of high water level. Sediment and erosion from upstream are deposited, resulting in gravel bars and floodplain areas with cobbled and gravel substrates (**Photo 5.13**). Fluvial channels associated with the historical movement of the Bow River were observed during field assessments, predominantly on the east portion of the Plan Area.

Vegetation observed within the fluvial channels were hydrophytic, similar to those observed in wetlands and included Sartwell's sedge (*Carex sartwellii*), water sedge, awned sedge, graceful sedge (*Carex praegracilis*), woolly sedge, smooth brome, foxtail barley (*Hordeum jubatum*), wild mint, marsh horsetail (*Equisetum palustre*), fowl bluegrass, reed canary grass, small-fruited bulrush and common cattail. Trees and shrubs were also observed adjacent to the fluvial channels (**Photo 5.14**). Regulated Noxious Weeds Canada thistle and perennial sow-thistle were observed within the fluvial channels at lower densities in areas with more established vegetation, and higher densities in areas with frequent flooding and disturbance (**Section 6.0**).

PHOTO 5.12: VIEW FROM TOP OF SLOPE SOUTHWEST OF CHANNEL ON THE EAST PORTION OF THE PLAN AREA

PHOTO 5.13: VIEW WEST OF FLUVIAL CHANNEL WITH GRAVEL AND EVIDENCE OF RECENT EROSION

PHOTO 5.14: VIEW WEST OF FLUVIAL CHANNEL WITH ADJACENT TREESTANDS AND VEGETATION

5.4 ANTHROPOGENIC WATERBODIES

Three (3) Anthropogenic Waterbodies were observed within the Ricardo Ranch ASP Area in the western portion of the Plan Area (**Figure 4.0**). A01 is a depression adjacent to a seasonal slope marsh that showed signs of excavation. An anthropogenic channel (A02) was observed in the western portion of the Plan Area and included water control structures such as culverts and outfalls (**Photo 5.15** and **Photo 5.16**). The largest anthropogenic pond on the Ricardo Ranch ASP Area is A03, a large pond that appeared in historical aerial photographs between 1982 and 1992 (**Photo 5.17**). A03 was identified as a marsh wetland within AMWI; however, given field observations and historical aerial photograph review, A03 was determined to be an anthropogenic waterbody rather than a modified wetland. In addition, a dugout was observed within seasonal marsh W03 in the northeastern portion of the Plan Area, and historical aerial photographs indicate W03 was modified sometime between 1974 and 1982.

Prior to 2013, A03 was isolated from the Bow River; however, the aerial photographs of A03 in 2014 show new fluvial channels connecting the pond to the Bow River. The creation of these recent channels is referred to as an avulsion event and is associated with the 2013 flood. A03 was observed with higher densities of Regulated Noxious Weeds such as perennial sow-thistle, Canada thistle, and common tansy (*Tanacetum vulgare*) (**Section 6.0**).

PHOTO 5.15: VIEW SOUTH OF SOUTHEASTERN PORTION OF A02 CHANNEL SHOWING WATER AND CULVERTS

PHOTO 5.16: VIEW WEST OF NORTHWESTERN PORTION OF A02 CHANNEL SHOWING WATER AND RIPRAP

PHOTO 5.17: VIEW SOUTHEAST OF A03 SHOWING WATER AND WEEDY VEGETATION

6.0 REGULATED WEEDS

Regulated Prohibited Noxious and Noxious Weeds are aggressive, invasive plant species that are difficult to manage. Regulated Weeds may displace or significantly alter native plant communities and cause economic damage to private and public lands. The *Weed Control Act* has been instated to prevent the introduction of these species to Alberta and the spread of existing species to new areas (Government of Alberta 2008).

Prohibited Noxious weeds are usually found in very few regions of Alberta. Often, low densities are present at a few specific locations. They are designated 'Prohibited Noxious' to prevent their establishment. Where found, destruction of Prohibited Noxious weeds is required (Government of Alberta 2008).

Noxious weeds are already established in many regions of the province. Control of Noxious weeds is required when identified as problematic (Government of Alberta 2008).

6.1 WEED PRESENCE AND DENSITY

Surveys to determine Regulated Weed presence and density were completed in conjunction with the vegetation and rare plant surveys. Regulated Weeds designated Prohibited Noxious and Noxious were recorded and mapped where encountered. Regulated Weed presence and density is shown on **Figure 5.0.**

6.1.1 0 – 9% DENSITY

The majority of the Plan Area was observed with an overall Regulated Weed density of 0 to 9%, indicating trace to relatively low densities (**Figure 5.0**).

Wetlands that were observed with trace amounts of Regulated Weeds were predominantly in the northern portion of the Plan Area, within the Tame Pasture land cover class where cattle grazing, and past agricultural disturbance has allowed some invasive species to establish.

Regulated Noxious Weeds observed within these wetlands include great burdock, Canada thistle, and common toadflax. Slope wetlands along the escarpment were observed with trace to low densities of Canada thistle, perennial sow-thistle, tall buttercup and common toadflax.

6.1.2 10 – 24% DENSITY

Several areas within the Ricardo Ranch ASP Area were observed with 10 to 24% Regulated Weed density (**Figure 5.0**). These areas were characterized by flatter topography, with low to moderate levels of disturbance from erosion or rural activities. The flat landscape allows invasive species to establish more readily than areas that are sloped, and areas adjacent to the river that are subject to periodic flooding is additionally susceptible to weed establishment.

Weed species observed within the 10 to 24% density category include common toadflax in the areas adjacent to the Bow River, and Canada thistle and perennial sow-thistle in other areas within the Plan Area.

6.1.3 25 – 49% DENSITY

One (1) large area in the south portion of the Ricardo Ranch ASP Area was observed with 25 to 49% Regulated Noxious Weed density (**Figure 5.0**). This area was observed with a moderate to high density of leafy spurge (*Euphorbia esula*), black henbane (*Hyoscyamus niger*), perennial sow-thistle, and common tansy. Pockets of localized higher density of common tansy and Canada thistle was observed within this area (**Photo 6.1**).

PHOTO 6.1: VIEW OF LOCALIZED HIGH-DENSITY POCKET OF CANADA THISTLE

6.1.4 50 – 75% DENSITY

Several areas along the escarpment were observed with extremely high densities of Regulated Noxious Weeds within the Ricardo Ranch ASP Area. Along the escarpment and at the top of the slope, these areas consisted of small pockets of highly dense leafy spurge or Canada thistle (**Photo 6.2**).

Adjacent to the large anthropogenic pond (A03), large portions of area were observed with high densities of common mullein (*Verbascum thapsus*), common tansy, Canada thistle, perennial sow-thistle, and leafy spurge. Recent erosion and flooding has allowed opportunistic invasive species and Regulated Noxious Weeds to establish.

PHOTO 6.2: VIEW OF EXTREMELY HIGH-DENSITY POCKET OF LEAFY SPURGE

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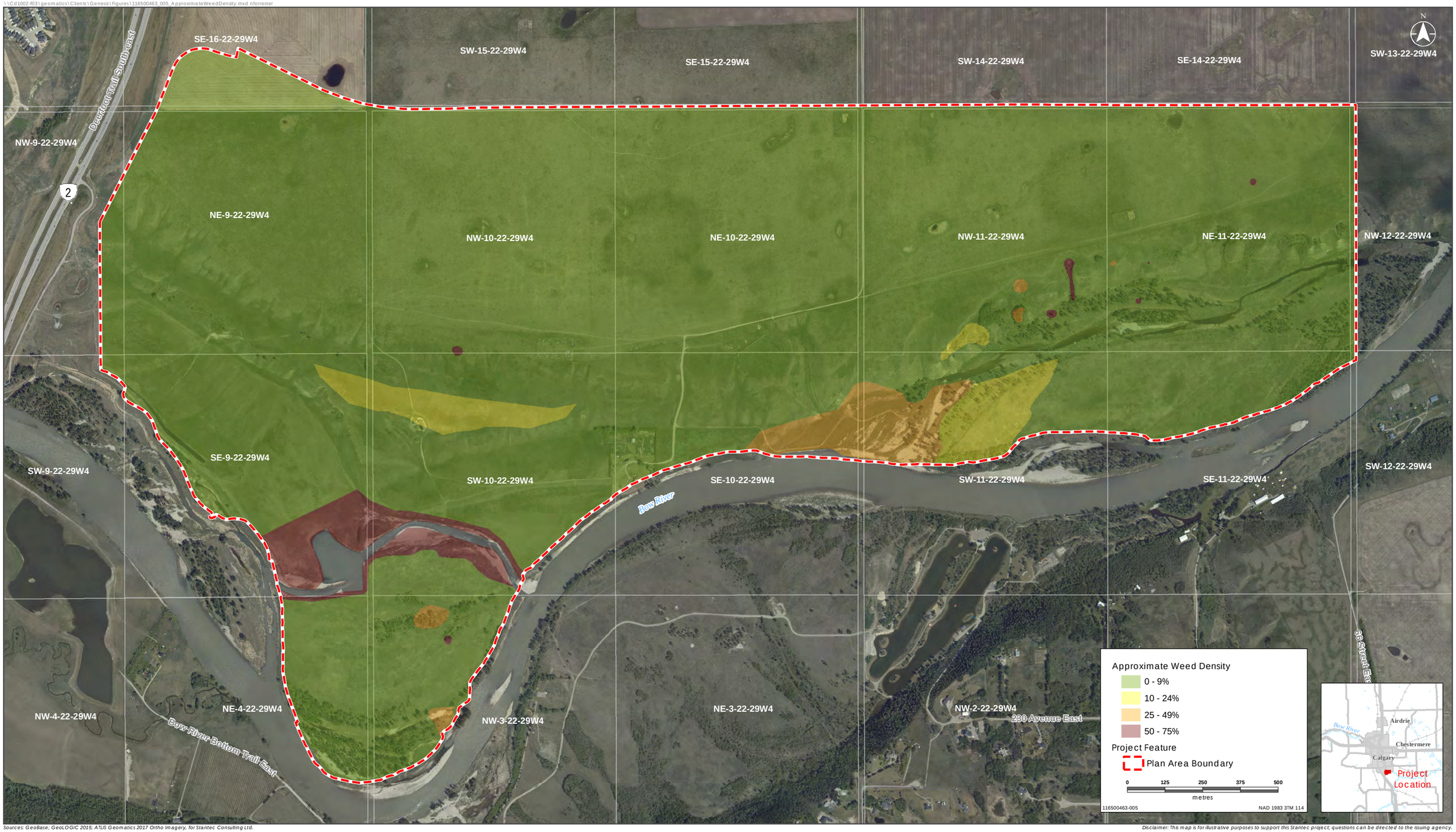

Sources: GeoBase; GeoLOGIC 2015; ATLIS Geomatics 2017 Ortho Imagery, for Stantec Consulting Ltd.

Disclaimer: This map is for illustrative purposes to support this Stantec project; questions can be directed to the issuing agency.

Approximate **Regulated** Weed Density

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RICARDO RANCH AREA STRUCTURE PLAN
ECOLOGICAL INVENTORY

Figure 5.0

7.0 RARE PLANTS

Rare plants refer to species that exist in low numbers, have a restricted range, or are of conservational concern due to population decline or ecological threats. Plant species considered rare in Alberta are identified by the Government of Canada (Canadian Endangered Species Conservation Council [CESCC] 2016).

7.1 TRACKED AND WATCHED PLANTS AND ECOLOGICAL COMMUNITIES

The Alberta Conservation Information Management System (ACIMS) tracks the occurrence and distribution of vascular and non-vascular plants in Alberta (ACIMS 2017). The goal of ACIMS is to provide information on the location, condition, status, and trends of plants in Alberta. The data is continually updated, analyzed, and disseminated to support conservation planning, development planning, natural resources and protected area management, and research and education.

The ACIMS data includes tracked and watched elements. Tracked species or ecological communities are those that ACIMS actively collects information on due to potential conservational concerns; and watched elements include species or communities that are not currently considered of high conservational concern but may become so, should there be significant alterations to habitat. Plant species considered rare in Alberta at a national level identified by the CESCC are tracked in ACIMS; however, not all tracked or watched species are considered rare by CESCC.

A search of the ACIMS tracking and watch lists was conducted in July 2017 to identify known tracked or watched species historically recorded within the Plan Area (ACIMS 2017).

The ACIMS database uses ranked statuses of conservation concern:

- **S1 / G1**: Known from 5 or fewer occurrences, especially vulnerable to extirpation because of other factor(s);
- **S2 / G2**: Known from 20 or fewer occurrences, or vulnerable to extirpation because of other factors;
- **S3 / G3**: Known from 100 or fewer occurrences, or somewhat vulnerable due to other factors such as restricted range, relatively small population sizes or other factors;
- **S4 / G4**: Apparently secure, taxon is uncommon but not rare; potentially some cause for long-term concern due to declines or other factors; or
- **S5 / G5**: Secure, taxon is common, widespread and abundant.

The desktop search of the ACIMS database identified three (3) records of previously recorded tracked or watched elements within the Plan Area (ACIMS 2017; **Appendix D**) including (2) two records of western false gromwell, and one (1) record of blunt-leaved watercress (*Rorippa curvipes*). These occurrences are all ranked S3 indicating fewer than 100 known occurrences.

7.2 FIELD SURVEYS

7.2.1 METHODS

Rare plant surveys were conducted following provincially accepted guidelines outlined by the Alberta Native Plant Council (ANPC; ANPC 2012) and techniques adapted from *An Investigation of Methods Used in Rare Plant Surveys Conducted for Impact Assessments* (Krichbaum 1998).

Field surveys for rare plants were completed during two visits, including both a spring and summer survey to account for variations in plant growth and flowering times. As field crews are completing field surveys, any rare plants, rare ecological communities, and tracked or watched species observed incidentally are also noted.

Field surveys for rare plants were completed during the following two visits:

- May 26 and 30, and June 2, 6 and 7, 2017 for the spring survey; and
- August 18, 24, and 25, 2017 for the summer survey.

7.2.2 RESULTS AND DISCUSSION

No federally regulated rare plant species were observed within the Ricardo Ranch ASP Area during the field surveys.

One (1) tracked species, western false gromwell, was observed throughout the Ricardo Ranch ASP Area during all field surveys, including rare plant surveys (**Photos 7.1** and **7.2**). Western false gromwell is tracked within ACIMS; however, it is not considered rare in Alberta by CESCC.

Where incidentally observed, number of individuals of western false gromwell was recorded and categorized into low to high densities per 100 m radius. All locations shown on **Figure 6.0** have been buffered and are shown as approximate.

No other tracked or watched species were observed during field surveys.

PHOTO 7.1: VIEW OF ONE INDIVIDUAL WESTERN FALSE GROMWELL

PHOTO 7.2: VIEW OF MANY INDIVIDUALS WITHIN A SMALL RADIUS AT HIGH DENSITY

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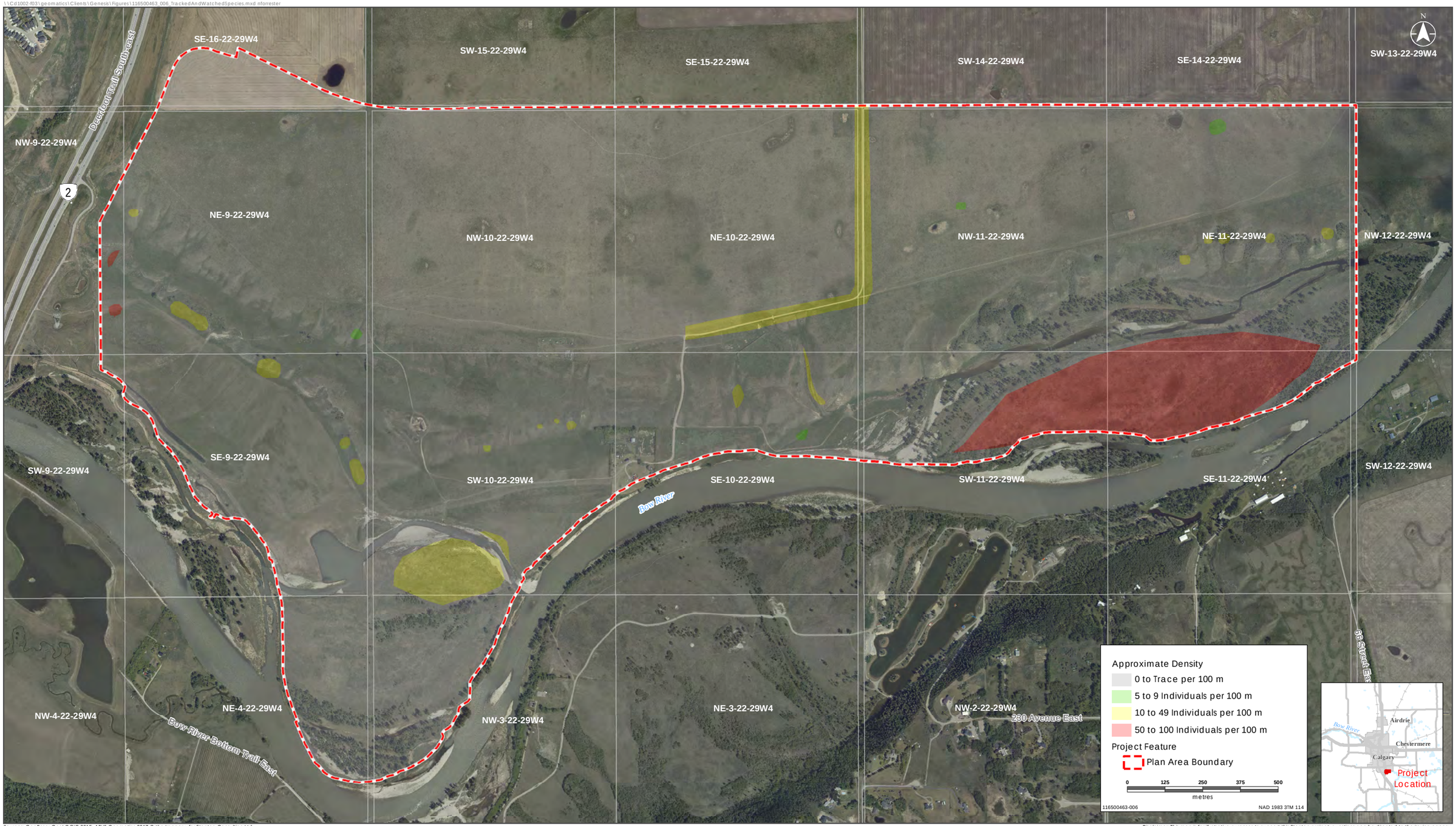

Sources: GeoBase; GeoLOGIC 2015; ATLIS Geomatics 2017 Ortho Imagery, for Stantec Consulting Ltd.

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Tracked and Watched Species Observations

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RICARDO RANCH
AREA STRUCTURE PLAN

Figure 6.0

8.0 SOILS AND LANDFORMS

The Plan Area is underlain by bedrock of the Tertiary Porcupine Hills Formation and the Tertiary-Cretaceous Paskapoo Formation. The Porcupine Hills Formation consists of non-marine pale grey, thick-bedded cherty calcareous sandstone and non-marine pale calcareous mudstone. The Paskapoo Formation consists of non-marine, thick-bedded calcareous cherty sandstone, siltstone, and mudstone with minor layers of conglomerate, limestone, coal, and tuft beds (MacMillan 1987).

Soil formation is largely dependent upon five general categories; parent material, climate, living organisms, relief, and time. In the Calgary area, weathering of soil components is not considered to be intense and soil textures are usually similar to the parent material. Variations in soil characteristics are a result of variations in one or more of these factors (MacMillan 1987).

8.1 SOILS

8.1.1 DESKTOP REVIEW

Soils present within the Ricardo Ranch Lands were determined through a desktop review of existing reports and the *Agricultural Region of Alberta Soil Inventory Database* (AGRASID; Alberta Agriculture and Rural Development [AARD] 2017). Soils were classified in accordance with the *Canadian System of Soil Classification* (Soil Classification Working Group 1998).

The underlying bedrock of the Foothills Fescue Natural Subregion consists primarily of Tertiary and Upper Cretaceous sandstones and mudstones. Surficial materials are dominantly medium-textured, moderately calcareous glacial till. Fine- and medium-textured glaciolacustrine materials cover approximately 25% of the Subregion, and sandy or gravelly glaciofluvial deposits occur within and adjacent to river valleys (Natural Regions Committee 2006).

Soil Subgroups present within the Plan Area include Orthic Black Chernozems and Rego Black Chernozems. A search of the AGRASID (AARD 2017) identified the DERK2/U1h, DERK1/H1l, DERK1/U1h and BOHI2/SC2 Soil Units within the Plan Area.

DERK is a Unit of the Delacour and Rockyview Soil Group. The U1h modifier identifies undulating to high relief landscapes, while H1l modifier shows areas that are hummocky with low relief. The Delacour component represents medium till with moderately fine textured sandy clay loam, clay loam and silty clay loam. The Rockyview component includes medium textured loam, silt loam and fine sandy loam over medium or fine textured till. A third component of this Soil Group is a miscellaneous gleysol soil in depressions.

BOHI is a Unit of the Highwood and Bow Valley Soil Group. The SC2 modifier indicates valley landforms with terraces. Highwood components are characterized by rapidly draining very course sand or loamy sand over sediments deposited by wind or water. The Bow Valley component is also rapidly draining and very gravelly sand and loamy sand over coarse textured

material. Undifferentiated miscellaneous gleysols are also observed in depressions but is a very small component of this Soil Unit (AARD 2017).

8.1.2 FIELD SURVEY

8.1.2.1 METHODS

Field-based soil inspections were completed within the Ricardo Ranch ASP Area in conjunction with the vegetation and land cover surveys on June 12, 14, 16, 19, 21 and 30, and July 6, 7, 19, 20 and 28, 2017. Representative soils were examined to a depth of 29 cm, where possible, using a shovel or hand auger for each survey site. The depth, texture, color, and structure in each soil horizon was recorded.

Soil texture was determined by hand, and soil color was assigned using the *Munsell Soil Color Book* (Munsell Color 2009). The presence or absence of redox, gleying and rock were recorded as well. Locations of site surveys where soil inspections were completed are presented in **Figure 7.0**.

8.1.2.2 RESULTS AND DISCUSSION

The texture of soils sampled during the field surveys varied greatly between ecosystem land cover Site Types. Areas that were observed with extremely dry xeric soils were correlated with the escarpment and sloped areas. Wetlands and waterbodies were observed with mesic to hydric soils. Where groundwater input was observed in slope marsh wetlands, soils were hydric or sub-hydric and water was observed at the surface or close to the surface. Slope marsh wetlands were often observed with a rich black organic component due to the consistent groundwater input contributing to anaerobic conditions (**Photo 8.1**).

Cobbly soils and gravel was observed in the south portion of the Ricardo Ranch ASP Area, where fluvial deposits have influenced the soils substrate structure over time. The areas adjacent to the Bow River or fluvial channels have aggregates on the surface that are recently deposited; whereas areas on the floodway and flood fringe showed evidence of loam on top of gravel or rocky substrates.

The surface (A) horizon was generally greater than 29 cm deep (the depth of excavation), with subsurface (B) horizons only observed at six (6) sites. Soils were brownish black to black in colour with redox present in some locations, where hydrology is anticipated to fluctuate (**Photo 8.2**).

A summary of soils found at each survey site is detailed in **Appendix E**. Soil survey data for land cover Site Types are detailed within **Table E-1**, and within **Table E-2** for waterbodies.

PHOTO 8.1 – BLACK ORGANIC COMPONENT OBSERVED AT SEASONAL SLOPE MARSH W26S

PHOTO 8.2 – REDOX WITHIN SANDY CLAY SUBSURFACE HORIZON AT WATERBODY SURVEY SITE 004

8.2 SLOPES AND TOPOGRAPHY

A topographical analysis was completed to identify slope and slope classes based on the City of Calgary's Digital Aerial Survey (DAS) and Digital Elevation Model (DEM) data. For purposes of this report, sloped areas of interest are lands with a slope of greater than 15%, and may require certain slope adaptive development methods to be applied during the planning process, to be determined in conjunction with geotechnical findings.

For purposes of this EI, slope analysis categories were divided into the following ranges:

- 15 to 20% slope;
- 21 to 33% slope; and
- Greater than 33% slope.

The goal of the slope and topographical analysis is to assist in the planning and design of sloped terrain in a safe and responsible manner by ensuring the development is compatible with the natural systems, terrain and geological character of the landscape. The topographical slope analysis of the Ricardo Ranch ASP Area is shown in **Figure 7.0**.

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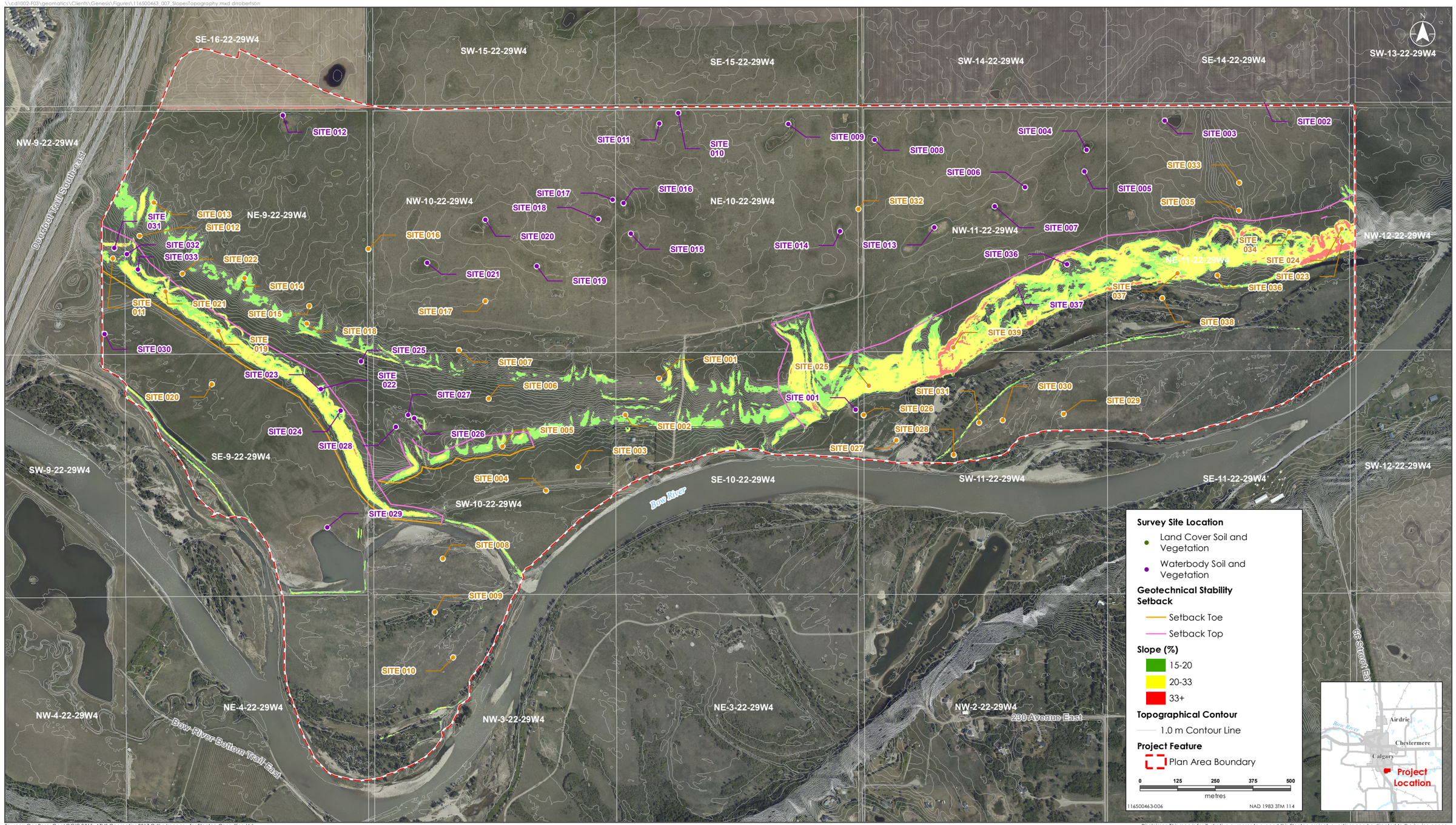

Sources: GeoBase; GeoLOGIC 2015; ATLIS Geomatics 2017 Ortho Imagery, for Stantec Consulting Ltd.

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Slopes and Topography

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ECOLOGCIAL INVENTORY

Figure 7.0

9.0 WILDLIFE AND WILDLIFE HABITAT

9.1 DESKTOP REVIEW

9.1.1 METHODS

A desktop review was completed to identify historic records of wildlife, wildlife habitat features (e.g., dens, nests, burrows, and breeding wetlands) and sensitive wildlife areas that may potentially occur. In addition, the desktop review was used to determine if species of management concern (SOMC) or their habitat, have been observed within or near the Plan Area.

The following sources were used to conduct the desktop review:

- Wildlife literature on species occurrence and distribution (Smith 1993, Pattie and Fisher 1999, Russell and Bauer 2000, Stebbins 2003, Federation of Alberta Naturalists 2007);
- Fish and Wildlife Management Information System (FWMIS; AEP 2017b) database and Fish and Wildlife Internet Mapping Tool (AEP 2017a).
  - Two (2) search buffers were used to query the FWMIS database: a search buffer of approximately 3.0 km was used to query for previously recorded observations of SOMC, consistent with the guidance provided in the *Ecological Inventory Framework: Area Structure Plans* (City of Calgary 2016), and a buffer of 1.0 km was used, based on the maximum setback requirements for SOMC potentially occurring in the area (Government of Alberta 2011c, 2017b), to query for locations of previously recorded wildlife habitat features (e.g., raptor stick nests);
- ESAs of Alberta (Fiera Biological Consulting 2014);
- AEP Wildlife Sensitivity Data Sets and protected areas (AEP 2016) including:
  - Key Wildlife and Biodiversity Zones (KWBZ);
  - Mapped sensitivity ranges for SOMC occurring in Alberta (e.g., sharp-tailed grouse, raptors);
  - Wildlife sanctuaries including Provincial Wildlife Corridor Sanctuary, Provincial Game Bird Sanctuary, Provincial Restricted Area, Provincial Seasonal Sanctuary;
  - Provincial Parks and Protected Areas; and
  - Ecological Reserves, Wilderness Areas, Wildland Provincial Parks, Wilderness Parks, Provincial Parks, Natural Areas, Heritage Rangelands, and Provincial Recreation Areas and National Parks.
- eBird (eBird 2018);
- Important Bird Areas (IBAs) (Bird Studies Canada 2018); and,
- Federally Protected Areas such as Migratory Bird Sanctuaries and National Wildlife Areas (ECCC 2017).

SOMC are defined as wildlife species that are:

- listed federally as Endangered, Threatened, or Special Concern on any Schedule of the SARA Public Registry (Government of Canada 2017b);
- designated federally as Endangered, Threatened, or Special Concern by the COSEWIC (COSEWIC 2017);
- listed provincially as Endangered or Threatened and protected under the AWA, or species listed as Special Concern by AESCC (AESCC 2015); and,
- designated provincially as At Risk, May be at Risk, or Sensitive according to the Alberta Wild Species General Listing of 2015 (Government of Alberta 2017a).

9.1.2 RESULTS AND DISCUSSION

Based on a review of species ranges and habitat preferences, sixty-four (64) wildlife SOMC may potentially occur within the Plan Area. Out of the 64 species that have potential to occur, fifty-one (51) are bird, six (6) are mammal, four (4) are amphibian and three (3) are reptile species (**Table F-1** in **Appendix F**).

The FWMIS database search identified twenty-seven (27) historical SOMC records within approximately 3.0 km of the Plan Area; no additional species were identified in the eBird database (**Appendix D**; **Table 4.0**). The SOMC records consisted of twenty-two (22) bird, four (4) mammal, and one (1) reptile species; no historical records of amphibian SOMC were identified.

The database search identified historical records for habitat features (e.g., nests) for the following species within 1.0 km of the Plan Area: great-blue heron (*Ardea herodias*), osprey (*Pandion haliaetus*), bald eagle (*Haliaeetus leucocephalus*), red-tailed hawk (*Buteo jamaicensis*), Swainson's hawk (*Buteo swainsoni*), and common raven (*Corvus corax*). Great blue heron, osprey, and bald eagle are SOMC with provincially recommended setback buffers of up to 1.0 km for the breeding sites of these species (Government of Alberta 2011c, Government of Canada 2017a).

The Plan Area occurs within a KWBZ associated with the Bow River valley as well as sharp-tailed grouse (*Tympanuchus phasianellus*) and sensitive raptor ranges (AEP 2016). Sensitive raptors identified for this portion of the raptor range are bald eagle, golden eagle (*Aquila chrysaetos*), and prairie falcon (*Falco mexicanus*). The Plan Area does not overlap with any other Key Range Layers or Key Wildlife Layers (e.g., grizzly bear support zones), Important Bird Areas, or any other protected areas.

TABLE 4.0 – HISTORICAL WILDLIFE SOMC RECORDS WITHIN 3.0 KM OF THE PLAN AREA

Common Name	Scientific Name	SARA Status[1]	COSEWIC Status[2]	AESCC Status[3]	Alberta General Status[4]
Birds					
trumpeter swan	*Cygnus buccinator*	-	Not at Risk	Special Concern	Sensitive
western grebe	*Aechmophorus occidentalis*	Special Concern (Schedule 1)	Special Concern	Threatened	At Risk
sora	*Porzana carolina*	-	-	-	Sensitive
black-necked stilt	*Himantopus mexicanus*	-	-	-	Sensitive
Forster's tern	*Sterna forsteri*	-	-	-	Sensitive
black tern	*Childonias niger*	-	-	-	Sensitive
American white pelican	*Pelecanus erythrorynchos*	-	-	-	Sensitive
American bittern	*Botaurus lentiginosus*	-	-	-	Sensitive
great blue heron	*Ardea herodias*	-	-	-	Sensitive
osprey	*Pandion haliaetus*	-	-	-	Sensitive
bald eagle	*Haliaeetus leucocephalus*	-	-	-	Sensitive
American kestrel	*Falco sparverius*	-	-	-	Sensitive
peregrine falcon	*Falco peregrinus*	Special Concern (1)	Special Concern	Threatened	At Risk
prairie falcon	*Falco mexicanus*	-	Special Concern	-	Sensitive
least flycatcher	*Empidonax minimus*	-	-	-	Sensitive
alder flycatcher	*Empidonax alnorum*	-	-	-	Sensitive
eastern kingbird	*Tyrannus tyrannus*	-	-	-	Sensitive
bank swallow	*Riparia riparia*	-	Threatened	-	-
barn swallow	*Hirundo rustica*	-	Threatened	-	Sensitive
Baird's sparrow	*Ammodramus bairdii*	Special Concern (Schedule 1)	Special Concern	-	Sensitive
common yellowthroat	*Geothlypis trichas*	-	-	-	Sensitive
Baltimore oriole	*Icterus galbula*	-	-	-	Sensitive

Common Name	Scientific Name	SARA Status[1]	COSEWIC Status[2]	AESCC Status[3]	Alberta General Status[4]
Mammals					
little brown bat	*Myotis lucifugus*	Endangered (Schedule 1)	Endangered	-	May Be at Risk
eastern red bat	*Lasiurus borealis*	-	-	-	Sensitive
silver-haired bat	*Lasionycteris noctivagans*	-	-	-	Sensitive
western small-footed bat	*Myotis ciliolabrum*	-	-	Special Concern	Sensitive
Reptiles					
wandering garter snake	*Thamnophis elegans vagrans*	-	-	-	Sensitive

[1] – listed Endangered, Threatened, or Special Concern by SARA Public Registry (Government of Canada 2017b);
[2] – listed Endangered, Threatened, or Special Concern by COSEWIC (COSEWIC 2017);
[3] – listed species legally protected under the AWA (AESCC 2015);
[4] – listed At Risk, May be at Risk, or Sensitive under the Alberta Wild Species General Listing of 2015 (Government of Alberta 2017a); and
"-" – Dash indicates no status or non-occurring species.

9.2 WINTER TRACK COUNT SURVEY

9.2.1 METHODS

A winter track count survey was conducted to gather information on relative abundance, distribution, and winter habitat use of wildlife in the Plan Area. Winter track count surveys are the preferred survey method in Alberta for large and medium-sized mammals because they are non-invasive and detect more species relative to other methods (Alberta Environment and Sustainable Resource Development [AESRD] 2013). Surveys were completed under research permit and collection license #18-231 issued by AEP.

Track data were collected using linear transects based on methods for a standard line-intercept survey and were used to calculate species-specific indices of relative abundance (Resources Inventory Committee 2006). Survey methods followed the *Sensitive Species Inventory Guidelines* (AESRD 2013) for non-linear disturbance with the exception that shorter transects were used due to the size and shape of the Plan Area. Species-specific tracks observed within 1.0 m of either side of the transect center line and made since the last track-obliterating snowfall were recorded for each segment. A track-obliterating snowfall is defined as snowfall greater than 1.0 cm or an average daily wind speed greater than or equal to 30 km/h (Alberta Biodiversity Monitoring Institute [ABMI] 2015). Temperature, snow depth, wind, and snow conditions (using a hardness scale) were recorded for each transect. All incidental wildlife observations were also recorded.

Tracks of mule and white-tailed deer and tracks of small rodents and shrews were identified to species groups because of difficulty differentiating to the species level. Where necessary, tracks were back-tracked to obtain more visible tracks and aid identification. Track counts are presented as a standardized index of relative abundance (km-days) calculated following Thompson *et al*. (1989):

$$\text{Track Density} = \frac{\sum \text{Tracks Observed}}{\sum \text{Transect length surveyed (km)} \times \text{Track Period (days)}}$$

The number of days since the last track-obliterating snowfall (track period) was used to standardize track counts. Standardized track counts (referred to as track density) were calculated for each species observed during the winter track survey.

9.2.2 RESULTS AND DISCUSSION

Eight (8) transects, ranging from 425 to 1,500 m in length (**Figure 8.0**) with a combined total of 7,875 m across seven landscape cover types were surveyed (**Table F-2** in **Appendix F**). Transects A, B, and C were surveyed on February 21, 2018 between 10:00 and 15:00 and Transects D, E, F, G, and H were surveyed on February 22, 2018 between 9:00 and 15:00. Conditions on both days were appropriate for winter tracking surveys (i.e., temperatures of -25 to -10°C, nil to light wind, and fresh snowfall within 4-5 days). Average snow depth was 34 cm, and ranged from 3 cm on valley breaks to 48 cm. Average days since last snowfall was 4.95.

In total, 442 tracks from seven species or species groups were observed (**Table 5.0**). No SOMC were recorded during the survey. Transects A and D were placed in Tame Pasture landscape cover on the tops of the valley (**Figure 8.0**) and contained the fewest tracks; whereas higher track counts were observed in eastern portions of the Plan Area (Transects E, F, G and H) (**Table 5.0**).

TABLE 5.0 – WILDLIFE TRACK COUNTS FOR SPECIES OBSERVED

Transect	upland game bird	small rodent	porcupine	coyote	ermine	least weasel	deer spp.	Total
A	-	4	-	-	-	-	-	**4**
B	2	5	-	15	-	-	14	**36**
C	1	6	2	14	-	-	33	**56**
D	-	-	-	-	-	-	7	**7**
E	5	1	-	30	-	1	80	**117**
F	-	4	-	26	8	-	65	**103**
G	-	6	-	21	3	1	27	**58**
H	-	-	-	13	-	-	48	**61**
Total	**8**	**26**	**2**	**119**	**11**	**2**	**274**	**442**

"-" – Dash indicates absence of species track counts

Deer (*Odocoileus* spp.) was the most commonly observed species group and made up 62% of all track observations, followed by coyote (*Canis latrans*) with just over 26%. Although deer and coyote activity were observed in most or all landscape cover types, habitat use was relatively high in Lotic (Herbaceous) and Thin Breaks for deer, and Lotic (River) and Lotic (Herbaceous) for coyote (**Photo 9.1; Table F-3** in **Appendix F**). Mule deer (*Odocoileus hemiotus*) were incidentally observed during the survey near Transect H in Lotic – Deciduous and Thin Break landscape cover. Several deer bed sites were also observed in various sites where shelter (e.g., trees) was available. Geotechnical investigations were ongoing in Loamy landscape cover on the valley top between Transects G and H, which may have altered behavior of some species, particularly deer, in that area.

PHOTO 9.1 – WILDLIFE TRACKS OBSERVED AROUND THE FLUVIAL CHANNELS WITHIN THE PLAN AREA

9.3 NOCTURNAL FOREST OWL SURVEYS

9.3.1 METHODS

Forest owl call-playback surveys were conducted in the Study Area targeting treed areas with potential for supporting tree-nesting owl species. Broadcasting the calls of owls during the breeding season can elicit a visual or vocal response from owls that can be used to identify species and potentially the locations of active nests.

Surveys were conducted between 30 minutes after sunset and midnight, the optimal period when nocturnal owls reliably respond to broadcasted calls (Takats *et al*. 2001). Each survey consisted of a 2-minute waiting period to mitigate the effects of the observer reaching the site. During this period, location, weather, and habitat data were recorded. If no owls were heard during the initial listening period, 20-second owl calls were broadcast for great horned owl (*Bubo virginianus*), barred owl (*Strix varia*), great gray owl (*Strix nebulosa)*, long-eared owl (*Asio otus)*, boreal owl (*Aegolius funereus)*, northern pygmy owl (*Glaucidium gnoma*), and northern-saw-whet owl (*Aegolius acadicus*) using a FOXPRO® NX3 (FOXPRO® Inc., Lewiston, PA) handheld speaker. Calls were broadcast at a volume sufficient to be heard at least 300 m away followed by a 1-minute listening period per species. The speaker was rotated in all directions over the broadcast period, with the observer scanning the surroundings. If any owls were detected, the broadcast was ceased immediately to limit disturbance to the owls. When an owl was detected, species, distance and bearing from the survey station were recorded.

Weather conditions, time of day and time of year can influence nocturnal forest owl surveys (Takats *et al*., 2001). Optimal environmental conditions for conducting forest owl surveys consists of seasonally average temperatures, and winds less than 20 km/h. Surveys were completed under research permit #18-298 issued by AEP.

9.3.2 RESULTS AND DISCUSSION

Four (4) nocturnal owl survey stations (**Figure 7.0**) were visited on April 25, 2018 between 21:20 h and 23:35 h, in favourable weather conditions (i.e., 6-10°C, no precipitation, light air) but under moderate to heavy noise levels due to nearby traffic at the two stations nearest Deerfoot Trail (stations A and B) in the western portion of the Study Area.

Two (2) great-horned owls were detected during the survey; one (1) approximately 200 m south of the Study Area in forested habitat associated with the south slopes of the Bow River valley, and one (1) in Thin Break landscape approximately 100 m northeast of station C.

Based on results of the survey and on previous incidental observations in the Study Area, great horned owl likely breeds within or near the Study Area. An additional juvenile great horned owl observation occurred during the breeding bird survey in June 2017. Although no active great horned owl nests were identified in the Study Area, suitable nesting habitat is available.

9.4 AMPHIBIAN SURVEYS

9.4.1 NOCTURNAL AMPHIBIAN SURVEYS

Nocturnal amphibian surveys were conducted to determine the presence of amphibians in areas that contain suitable amphibian habitat, and involve listening for calling males, which are more active at night during the breeding period. Nocturnal amphibian surveys were conducted from 30 minutes after sunset to 01:00 during active breeding periods for amphibians when males are most vocal (i.e., mid-April to mid-June).

Survey methodology deviated from the *Sensitive Species Inventory Guidelines* (AESRD 2013) by reducing the number of nocturnal visits from three to two, and including a diurnal visit later in the season, as per approval from the regional AEP biologist (Boukall 2016, pers. comm.). The survey consisted of a 5-minute listening period to identify calling amphibians from survey stations that were determined based on proximity to potentially suitable breeding habitat.

All amphibians observed during the listening period were recorded. The number of individual males calling were estimated using the following index of abundance (Mossman et al. 1998):

- 0 = no amphibians heard calling;
- 1 = 1-5 individuals (no overlapping calls) estimated heard calling;
- 2 = 6-10 individuals (overlapping but distinguishable calls) estimated heard calling; and
- 3 = >10 individuals (full chorus where overlapping calls are not distinguishable) estimated heard calling with full chorus.

Two (2) rounds of nocturnal amphibian surveys were conducted at thirteen (13) stations within the Plan Area (**Figure 8.0**). Both rounds of surveys were conducted over three (3) nights with the first round being conducting on May 3, 2017, May 10, 2017 and May 18, 2017. The second round was conducted on May 25, 2017, May 26, 2017 and May 30, 2017. Surveys were conducted in favourable conditions.

Boreal chorus frog (*Pseudacris maculata*) were detected at all survey stations. Boreal chorus frogs were observed in greater quantities during the first visit, predominantly call index 3. Wood frogs (*Lithobates sylvaticus*) were detected at five (5) stations (Stations A, B, C, N and P) but were only detected during the first visit and in relatively low numbers compared to boreal chorus frogs.

9.4.2 DIURNAL AMPHIBIAN SURVEY

Diurnal amphibian surveys were conducted to determine the presence of amphibians in areas that contain suitable amphibian habitat. Diurnal visual encounter surveys involve searching for young-of-the-year and adult amphibians in potential breeding locations. Surveys were conducted during the transformation period (i.e., June to September).

To conduct the survey, a wildlife biologist walked the perimeter of suitable waterbodies to determine the presence of tadpoles and adult amphibians. The search lasted until an appropriate area of suitable habitat was searched. All wetlands within the Plan Area with habitat suitable for development of young were surveyed. Surveys were completed under research permit #58993 and collection license #58994 issued by AEP.

The diurnal amphibian survey was conducted under favourable weather conditions in wetlands with suitable water levels to support developing amphibians. One round of diurnal surveys was conducted over a span of two (2) days on August 15, 2017 between 09:30 and 15:30, and on August 17, 2017, between 09:00 and 13:00. Heavy rainfall occurred between the survey dates and water temperature ranged from 8 to 17°C.

A total of one hundred thirty-four (134) wood frogs including forty-two (42) young of the year and ninety-two (92) adults, and one (1) boreal chorus frog were observed during the survey. All frogs were observed on August 15, 2017 in Lotic (Herbaceous) Site Type within the fluvial channels in the east portion of the Plan Area at Stations A to K (**Photo 9.2**).

PHOTO 9.2 – LOTIC (HERBACEOUS) SITE TYPE WHERE AMPHIBIAN OBSERVATIONS OCCURRED DURING THE DIURNAL AMPHIBIAN SURVEY.

9.5 SNAKE HIBERNACULUM SURVEY

9.5.1 METHODS

Snake hibernacula in Alberta are protected and require setback buffers during development. Snake hibernaculum searches were conducted in areas with potential to support snake hibernacula or roost sites in the Plan Area.

A qualified wildlife biologist conducted surveys by inspecting suitable sites while walking slowly and focusing on important habitat features (south facing slopes with rocky outcrops, mammal burrows, rock piles, brush piles, areas with pushed up or slumping soil). All snakes and signs were recorded during the survey.

Snake hibernacula and rookeries are difficult to locate, and weather conditions play a significant role in snake activity; therefore, suitable snake habitat was visited twice. Snake hibernaculum surveys can be surveyed either during the spring (April 1 to June 15) or fall periods (August 15 to October 31) during optimal conditions (e.g., calm, sunny days when temperatures regularly reach 15°C by mid-morning). Surveys were completed under research permit #49997 and collection license # 49998 issued by AEP.

9.5.2 RESULTS AND DISCUSSION

Two (2) rounds of snake hibernaculum surveys were conducted within the Plan Area, one (1) in spring and one (1) in autumn. Spring surveys were conducted in favourable conditions (i.e., temperatures between 15 and 26°C, light breeze, and no precipitation) over a span of three (3) days on May 8, 2017 between 13:50 and 16:50, May 10, 2017, between 1800 and 1945, and May 11 between 14:25 and 16:40.

The fall survey was conducted during favourable conditions (i.e., temperature of 18°C, no wind, no precipitation) on September 29, 2017 between 11:40 and 13:30. The search area was restricted to the Thin Breaks Site Type, which consists of south facing grassland slopes, and focused on areas with potential to support hibernating snakes, such as rocky outcrops and abandoned mammal burrows (**Photos 9.3** and **9.4**). During the spring survey, all possible features (e.g., burrows, rock outcrops or piles) were identified and then revisited during the fall survey.

Rocky outcrops were identified but did not contain large cavernous or underground networks that would be suitable for snake hibernaculums (**Photo 9.3**). No high-suitability habitat features (i.e., large cavernous rocky outcrops with underground network), snakes or snake signs (e.g., skin sheds) were observed during the survey.

PHOTO 9.3 – ROCKY OUTCROP ON SOUTH FACING SLOPE LACKING UNDERGROUND CAVERNOUS NETWORK

PHOTO 9.4 – BURROW OBSERVED IN THE PLAN AREA

9.6 RAIL SURVEY

9.6.1 METHODS

Nocturnal rail call-broadcast surveys were conducted to determine presence and habitat use of rail species within the Plan Area. Surveys were conducted using a call-broadcast method in areas that contained suitable habitat. All wetlands within the Plan Area were included in the surveys.

Survey methodology was consistent with the *Sensitive Species Inventory Guidelines* (AESRD 2013). Surveys were conducted from 30 minutes after sunset to dawn. During the survey, weather and habitat data were recorded. Surveys consisted of an initial 5-minute listening period completed at each survey station. All rails and incidental wildlife detected during the listening period were recorded. The silent listening period was following by a call-broadcast sequence that consisting of calls of yellow rail (*Coturnicops noveboracensis*), Virginia rail (*Rallus limicola*), and sora (*Porzana carolina*) using a FOXPRO® NX3 (FOXPRO® Inc., Lewiston, PA) handheld speaker. The broadcast period lasted for 3-minutes and consisted of three 30-second calls (one for each species) followed by 30-seconds of silence after each call.

Optimal environmental conditions for conducting rail surveys consist of temperatures above freezing and no precipitation. Surveys were completed under research permit #49997 and collection license #49998 issued by AEP.

9.6.2 RESULTS AND DISCUSSION

Nocturnal rail surveys were conducted at ten (10) survey stations within the Plan Area (**Figure 8.0**) between 22:10 and 02:05 on June 1 and June 2, 2017 during favourable survey conditions (i.e., light air, cloudy skies, no precipitation, and temperatures of approximately 20°C). A second round of surveys was conducted on June 8, 2017 between 22:10 and 23:30 in less favourable conditions (i.e., light winds and intermittent drizzle). All survey stations were surveyed at least once, with some stations surveyed twice throughout the season.

Two (2) sora were observed from Station J during the first round of surveys. Four (4) sora were observed from Station E, approximately 200 m west outside the Plan Area boundaries and Station D, 25 – 100 m southwest, outside the Plan Area during the second round of surveys.

All sora observed within the Plan Area occurred in Lotic (Herbaceous)or Lotic (Deciduous) Site Types; observations that occurred outside the Plan Area occurred in similar habitat and landscape.

9.7 BREEDING BIRD SURVEY

9.7.1 METHODS

Breeding bird surveys were conducted to determine presence of SOMC, species richness and relative abundance of breeding birds within the Plan Area. A modified fixed-radius, point count sampling procedure (Bibby *et al*. 2000) was used to conduct the breeding bird survey. Breeding bird surveys were conducted twice between June 1 and July 7, consistent with the *Sensitive Species Inventory Guidelines* (AESRD 2013) and within the peak breeding period (Environment Canada 2007).

Point count stations were placed at least 300 m apart to allow for space between each 100-m radius survey plot (centered at the point count station). Each survey consisted of a 10-minute listening period where all bird species heard or seen were recorded. For each observation, species, the distance to each bird, sex (if possible), and behavior of the bird was recorded. Any birds observed before or after the survey period or a distance greater than 100 m from the observer were recorded as incidental observations. Each station was visited twice, spaced ten (10) to fourteen (14) days apart. All surveys were completed between a half hour before sunrise and 10:00 (Ralph *et al.* 1993).

Most birds detected during breeding bird surveys are singing males, which are assumed to represent an active territory for each singing male detected (Bibby *et al.* 2000), therefore abundance is represented as maximum number of territories per station for each species over the two (2) visits. Although all bird species detected were recorded during the survey, analysis was restricted to songbirds, woodpeckers, and waterbirds/waterfowl. Raptors, gulls, herons, and corvids were excluded from analysis as these species have large territories and/or habitually feed far from their breeding territory.

9.7.2 RESULTS AND DISCUSSION

Two (2) rounds of breeding bird surveys were conducted at eighteen (18) point-count stations in the Plan Area (**Figure 8.0**); each round of surveys was completed over a span of two (2) days. The first round of surveys was conducted between 05:20 and 09:20 on June 12, 2017, and 05:30 and 09:35 on June 13, 2017. The second round was conducted between 05:30 and 08:15 on June 22, 2017 and between 05:30 and 09:25 on June 23, 2017.

Surveys were conducted under favourable weather conditions (i.e., temperatures between 5-14°C, calm to light breeze, and no precipitation) but with moderate to high noise levels experienced at some survey stations. Landscape cover types surveyed during the breeding bird survey are presented in **Table F-4** in **Appendix F**.

A total of two hundred sixty-seven (267) breeding territories from thirty-five (35) species were systematically recorded during the breeding bird survey (**Table F-5** in **Appendix F**). Species

richness was greatest at stations situated within fluvial channels and overflow areas, compared to grassland or pasture sites.

Six (6) SOMC, including two (2) SARA-listed species, bank swallow (*Riparia riparia*) and Baird's sparrow (*Ammodrammus bairdii*), were detected during the surveys (**Table F-5** in **Appendix F**), five (5) of which require forested upland, riparian, or wetland habitat and one (1) of which requires grassland habitat.

9.8 TREE-NESTING RAPTOR AND GREAT BLUE HERON SURVEY

9.8.1 METHODS

A survey for tree-nesting raptors and great blue heron was conducted. Potential breeding habitat for raptors, such as bald eagle, Swainson's hawks, and red-tailed hawk, and great blue herons, which rely on tree stick nests for breeding were visited and searched or scanned with binoculars or spotting scope to determine presence of stick nests and occupancy.

All previously-recorded nests found in the FWMIS database were visited to determine their status, including the great-blue heron colony, which has been historically located on an island in the south portion of the Plan Area, adjacent to the Bow River.

Where visible, searches of potential nesting habitat up to 500 m beyond the Plan Area were scanned. Surveys were completed under research permit #49997 and collection license #49998 issued by AEP.

9.8.2 RESULTS AND DISCUSSION

Surveys were conducted on May 8, 10, 11, and June 12, 13, 22, 23, 2017. A great blue heron colony occurs in a stand of balsam poplar near the Bow River (**Figure 8.0**). During a passive scan of the great blue heron colony, a total of eighteen (18) nests were observed, with at least ten (10) active nests, or breeding pairs, using the colony during the surveys (**Photo 9.5**). Several observations of great blue heron were recorded elsewhere throughout the Plan Area, many of which were individuals flying or travelling overhead.

A total of four (4) stick nests occupied by red-tailed hawk and Swainson's hawk were identified in the Plan Area. In addition, other stick nests observed included one (1) common raven, and three (3) unoccupied stick nests (**Photo 9.6**; **Table 6.0**). The nest occupied by common raven in 2017 may be used again by raptors in successional years. A bald eagle was observed on May 1, 2018 sitting on a nest during a site visit completed by Parks and others (E Almasi-Klausz, pers. comm). Although bald eagles were observed within the Plan Area (**Figure 8.0**), this nest was identified in subsequent visits as unoccupied during the wildlife surveys.

Osprey, bald eagle, great-horned owl, and American kestrel (*Falco sparverius*) were observed during the surveys; although nests for these species were not observed in the Plan Area during

the surveys, suitable nesting habitat (i.e., stick nests, cavities) is available. Osprey, bald eagle and American kestrel are considered SOMC and observation locations of these species are illustrated on **Figure 8.0**.

PHOTO 9.5 – GREAT BLUE HERON INDIVIDUALS OBSERVED WITHIN COLONY

PHOTO 9.6 – UNOCCUPIED STICK NEST OBSERVED DURING FIELD SURVEYS

TABLE 6.0 – STICKNESTS OBSERVED IN THE PLAN AREA

2017 Status	Species Occupying Nest	Legal Location	Site Type and Location Description
Active	red-tailed hawk	NE-22-29-W4M	Thin Break/Balsam poplar tree
Active	Swainson's hawk	SE-9-22-29-W4M	Thin Break/Trembling aspen tree
Inactive	unoccupied	NW-3-22-29-W4M	Lotic (Deciduous)/Trembling aspen tree
Active	red-tailed hawk	NW-3-22-29-W4M	Lotic (Deciduous)/Balsam poplar tree
Inactive	unoccupied	SW-11-22-29-W4M	Lotic (Deciduous)/Balsam poplar tree
Inactive	unoccupied	SW-11-22-29-W4M	Lotic (Deciduous)/Balsam poplar tree
Active	common raven	NW-11-22-29-W4M	Thin Break/Balsam poplar tree
Active	red-tailed hawk	NE-11-22-29-W4M	Lotic (Deciduous)/Balsam poplar tree

9.9 ACOUSTIC BAT SURVEY

9.9.1 METHODS

A passive acoustic bat survey was conducted to estimate relative abundance and presence of bat species in the Plan Area. Passive bat echolocation surveys are acoustic surveys that use bat detectors to record the ultrasonic calls of bats, which then allow the identification of bat species using call sequencing computer software. Survey protocols were consistent the *Handbook of Inventory Methods and Standard Protocols for Surveying Bats in Alberta* (Echo Biological Consulting Inc. 2006).

Bat detectors were deployed in areas with high potential for travelling bats to be observed such as open areas or along potential travel routes and in areas near suitable foraging or roosting trees (**Photo 9.7**). At each detector location, a painter pole was used to position a microphone at least 5 m above ground level. The painter poles were attached to trees for added height extension and support. Detectors were programmed to record sound from sunset to sunrise each night.

The bat call data were transcribed using Kaleidoscope Pro 4 (Kaleidoscope) version 4.5.0 (Wildlife Acoustics Inc. Maynard, Massachusetts, USA) and AnalookW version 4.2d (Titley Scientific, Columbia, Missouri, USA). A sub-set of three (3) detector nights was used for the analysis. Bat identification and measure of activity was analyzed using bat call sequencing (echolocation analysis), where each call sequence represents one bat pass or observation. Where possible, bat passes were categorized per species. Due to similarities between species echolocation parameters and/or degraded call quality from extraneous noise, some bat calls could not be conclusively identified to species and were categorized into six generalized groups (in bold below). AnalookW was used when bat species identification was not easily distinguishable using Kaleidoscope.

A total of eleven (11) species or species groups based on species potentially occurring within the Plan Area were used for analysis:

- big brown bat (*Eptesicus fuscus*);
- silver-haired bat (*Lasionycteris noctivagans*);
- eastern red bat (*Lasiurus borealis*);
- hoary bat (*Lasiurus cinereus*);
- long-eared myotis (*Myotis evotis*);
- little brown myotis (*Myotis lucifugus*);
- western small-footed myotis (*Myotis ciliolabrum*);
- **low frequency bat**: includes big brown bat, silver-haired bat, and hoary bat;
- **high frequency bat**: includes eastern red bat and *Myotis* species;
- **big brown bat or silver-haired bat**; and
- ***Myotis* species**: includes long-eared bat, and little brown myotis.

The total number of bat passes per detector-night was used as an index of relative abundance.

PHOTO 9.7 – BAT DETECTOR STATIONS (CLOCKWISE FROM TOP LEFT): STATION A, B, C AND D.

9.9.2 RESULTS AND DISCUSSION

Four (4) acoustic detectors were deployed in the Plan Area (**Figure 8.0**) between July 7 – 12, 2017. Detectors were deployed at sites to capture a range of habitat types (**Table F-6** in **Appendix F**). The subset of data used for the analysis consisted of July 7, 8 and 10.

A total of three thousand two hundred sixteen (3216) bat passes were recorded over twelve (12) detector nights (3 detector nights per station), or two hundred sixty-eight (268) bat passes per detector night overall. All eleven (11) species and species groups used in the analysis were detected, which includes four (4) SOMC (**Table F-7** in **Appendix F**). Little brown myotis was the most frequently detected species, followed by hoary bat and eastern red bat; these three (3) accounted for over 65% of all bat passes detected while western small-footed bat and long eared bat accounted for less than 5% of bat passes combined (**Table 7.0**).

Station A was the most active accounting for over 75% of all bat passes detected, followed by Station B, which accounted for about 20%. Station C and Station D were less than 5% of all bat passes detected. The difference in bat activity between Stations A and Stations C and D is likely due to greater quantities of suitable habitat along the Bow River, including mature and decaying trees that provide more opportunity for safe roosting sites, and greater connectivity.

TABLE 7.0 – ACOUSTIC BAT ACTIVITY IN THE PLAN AREA

Common Name	Scientific Name	Number of Passes per Station				Total Number of Passes	Percent of Total
		A	B	C	D		
hoary bat	*Lasiurus cinereus*	535	93	39	21	688	21.4%
big brown bat	*Eptesicus fuscus*	194	75	1	1	271	8.4%
silver-haired bat	***Lasionycteris noctivagans***	167	20	5	2	194	6.0%
eastern red bat	***Lasiurus borealis***	278	68	25	7	378	11.8%
long-eared bat	*Myotis evotis*	3	-	-	-	3	0.1%
western small-footed myotis	***Myotis ciliolabrum***	71	74	-	1	146	4.5%
little brown myotis	***Myotis lucifugus***	857	199	22	10	1088	33.8%
big brown bat or silver-haired bat	-	137	19	-	-	156	4.9%
unidentified Myotis spp.	-	66	6	-	-	72	2.2%
unidentified low frequency bat[1]	-	46	7	-	1	54	1. %
unidentified high frequency bat[2]	-	278	30	-	-	166	5.2%
Total		**2,490**	**591**	**92**	**43**	**3216**	**100%**
Percent of Total Per Station		**77.4%**	**18.4%**	**2.9%**	**1.3%**	**100%**	
Total Passes Per Detector Night		**830.0**	**197.0**	**30.7**	**3.6**	**268.0**	

***Bold** style font indicates SOMC
[1] – includes big brown bat, silver-haired bat, and hoary bat
[2] – includes eastern red bat and *Myotis* spp.

9.10 AVAILABLE WILDLIFE HABITAT

The Plan Area is located within the Foothills Fescue Natural Subregion (Natural Regions Committee 2006), which supports a unique assemblage of wildlife species. Few permanent waterbodies occur in this Natural Subregion and those that do are often important waterfowl and shorebird breeding and migratory stopover sites. Common wildlife species in short vegetated areas include horned lark (*Eremophila alpestris*) and Richardson's ground squirrel (*Urocitellus richardsonii*). Richardson's ground squirrel populations support large birds of prey, such as Swainson's hawk, as well as carnivorous mammals such as American badger (*Taxidea taxus*). Common bird species in areas with taller vegetation (lightly grazed) include Baird's sparrow (*Ammodramus bairdii*), Sprague's pipit (*Anthus spragueii*), and sharp-tailed grouse.

A description of available wildlife habitat occurring in the Plan Area, broken down by Land Cover Site Types (**Section 4.2.2**), is provided below.

9.10.1TAME PASTURE OR HAY AND LOAMY

The Tame Pasture or Hay and Loamy Site Types are combined for the purposes of this description due to similarities in habitat. The Tame Pasture or Hay Site Type makes up a relatively large proportion of the Plan Area and consists of modified grassland used for grazing livestock. Although greater proportions of native vegetation occur in the Loamy Site Type, the small patch size (relative to species' requirements for many grassland species) and close proximity to urbanization may limit the suitability of these areas for rare or sensitive grassland species, such as sharp-tailed grouse or Sprague's pipit; thus, habitat use by wildlife, particularly for breeding purposes, may be restricted predominantly to common grassland species, such as savannah sparrow (*Passerculus sandwichensis*), Richardson's ground squirrel and coyote. The Tame Pasture or Hay and Loamy site types may provide important remnant patches for some sensitive grassland species, such as Baird's sparrow, or American badger.

9.10.2 CROP (NON-IRRIGATED) AND RURAL

The Crop (Non-irrigated) and Rural Site Types are combined for the purposes of this description. The Crop (Non-irrigated) Site Type is an anthropogenic land class, and encompasses a small proportion of the Plan Area. Although some species may pass through these areas, and waterfowl may forage in cropland during non-breeding periods, these areas contains low suitability habitat for wildlife, particularly for breeding purposes.

Old or abandoned rural buildings may be used as nesting sites by some SOMC, including bat species and barn swallow (*Hirundo rustica*).

9.10.3 LENTIC

The Lentic land sub-class consists of all wetlands and anthropogenic waterbodies on the Ricardo Ranch ASP Area. There are no large natural features within the Lentic (Temporary) and Lentic (Seasonal) Site Types, and many of the wetlands have been disturbed by cattle, limiting habitat potential for aquatic wildlife.

The Lentic (Seasonal) areas have potential to support amphibians, and marsh bird species like sora, as well as some wetland-dependent songbird species. One (1) open water feature in this sub-class (A03) is large enough to support waterfowl. A03 has the potential to support foraging for piscivorous bird species, such as common merganser (*Mergus merganser*) and common goldeneye, and breeding for mallards and other duck species.

9.10.4 LOTIC (RIVER)

The Lotic (River) Site Type makes up relatively small portion of the Plan Area and consists largely of bare ground, gravel and cobbled substrates and is not likely to be suitable for many bird species; however, the river banks associated with this Site Type could be potentially valuable for bank swallow (*Riparia riparia*) and as foraging sites for piscivorous bird species, such as common merganser.

9.10.5 LOTIC (DECIDUOUS)

The Lotic (Deciduous) Site Type is mostly confined to the fluvial channels on the east portions of the Plan Area; however, it likely contains the highest habitat suitability for a variety of species, particularly migratory songbirds, tree-nesting raptors, and bats. Habitat potential is relatively high in these areas due largely to the presence of mature and decaying deciduous trees that provides high structural complexity, which increases the number and variety of potential nest or roost sites, thermal and security cover, and is in close proximity to high quality foraging areas. The above characteristics also likely enhance the mobility of wildlife through the general area, particularly deer species.

9.10.6 LOTIC (HERBACEOUS)

The Lotic (Herbaceous) Site Type makes up a relatively small portion of the Plan Area and occurs in riparian habitats associated predominantly with fluvial channels on the east portion of the Plan Area.

This Site Type contains the highest habitat suitability in the Plan Area for amphibians, marsh birds, waterfowl, and aquatic mammals, such as muskrat (*Ondatra zibethicus*) and beaver. This Site Type also provides valuable foraging sites for a variety of wildlife, such as songbirds and bats.

9.10.7 OVERFLOW

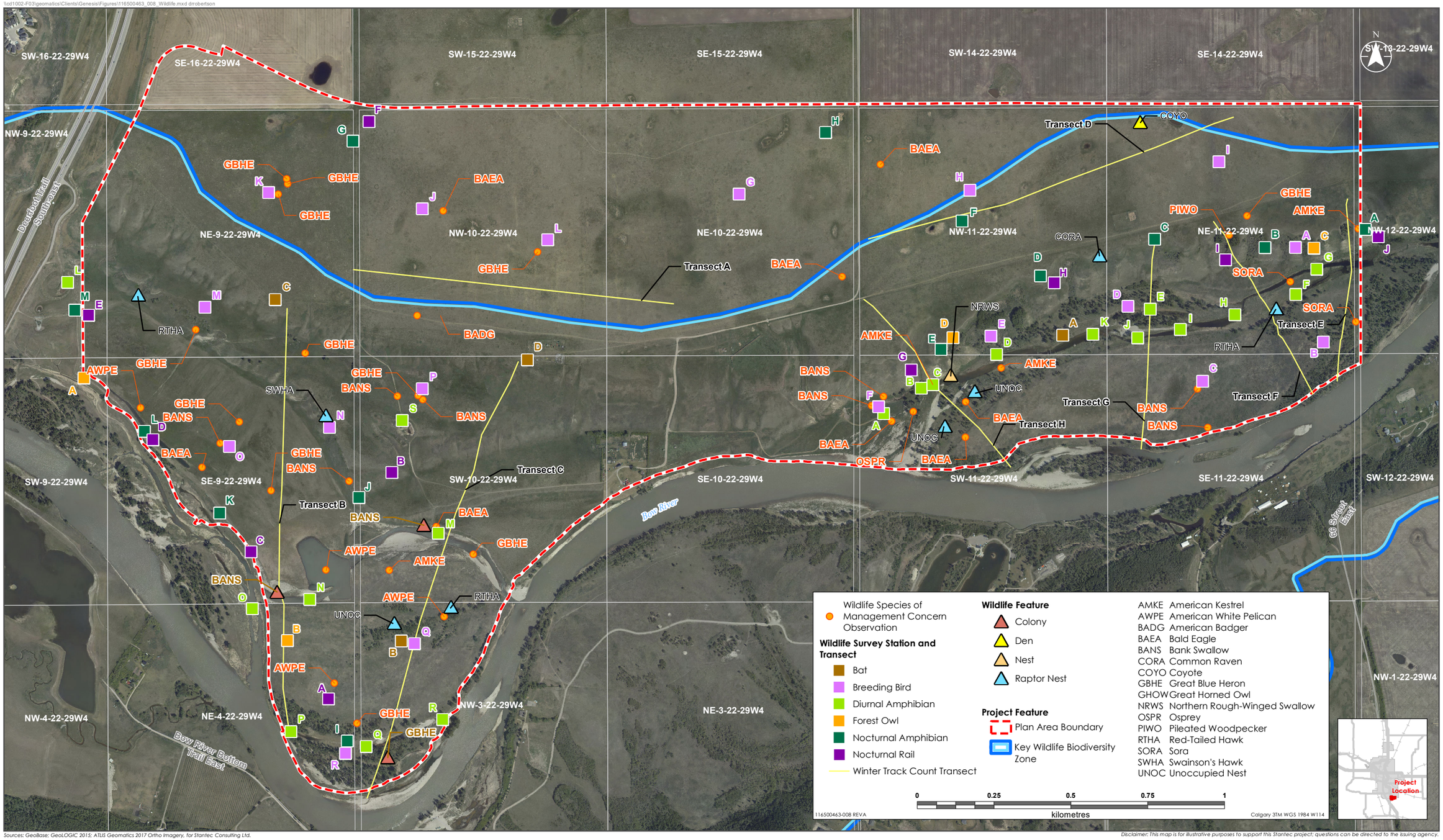
The Overflow Site Type makes up a relatively small proportion of the Plan Area, and consists predominantly of shrubs, grasses and forbs of moderate height. The vegetative structure and close proximity to cover makes this Site Type potentially valuable foraging and calving habitat for deer.

These areas also would support common shrubland and grassland songbird species, such as clay-colored sparrow (*Spizella palluda*) and savannah sparrow.

9.10.8 THIN BREAKS

The Thin Break Site Type includes moderate to steep, south-facing valley slopes associated with the Bow River valley escarpment and although it makes up a relatively small proportion of the Plan Area, it forms a contiguous habitat patch across the entire Ricardo Ranch ASP Area.

This Site Type provides the highest suitability habitat for snake hibernation sites in the Plan Area, as well as potentially important travel routes and winter habitat for deer. Tree patches in this Site Type likely also support tree-nesting raptors, and songbird communities.



Sources: GeoBase; GeoLOGIC 2015; ATLIS Geomatics 2017 Ortho Imagery, for Stantec Consulting Ltd.

Wildlife Survey Stations, Features and Species of Management Concern Observations

9.11 SUMMARY OF WILDLIFE OBSERVATIONS

In total, eighty-eight (88) wildlife species were observed in the Plan Area, including eighteen (18) SOMC. All species observed, and their conservation statuses are provided in **Table F-7** in **Appendix F**.

9.11.1 INCIDENTAL OBSERVATIONS AND FEATURES

In addition to the forty-one (41) bird species systematically recorded during the rail, breeding bird and raptor surveys, twenty-eight (28) other bird species were recorded incidentally (**Table F-7**), including one (1) SOMC, American white pelican (*Pelecanus erythrorynchos*) (**Photo 9.8**).

Vertical river banks with exposed soil are prominent in the Lotic (River) Site Type (**Photo 9.9**) where >100 individual bank swallows were observed on multiple occasions and where nest sites are prevalent. Other bird nest sites observed included a mourning dove (*Zenaida macroura*) nest located near breeding bird station R (**Photo 9.10**), and a tree swallow (*Tachycineta bicolor*) nest, and northern rough-winged swallow (*Stelgidopteryx serripennis*) nest located near breeding bird station E (**Figure 8.0**).

PHOTO 9.8 – AMERICAN WHITE PELICAN INCIDENTALLY OBSERVED WITHIN THE PLAN AREA.

PHOTO 9.9 – BANK SWALLOW COLONY OBSERVED WITH NESTING HOLES ON VERTICAL BANKS.

PHOTO 9.10 – MOURNING DOVE NEST OBSERVED WITHIN THE PLAN AREA.

In addition to the six (6) mammal species systematically recorded during the bat and winter tracking surveys, an additional thirteen (13) mammal species were observed incidentally, including one (1) SOMC, American badger.

Dozens of burrows suitable for small to medium-sized mammals and game trails were observed during the wildlife surveys, particularly in the Thin Breaks Site Type during the snake surveys. Richardon's ground squirrel colonies were scattered in the Tame Pasture Site Type. Other features observed include a coyote den near W03 and an abandoned beaver (*Castor canadensis*) lodge and active dams (**Photos 9.11** and **9.12**) located in fluvial channels in the eastern portion of the Plan Area. Porcupine was also incidentally observed (**Photo 9.13**).

Many observations of mule deer and white-tailed deer (*Odocoileus virginianus*) were recorded during the wildlife surveys, including observations of large groups of mule deer (>20 to <35) on multiple occasions. Moose (*Alces americanus*) were also observed on two occasions, including one occasion where a cow and calf were observed together. Numerous deer tracks were also identified on game trails that line the south facing valley slopes, and in the Lentic (Herbaceous) Site Types, particularly in the east portion of the Plan Area.

PHOTO 9.11 – INACTIVE BEAVER LODGE OBSERVED WITHIN FLUVIAL CHANNELS IN THE PLAN AREA.

PHOTO 9.12 – ACTIVE BEAVER DAM IN EASTERN PORTION OF PLAN AREA WITHIN FLUVIAL CHANNELS

PHOTO 9.13 – PORCUPINE OBSERVED IN EASTERN PORTION OF PLAN AREA

10.0 ENVIRONMENTALLY SIGNIFICANT AREAS

ESAs are generally defined as landscape elements or places which are vital to the long-term maintenance of biological diversity, soil, water, or other natural processes, both on-site and in a regional context (Jennings and Reganold 1991).

The identification of ESAs within a Plan Area can aid in the land planning process by determining important, useful and often sensitive features of the landscape. ESAs are intended to be an information tool to help inform land-use planning and policy at a local, regional, and provincial scale (Fiera Biological Consulting 2014).

10.1 BOW RIVER CORRIDOR

The Bow River Corridor is a defining feature of the Ricardo Ranch ASP Area and an integral part of the Alberta landscape. While the segments of the Bow River and its corridor within the Ricardo Ranch ASP Area are not identified as a national or international ESA, segments of the Bow River downstream and east of the Plan Area (from Calgary to Siksika Reserve) are considered to be of international significance due to its international class rainbow trout sport fishery (Sweetgrass Consulting Ltd. 1997).

10.2 PROVINCIAL ESAS

The provincial criteria selected to identify ESAs in Alberta includes both coarse-filter and fine filter indicators. Coarse-filter indicators have been developed with the goal of identifying sites that contribute to the maintenance of native biota and natural ecosystem function, while fine-filter indicators have been developed to capture environmental features that are required to maintain populations, species, ecosystems, or other special features that are not accounted for under coarse filter criteria.

A summary of the four criteria utilized to define, measure, and map terrestrial and aquatic ESAs in Alberta are (Fiera Biological Consulting 2014):

1. Areas that contain focal species, species groups, or their habitats, including:
    - Conservation hotspots: rare, threatened or endangered species;
    - Focal species groups: amphibians, aquatic breeding birds, and fish; and
    - Focal species habitat: harlequin duck, grizzly bear, woodland caribou (boreal ecotype), western burrowing owl, sage grouse, and arctic grayling.
2. Areas that contain rare, unique, or focal habitat, including:
    - Rare habitats: vegetation communities and peatlands;

- Unique habitats and landforms: natural springs, nationally or internationally recognized landforms; and
- Focal habitats: Class A and B rivers and streams, snake and bat hibernacula, waterfowl staging and foraging areas, and sharp-tailed grouse leks.

3. Areas with ecological integrity, including:
    - Habitat patch size: terrestrial habitat patches; and
    - Habitat intactness and connectivity: intact landscapes, connectivity of lotic (rivers and streams) habitat, and intactness of lentic habitat (wetlands and lakes).
4. Areas that contribute to water quality and quantity, including:
    - Rivers and streams: river and stream density, lotic landscape intactness; and
    - Wetlands and lakes: wetland landscape composition and water storage potential (Fiera Biological Consulting 2014).

The above method of identifying ESAs relies on the presence or absence of indicators and does not consider the physical state of ESAs. Direct or indirect disturbance is not included in the evaluation and may not accurately account for the human footprint on the land. The overall level of significance should consider the level of representativeness, diversity, naturalness, and ecological integrity of the ESA to inform maintenance, management, and restoration decisions (Fiera Biological Consulting 2014).

A search of the provincial ESA database was conducted on March 8, 2018. The search identified SE and SW-10-22-29-W4M, NW-3-22-29-W4M, and SW, SE and NE-11-29-29-W4M as ESAs based on high values for Criteria 4 for proximity to rivers, streams, wetlands and lakes.

10.3 CITY OF CALGARY ESAS

City of Calgary Parks defines an ESA as "a natural area site that has been inventoried prior to potential development and which, because of its features or characteristics, is significant from an environmental perspective to Calgary, and has the potential to remain viable in an urban environment" (City of Calgary Parks 2003).

10.3.1 METHODS

The rating criteria used here align with the criteria to determine the significance of natural areas outlined in the *Open Space Plan* (City of Calgary Parks 2003). Potential ESAs in the Plan Area are rated high, moderate, low and nil. The following outlines criteria of this rating system.

Areas were rated **HIGH** if they contain:

- Rare plants or rare plant communities, and may include a high density of tracked or watched species, as identified by the ACIMS;
- Showed evidence (e.g., nests, burrows, etc.) of wildlife SOMC directly observed using the area or feature;

- Areas of high quality wildlife habitat determined to be suitable for multiple species groups and SOMC potential with minimal disturbance and anthropogenic influence;
- Native grassland communities and native shrub communities surrounded by native grassland;
- Intermittent or small permanent streams or seeps; and/or
- Uncommon features regionally, or contained regionally uncommon soils or surficial geology units.

Areas were rated **MODERATE** if they contain:

- Natural or non-natural forested communities surrounded by anthropogenic influence or disturbance;
- Areas of moderate quality wildlife habitat or areas of high quality habitat but are subject to anthropogenic influences such as agricultural grazing of livestock;
- Wetlands dominated by native species, but surrounded by cropland or modified grassland;
- Ephemeral streams; and
- Native shrub communities surrounded by cropland or modified grassland.

Areas were rated **LOW** if they were dominated by non-native or agricultural species and provided limited wildlife habitat value (e.g., cropland). Included in the low ranking are:

- Modified grassland (i.e., tame pasture);
- Areas of low quality wildlife habitat or moderate quality habitat but subject to anthropogenic influences such as agricultural grazing of livestock; and
- Non-natural forested communities (i.e., areas recovering from past disturbance and ground cover dominated by non-native grass and forb species) with low wildlife habitat potential.

Areas were rated **NIL** if they were dominated by anthropogenic disturbances or are anthropogenic in origin. Included in the nil ranking are:

- Disturbed areas, residences with no bat habitat potential, shelterbelts, industrial/commercial areas, and transportation corridors.

10.3.2 RESULTS AND DISCUSSION

Using the City of Calgary criteria, features and habitat identified were assessed and the associated rankings are summarized in **Table 8.0**. The features and their rankings are also shown on **Figure 9.0**.

TABLE 8.0 – POTENTIAL ESA RANKINGS

Biophysical Feature, Site Type or Habitat	Potential ESA Ranking	Ranking Rationale
Crop (Non-Irrigated)	**Low**	Agricultural cropland is an anthropogenic Site Type with limited habitat potential.
Tame Pasture or Hay (Non-Irrigated) and Loamy	**Low**	Tame Pasture or Hay and Loamy Site Types are modified grassland landscapes with anthropogenic influences. Vegetation species present are predominantly non-native, or invasive. Although SOMC were observed within these Site Types, the agricultural land use limits the suitability for rare or sensitive grassland species.
Low densities of tracked or watched species	**Low**	Pockets of western false gromwell were observed in low densities throughout disturbed areas. These pockets are generally small and would not be viable in an urban environment.
Temporary and Seasonal Marshes	**Moderate**	Temporary and Seasonal Marshes were considered moderate ESAs given the assemblage of native and non-native vegetation species observed. These areas are concentrated in the northern portion of the Plan Area and provide limited amphibian and waterfowl habitat given the surrounding land uses, cattle disturbance, and temporary to seasonal hydrology.
Anthropogenic Ponds A01 and A02	**Moderate**	Anthropogenic Ponds A01 and A02 were observed with standing water and A02 may provide some resting habitat for wildlife. American white pelican and bank swallows were observed near these features during wildlife surveys.
Moderate densities of tracked or watched species	**Moderate**	Several areas of western false gromwell were observed in moderate densities throughout the Plan Area. These areas are generally small; however, the density per 100 m results in a moderate ESA potential.
Rural (excluding roadways)	**Moderate**	Rural Site Type includes buildings and structures is anticipated to provide some bat SOMC roosting habitat.
Ephmeral Drainages	**Moderate**	The ephemeral drainages inventoried within the Plan Area are ranked as potentially moderate ESA given the highly seasonal nature of these features and lack of a distinct flow channel.
Intermittent Drainages	**High**	One intermittent drainage has been inventoried within the Plan Area. This feature is ranked as a potentially high ESA due to association with the escarpment, and evidence of channel formation.
Overflow	**High**	Overflow Site Types were observed with a combination of native and non-native species. Given the proximity to the Bow River, these areas are considered high potential ESAs based on wildlife habitat or tracked and watched species densities. Overflow areas on the west side of the Plan Area are considered high ESAs due to proximity to the great blue heron colony, bank swallow colony and variety of landscape classes. Overflow areas on the east side of the Plan Area are considered high ESAs due to the relatively high densities of tracked and watched species present.

Biophysical Feature, Site Type or Habitat	Potential ESA Ranking	Ranking Rationale
Temporary and Seasonal Slope Marshes	**High**	Slope Marshes are regionally unique features observed with a relatively high vegetation species diversity. Groundwater input and springs within these features increase the potential ESA ranking of these wetlands.
Slopes greater than 15% within Bow River valley	**High**	The escarpment associated with the Bow River valley is a regionally unique landscape feature. Slope stability and erosion considerations may be required.
Anthropogenic Pond A03	**High**	Anthropogenic Pond A03 is a dugout previously observed in historical aerial photographs to be man-made in nature. The open water portion of the pond is large enough to support waterfowl species, and great blue heron as well as American white pelican were observed using the pond.
Lotic (Deciduous)	**High**	Contains high habitat suitability for a variety of species, particularly migratory songbirds, tree-nesting raptors, and bats in close proximity to high quality foraging areas. Habitat potential is high due to the presence of mature and decaying deciduous trees that provide structural complexity and increases the number and variety of potential nest or roost sites, thermal and security cover.
Lotic (Herbaceous)	**High**	Contains high habitat suitability for amphibians, marsh birds, waterfowl, and aquatic mammals such as muskrat and beaver. The Site Type also provides valuable foraging sites for songbirds and bats.
Lotic (River)	**High**	The 2013 flood event has created connectivity to the Bow River within this Site Type, including vertical slopes used by a bank swallow (SOMC) colony.
Fluvial channels	**High**	Fluvial channels are considered high potential ESAs due to hydrological connectivity to the Bow River and the high-quality habitat that is associated with these areas.
High densities of tracked or watched Species	**High**	Several areas of western false gromwell were observed in high densities, with the largest being in the southeast portion of the Plan Area. This large area has potential to remain sustainable post-development.
Great blue heron colony	**High**	Great blue herons are SOMC and their colonies are regionally unique and uncommon.

* In cases where multiple features spatially overlap, the highest potential ESA ranked feature is shown on **Figure 9.0**.

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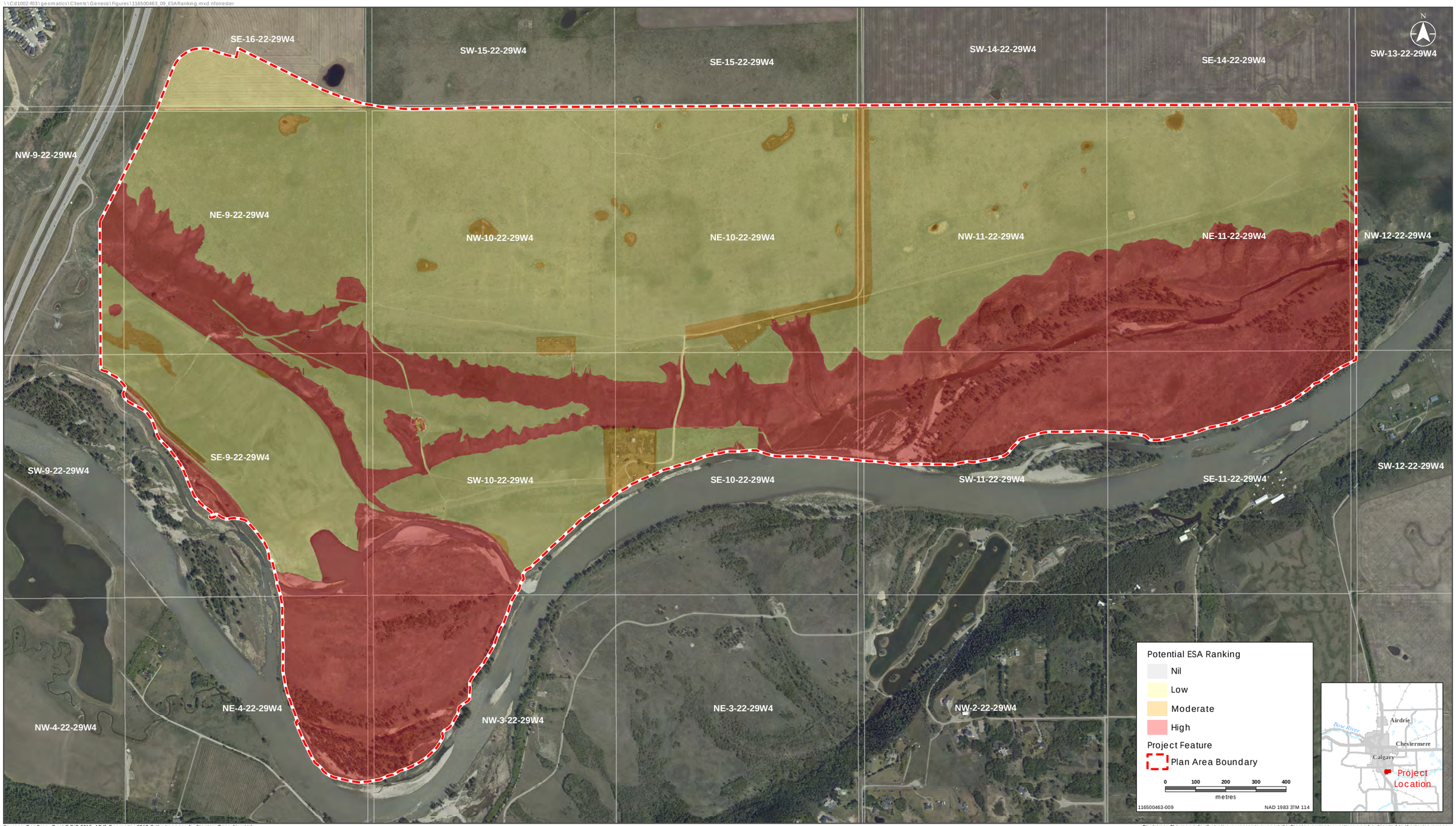

Sources: GeoBase; GeoLOGIC 2015; ATLIS Geomatics 2017 Ortho Imagery, for Stantec Consulting Ltd.

Disclaimer: This map is for illustrative purposes to support this Stantec project; questions can be directed to the issuing agency.

Stantec

RICARDO RANCH AREA STRUCTURE PLAN
ECOLOGICAL INVENTORY

Potential ESA Rankings

Figure 9.0

11.0 FUTURE STUDIES

The intent of the Ecological Inventory is to provide baseline information on existing features to inform and guide policy development for the Area Structure Plan. Future studies may be completed at the Outline Plan stage through Biophysical Impact Assessments (BIAs), at the appropriate stages of the planning process.

Through conversations with the City of Calgary, the following includes a list of potential studies and surveys that may be required within future BIAs; however, it should be noted that surveys should be completed as appropriate given the habitat types present in each area of interest.

The list of surveys below should be used as a guideline only. New survey requirements as a result of updates in policy, standards, and legislation, should be considered at that time and scoped appropriately.

- Vegetation community surveys;
- Upland and wetland soil surveys;
- Regulated weed surveys;
- Coulee and esker identification;
- Waterbody surveys and delineation (including wetlands, drainages, and aritificial ponds);
- Wildlife Surveys including:
  - Amphibian surveys;
  - Snake hibernaculum surveys;
  - Tree-nesting raptor surveys; and
  - Great blue heron surveys.

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12.1.1 PERSONAL COMMUNICATIONS

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Appendix A

ECOLOGICAL INVENTORY REPORT CHECKLIST

ECOLOGICAL INVENTORY REPORT CHECKLIST

Area Structure Plan name: Ricardo Ranch Area Structure Plan

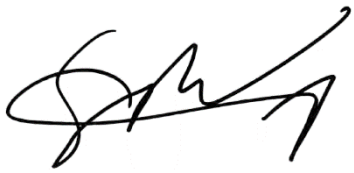
Consulting company: Stantec Consulting Ltd.

Contact name: Sunny Wang Contact email: sunny.wang@Stantec.com

Ecological Inventory Report submission (check one): ☐ Initial ☒ Final

Use this checklist to ensure that all requirements for Ecological Inventory Reports have been met. See the *Ecological Inventory Framework* (see Section 3) for detailed information about items in this checklist. At all times, new Ecological Inventory Reports must meet the requirements within Section 3 of the 2016 *Ecological Inventory Framework*.

The undersigned agree and certify that all requirements on this checklist have been reviewed and properly identified as part of this submission. The undersigned understand that this checklist will be used as a tool for review of the Ecological Inventory Report by Calgary Parks.



February 8, 2019

Date

Signature

YES	NO	N/A	CHECKLIST ITEM
✓			1. All items in the SHADED areas are explained in the comments section of this checklist.
✓			2. Submit copies (two (2) for initial Report; three (3) for final Report) of the Report that include the Professional Biologist's or overseeing professional's signature (and stamp).
		✓	3. Cover letter highlights any unresolved issues or areas where requirements cannot be met.
✓			4. First page of the Report includes the report publication statement listed in Section 2.3.3.
✓			5. Explicitly state that all details conform to all City of Calgary standard specifications and the *Ecological Inventory Framework*, or explicitly state items that have to be addressed prior to Ecological Inventory Report approval.
✓			6. **Title page –** Include a descriptive Ecological Inventory Report title that specifies the Area Structure Plan project name and Report version (initial or final).
✓			7. **Executive summary –** Summarize the Report, including its objectives, methods, results, and discussion.
✓			8. **Table of contents –** Provide a table of Report contents.
✓			9. **Introduction –** Describe the study objectives of the ecological inventory, including a description of the Area Structure Plan. Include the study area and location, name of the project, name of landowners, and land location (i.e., legal description).

YES	NO	N/A	CHECKLIST ITEM
✓			10. **Methods –** Include sub-sections for each required component (see Section 3): regional environmental setting, ecosystem and land cover classification, vegetation, soils and landforms, water resources, wildlife, Environmentally Significant Areas. Describe methodology and justification for methods in detail, including a field program schedule of actual site visit dates. Specify which methods are *Ecological Inventory Framework* standards or where methods were modified. Cite all standards and data sources referenced (see literature cited). Provide maps for all survey points, routes or areas surveyed, and maps of photograph locations in the Plan Area.
✓			11. **Results –** Include sub-sections for each required component of the Ecological Inventory (see Section 3). Describe the results for each component, including relevant information from the background information review. Provide data in table or graphic format where appropriate. Provide maps of the results (see map list on this checklist). Cite the sources reviewed and compile in the literature cited section.
✓			12. **Discussion –** Summarize and discuss results for specific points of discussion for each required sub-section (see Section 3). Include discussion regulatory considerations and recommended next steps. Include an anticipated schedule for additional field work required. Cite all standards and data sources relevant to the discussion. Identify any unresolved issues or evaluation components where guidelines or checklist items cannot be met. Identify additional surveys, including appropriate assessment periods and analyses to be completed for a Biophysical Impact Assessment at the Outline Plan Land Use Amendment stage. Cite the sources reviewed and compile the information in the literature cited section.
✓			13. **Literature cited –** Cite in detail all references used as background information, data sources, imagery, methodology, or that are included for discussion.
✓			14. **Appendices –** Ecological inventory data sheets, site photographs, historical aerial photographs, vegetation and wildlife species lists, and supplementary maps.
✓			15. **Maps –** Maps for each sub-section may be combined. Where maps have been combined, describe in the comments section of this checklist.
✓			a. Regional environmental setting (see Section 3.1.2.2)
✓			i. Plan Area location map
✓			ii. Plan Area environmental setting map
✓			b. Ecosystem and land cover classification (see Section 3.2.2.2)
✓			i. Ecosystem and land cover classification: survey points and transects map
✓			ii. Ecosystem and land cover classification map
✓			c. Water resources (see Section 3.3.2.2)
✓			i. Hydrogeology map
✓			ii. Watercourses map
✓			iii. True aquatic habitats map
✓			iv. Wetlands map
✓			v. Riparian areas map
✓			vi. Crown-ownership map
✓			d. Vegetation map (see Section 3.4.2.2)
✓			e. Soils and landforms (see Section 3.5.2.2)
✓			i. Soils map
✓			ii. Slopes map
✓			iii. Landforms map
✓			f. Wildlife (see Section 3.6.2.2)
	✓		i. Habitat suitability map
✓			ii. Wildlife map
✓			g. Environmentally Significant Areas map (see Section 3.7.2.2)

Comments:

1. Riparian features, watercourses, wetlands and waterbodies are combined on one map using the appropriate classification systems and methodology.

2. Soils, slopes and topography are combined on one map.

3. No wildlife habitat suitability map has been provided due to complex overlaps in species suitability that is challenging to show visually; however, a habitat suitability section is included within the EI report that includes a description of habitat and suitable species that may potentially use habitat within the Plan Area.

4. No photo location map is provided. Stantec has provided the City of Calgary with photos that include geotagged coordinates.

(Calgary Parks use only)

Date received: _____ Approval date:_____

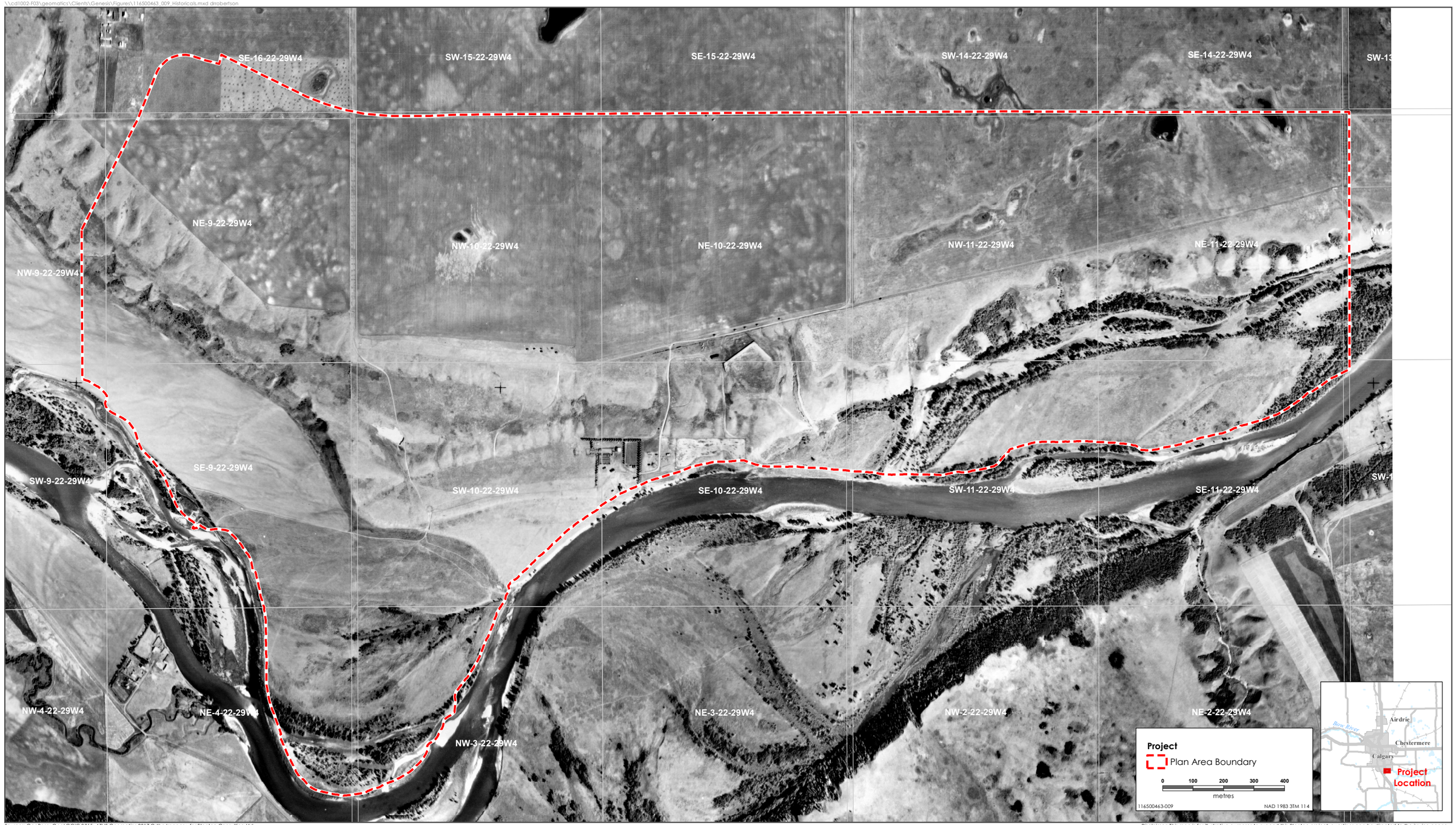
Approval: □ Yes
□ Yes (with conditions):
□ No (comments):

Approver name:_____Approver signature: _____

Appendix B

HISTORICAL AERIAL PHOTOGRAPHS

\\cd1002-F03\geomatics\Clients\Genesis\Figures\116500463_009_Historicals.mxd drobertson



Sources: GeoBase; GeoLOGIC 2015; ATLIS Geomatics 2017 Ortho Imagery, for Stantec Consulting Ltd.

Disclaimer: This map is for illustrative purposes to support this Stantec project; questions can be directed to the issuing agency.

Stantec

RICARDO RANCH AREA STRUCTURE PLAN
ECOLOGICAL INVENTORY

Historical Aerial Photograph
Unknown Month, 1948

Figure B-1

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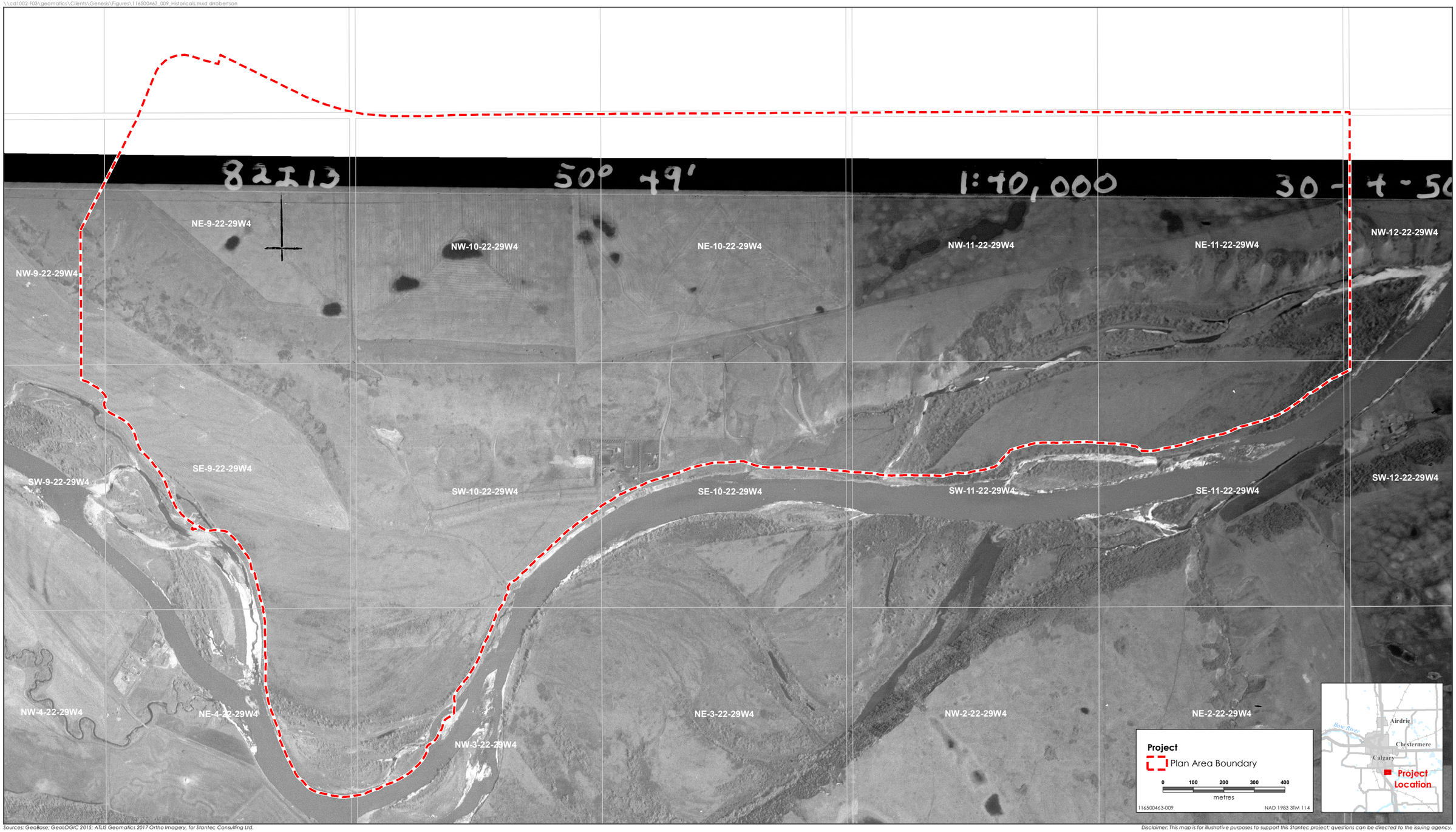

Sources: GeoBase; GeoLOGIC 2015; ATLIS Geomatics 2017 Ortho Imagery, for Stantec Consulting Ltd.

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RICARDO RANCH AREA STRUCTURE PLAN
ECOLOGICAL INVENTORY

Historical Aerial Photograph
April, 1950

Figure B-2

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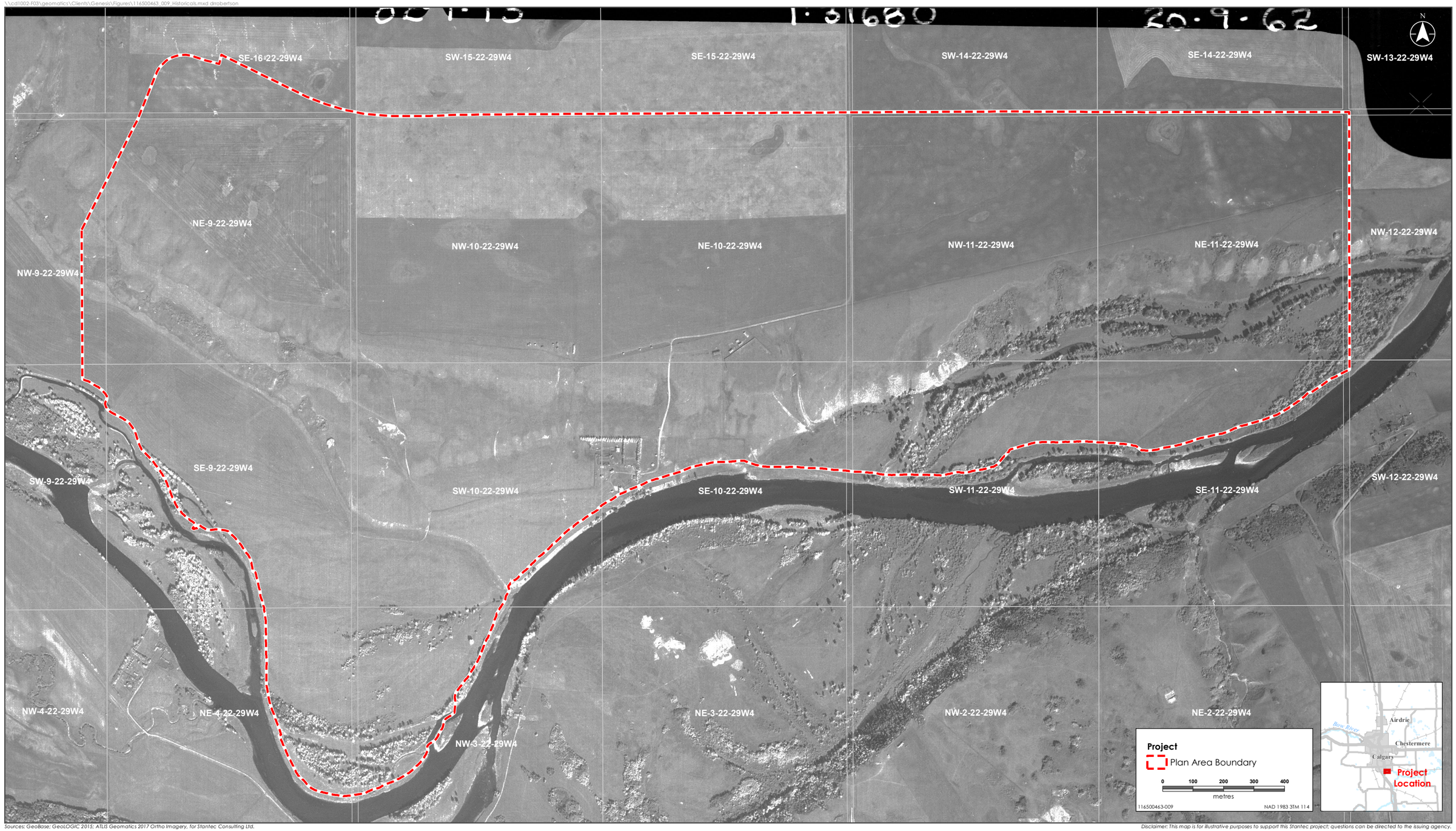

Sources: GeoBase; GeoLOGIC 2015; ATLIS Geomatics 2017 Ortho Imagery, for Stantec Consulting Ltd.

Disclaimer: This map is for illustrative purposes to support this Stantec project; questions can be directed to the issuing agency.

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RICARDO RANCH AREA STRUCTURE PLAN
ECOLOGICAL INVENTORY

Historical Aerial Photograph
September, 1962

Figure B-3

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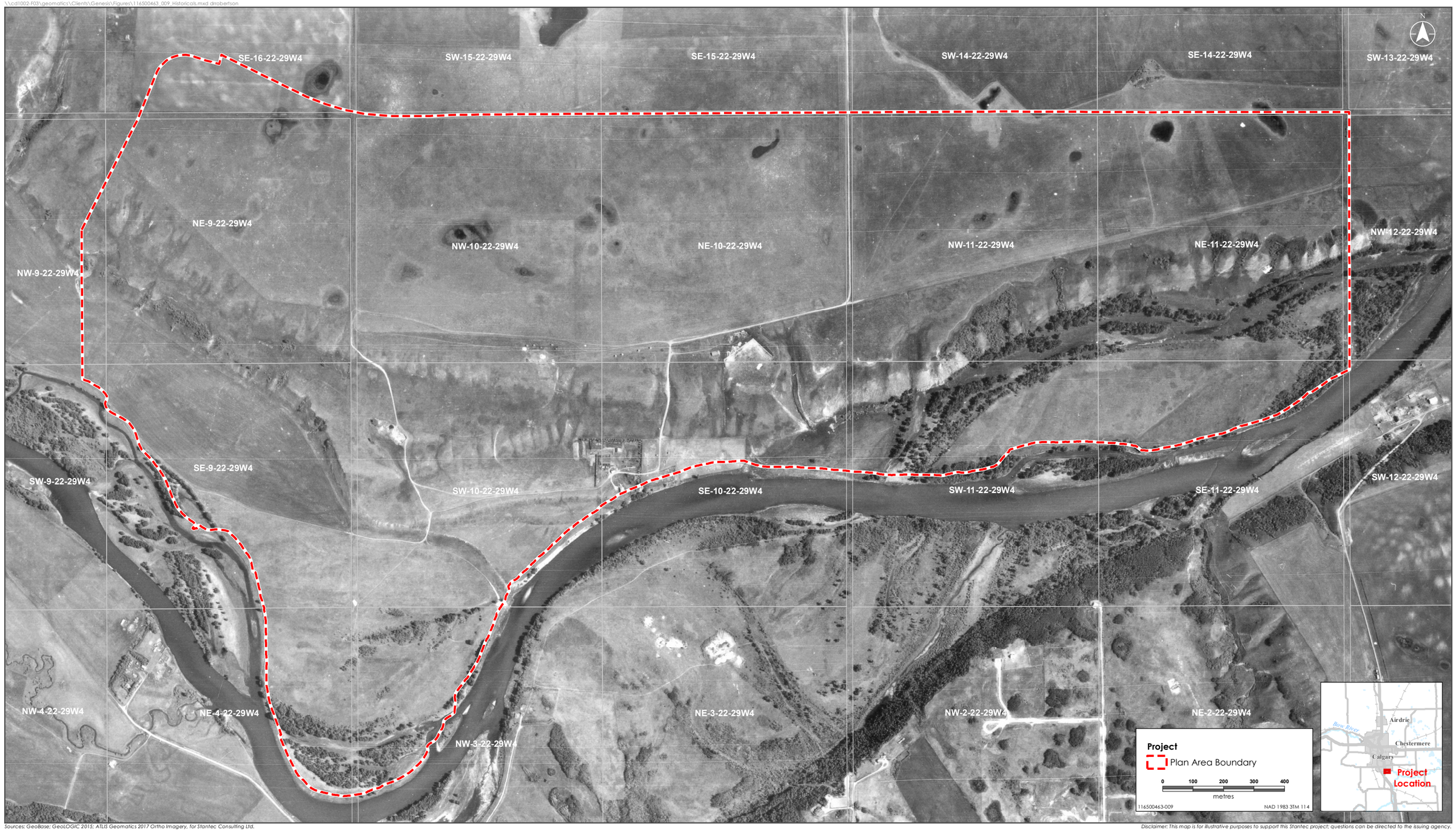

Sources: GeoBase; GeoLOGIC 2015; ATLIS Geomatics 2017 Ortho Imagery, for Stantec Consulting Ltd.

Disclaimer: This map is for illustrative purposes to support this Stantec project; questions can be directed to the issuing agency.

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RICARDO RANCH AREA STRUCTURE PLAN
ECOLOGICAL INVENTORY

Historical Aerial Photograph
June, 1974

Figure B-4

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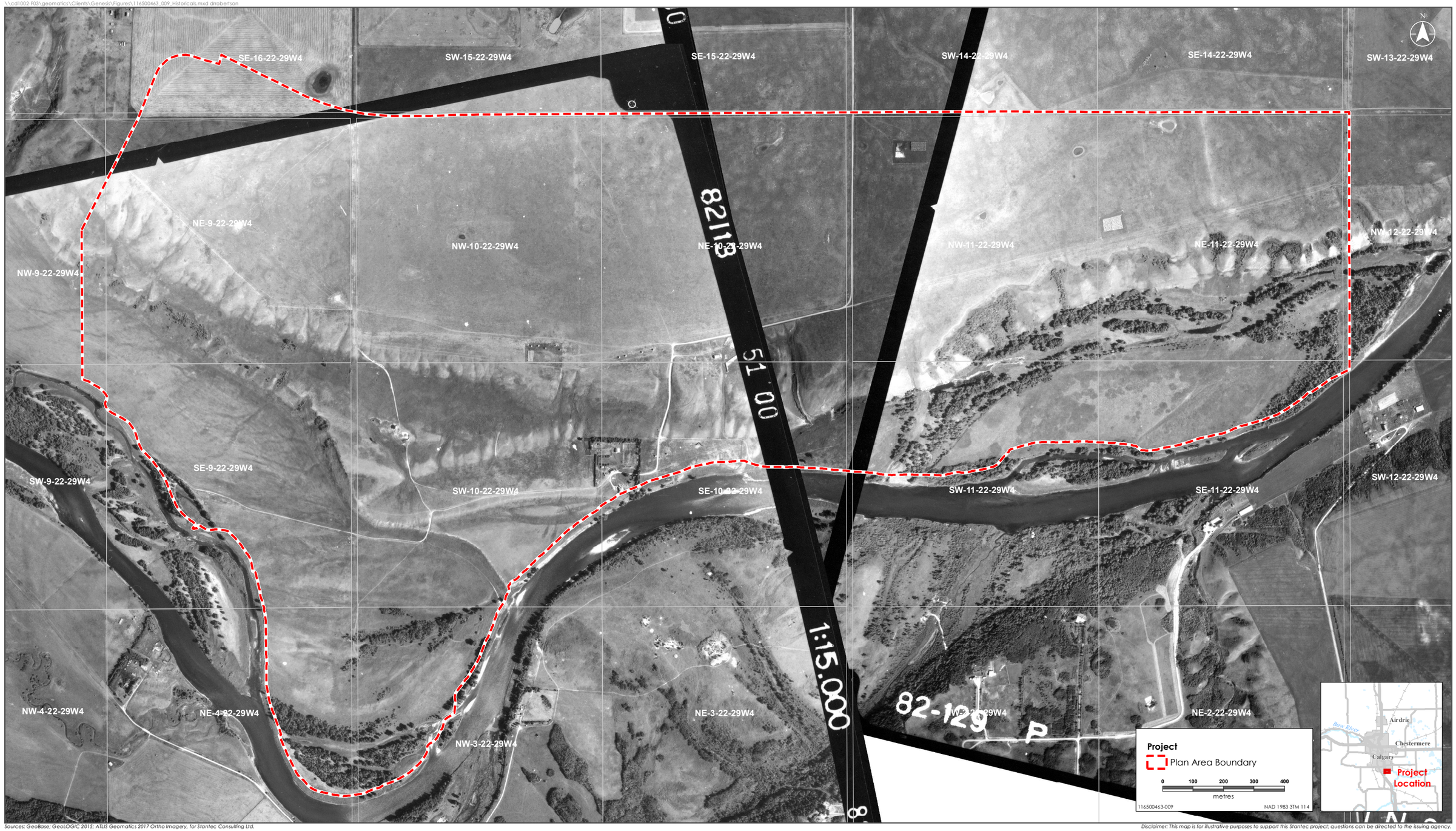

Sources: GeoBase; GeoLOGIC 2015; ATLIS Geomatics 2017 Ortho Imagery, for Stantec Consulting Ltd.

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RICARDO RANCH AREA STRUCTURE PLAN
ECOLOGICAL INVENTORY

Historical Aerial Photograph
July, 1982

Figure B-5

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SE-16-22-29W4
SW-15-22-29W4
SE-15-22-29W4
SW-14-22-29W4
SE-14-22-29W4
SW-13-22-29W4
NE-9-22-29W4
NW-10-22-29W4
NE-10-22-29W4
NW-11-22-29W4
NE-11-22-29W4
NW-12-22-29W4
NW-9-22-29W4
SE-9-22-29W4
SW-10-22-29W4
SE-10-22-29W4
SW-11-22-29W4
SE-11-22-29W4
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NW-3-22-29W4
NE-3-22-29W4
NW-2-22-29W4
NE-2-22-29W4
15212
24467A
Project
Plan Area Boundary
0 100 200 300 400
metres
116500463-009
NAD 1983 3TM 114
Airdrie
Chestermere
Calgary
Bow River
Project Location

Sources: GeoBase; GeoLOGIC 2015; ATLIS Geomatics 2017 Ortho Imagery, for Stantec Consulting Ltd.

Disclaimer: This map is for illustrative purposes to support this Stantec project; questions can be directed to the issuing agency.

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RICARDO RANCH AREA STRUCTURE PLAN
ECOLOGICAL INVENTORY

Historical Aerial Photograph
May, 1996

Figure B-6

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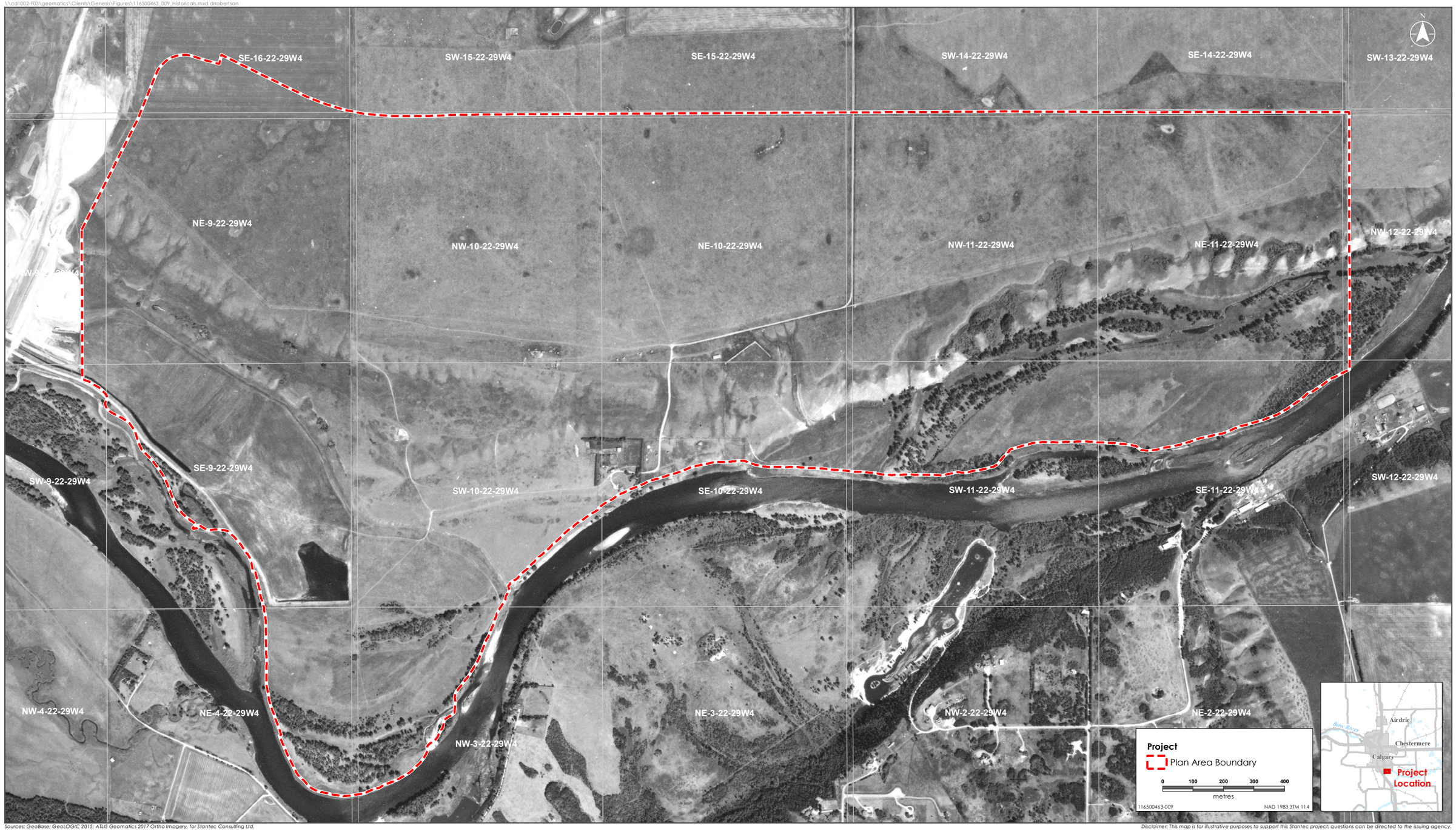

Sources: GeoBase; GeoLOGIC 2015; ATLIS Geomatics 2017 Ortho Imagery, for Stantec Consulting Ltd.

Disclaimer: This map is for illustrative purposes to support this Stantec project; questions can be directed to the issuing agency.

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RICARDO RANCH AREA STRUCTURE PLAN
ECOLOGICAL INVENTORY

Historical Aerial Photograph
July, 2001

Figure B-7

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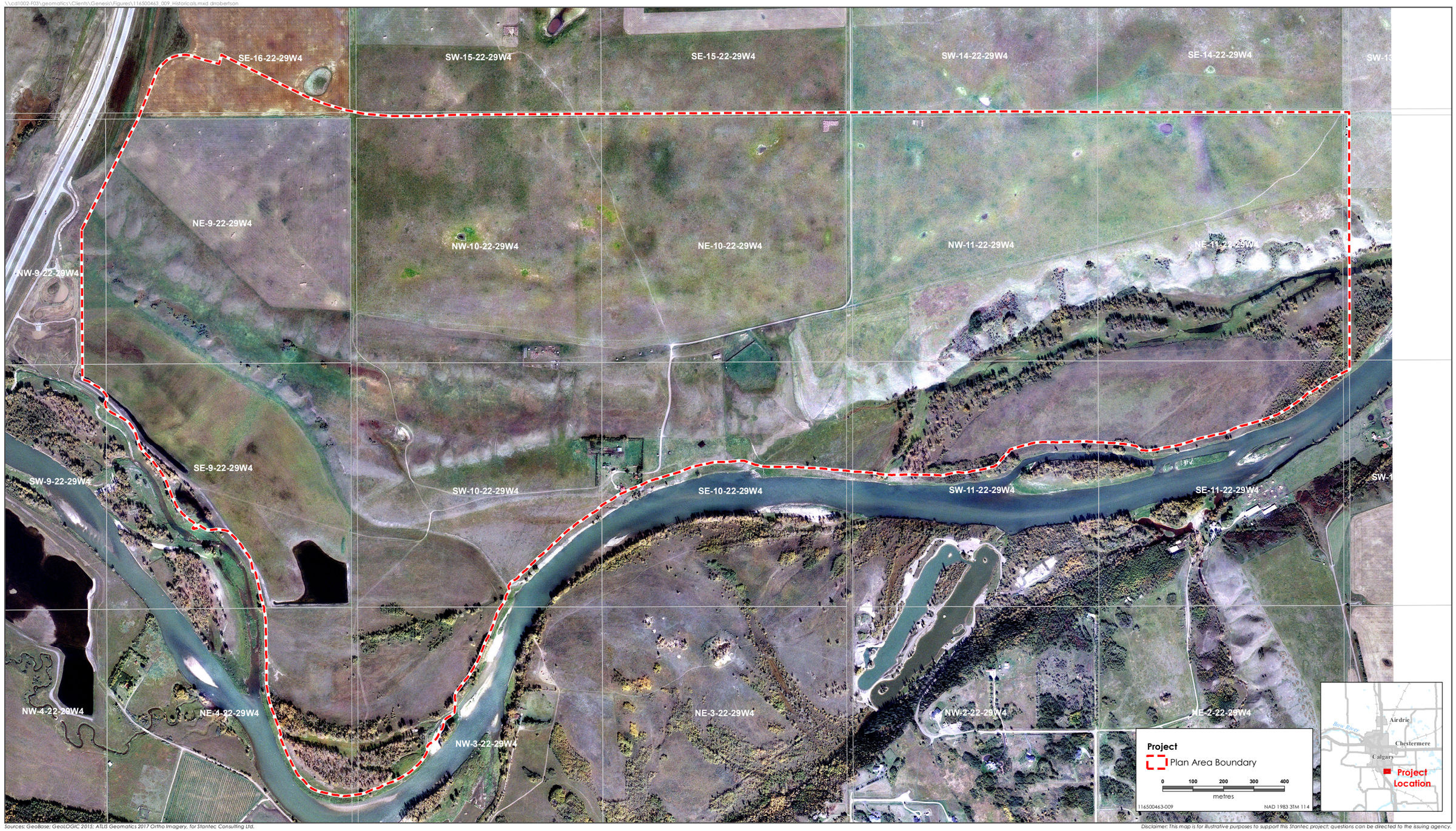

Sources: GeoBase; GeoLOGIC 2015; ATLIS Geomatics 2017 Ortho Imagery, for Stantec Consulting Ltd.

Disclaimer: This map is for illustrative purposes to support this Stantec project; questions can be directed to the issuing agency.

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RICARDO RANCH AREA STRUCTURE PLAN
ECOLOGICAL INVENTORY

Historical Aerial Photograph
Unknown Month, 2005

Figure B-8

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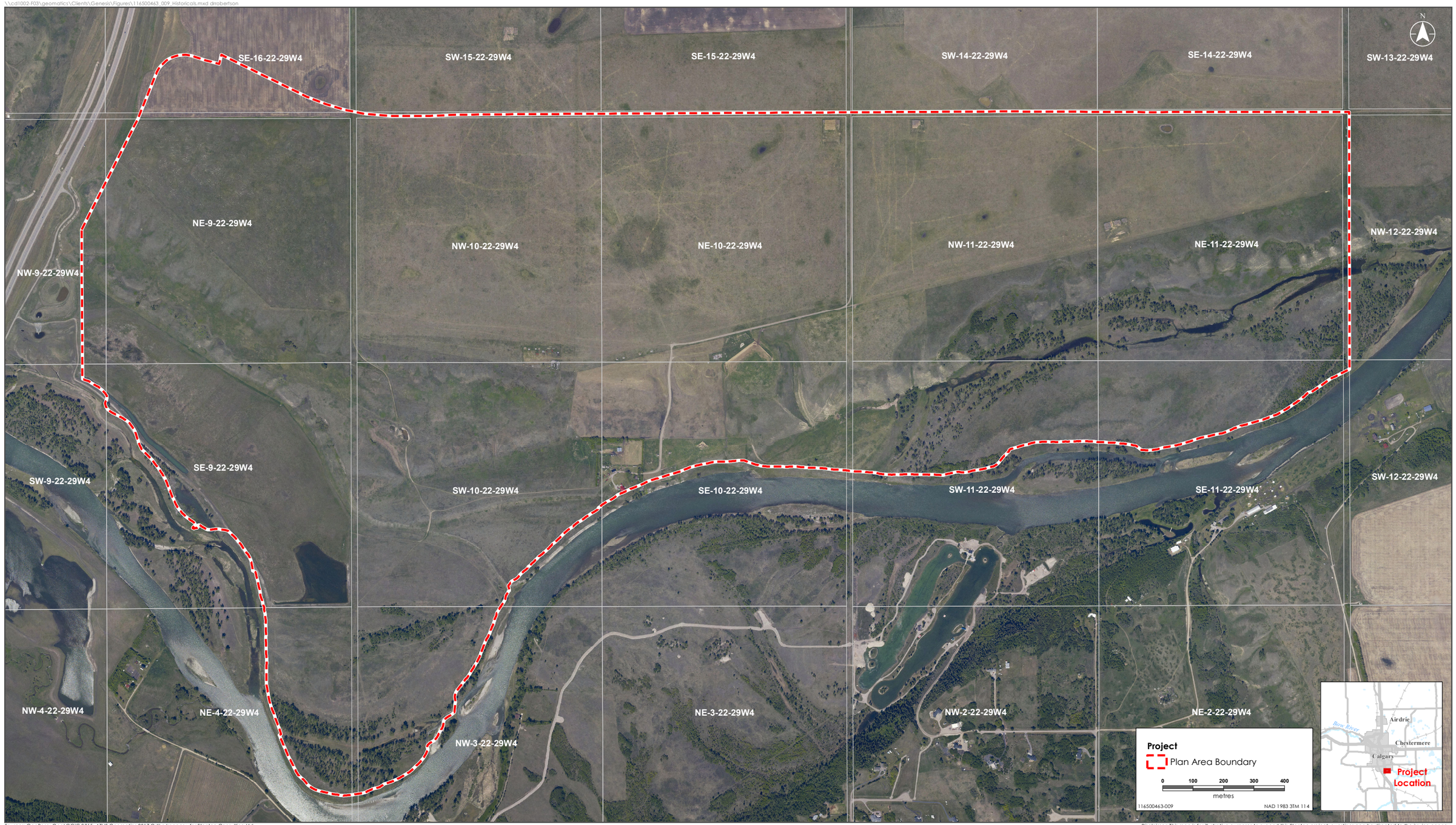

Sources: GeoBase; GeoLOGIC 2015; ATLIS Geomatics 2017 Ortho Imagery, for Stantec Consulting Ltd.

Disclaimer: This map is for illustrative purposes to support this Stantec project; questions can be directed to the issuing agency.

Stantec

RICARDO RANCH AREA STRUCTURE PLAN
ECOLOGICAL INVENTORY

Historical Aerial Photograph
Unknown Month, 2010

Figure B-9

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Sources: GeoBase; GeoLOGIC 2015; ATLIS Geomatics 2017 Ortho Imagery, for Stantec Consulting Ltd.

Disclaimer: This map is for illustrative purposes to support this Stantec project; questions can be directed to the issuing agency.

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RICARDO RANCH AREA STRUCTURE PLAN
ECOLOGICAL INVENTORY

Historical Aerial Photograph
July, 2012

Figure B-10

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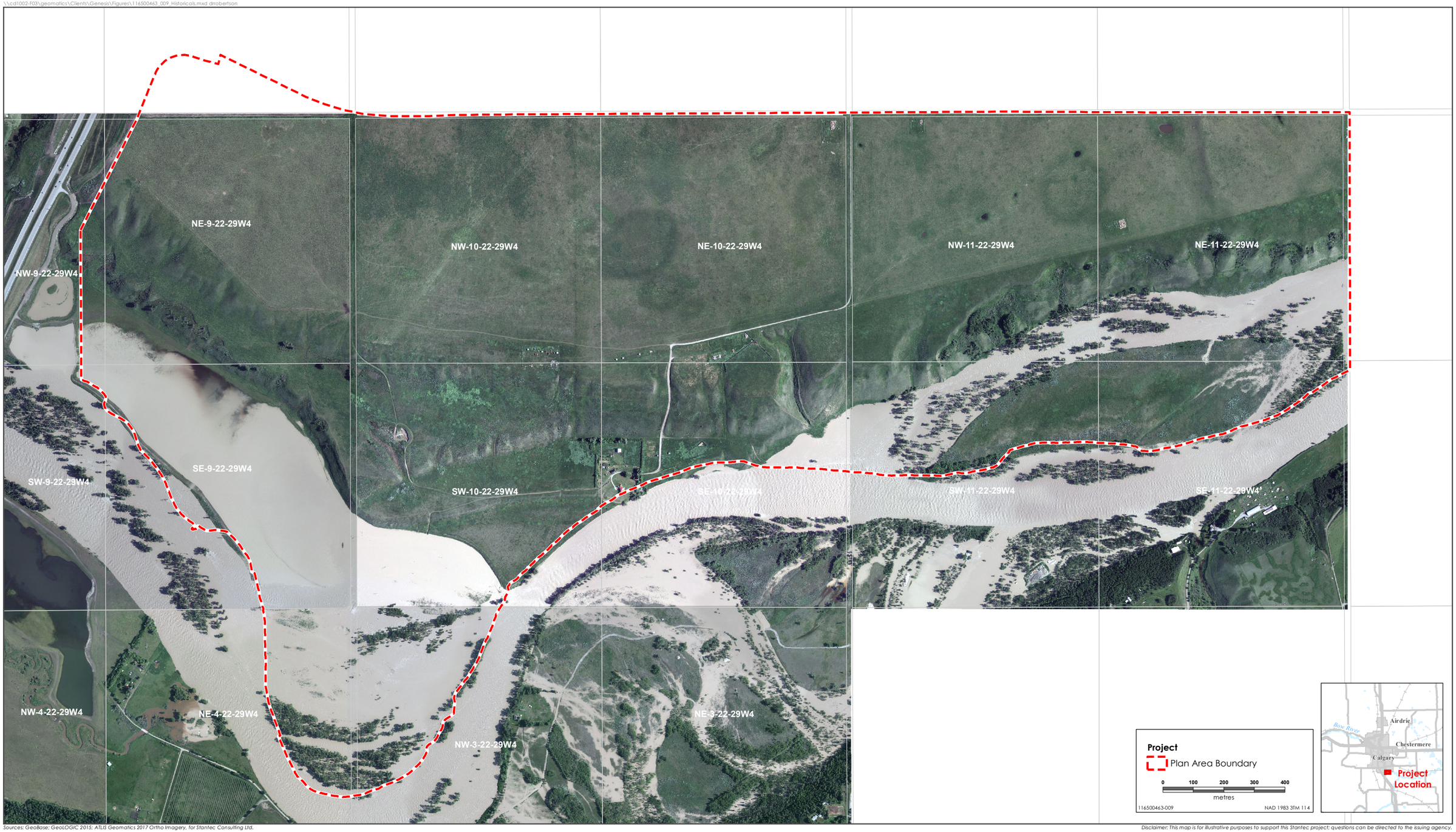

Sources: GeoBase; GeoLOGIC 2015; ATLIS Geomatics 2017 Ortho Imagery, for Stantec Consulting Ltd.

Disclaimer: This map is for illustrative purposes to support this Stantec project; questions can be directed to the issuing agency.

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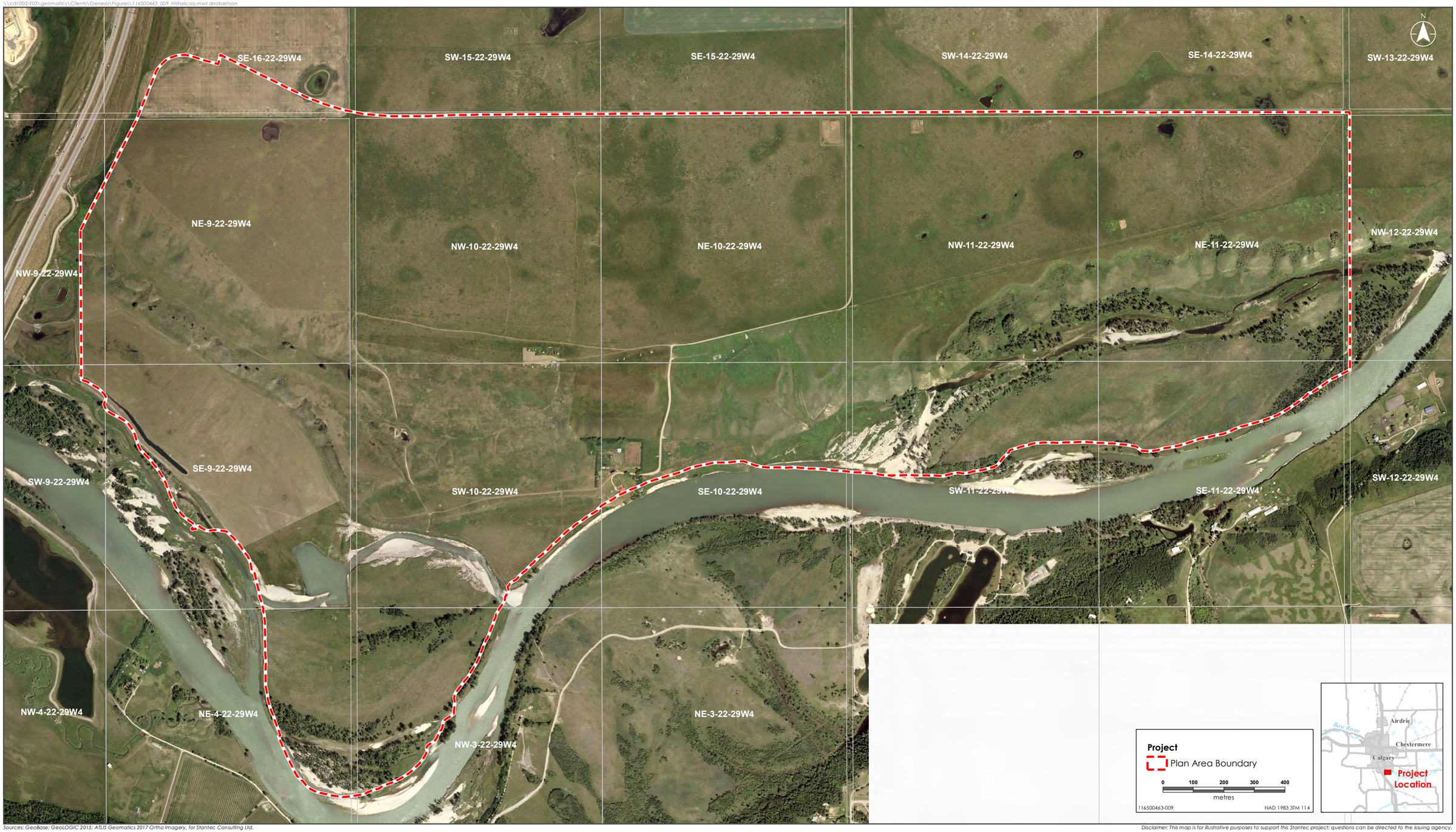
RICARDO RANCH AREA STRUCTURE PLAN
ECOLOGICAL INVENTORY

Historical Aerial Photograph
June, 2013

Figure B-11

\\cd1002-F03\geomatics\Clients\Genesis\Figures\116500463_009_Historicals.mxd drobertson



Sources: GeoBase; GeoLOGIC 2015; ATLIS Geomatics 2017 Ortho Imagery, for Stantec Consulting Ltd.

Disclaimer: This map is for illustrative purposes to support this Stantec project; questions can be directed to the issuing agency.

Historical Aerial Photograph
July, 2014

Figure B-12

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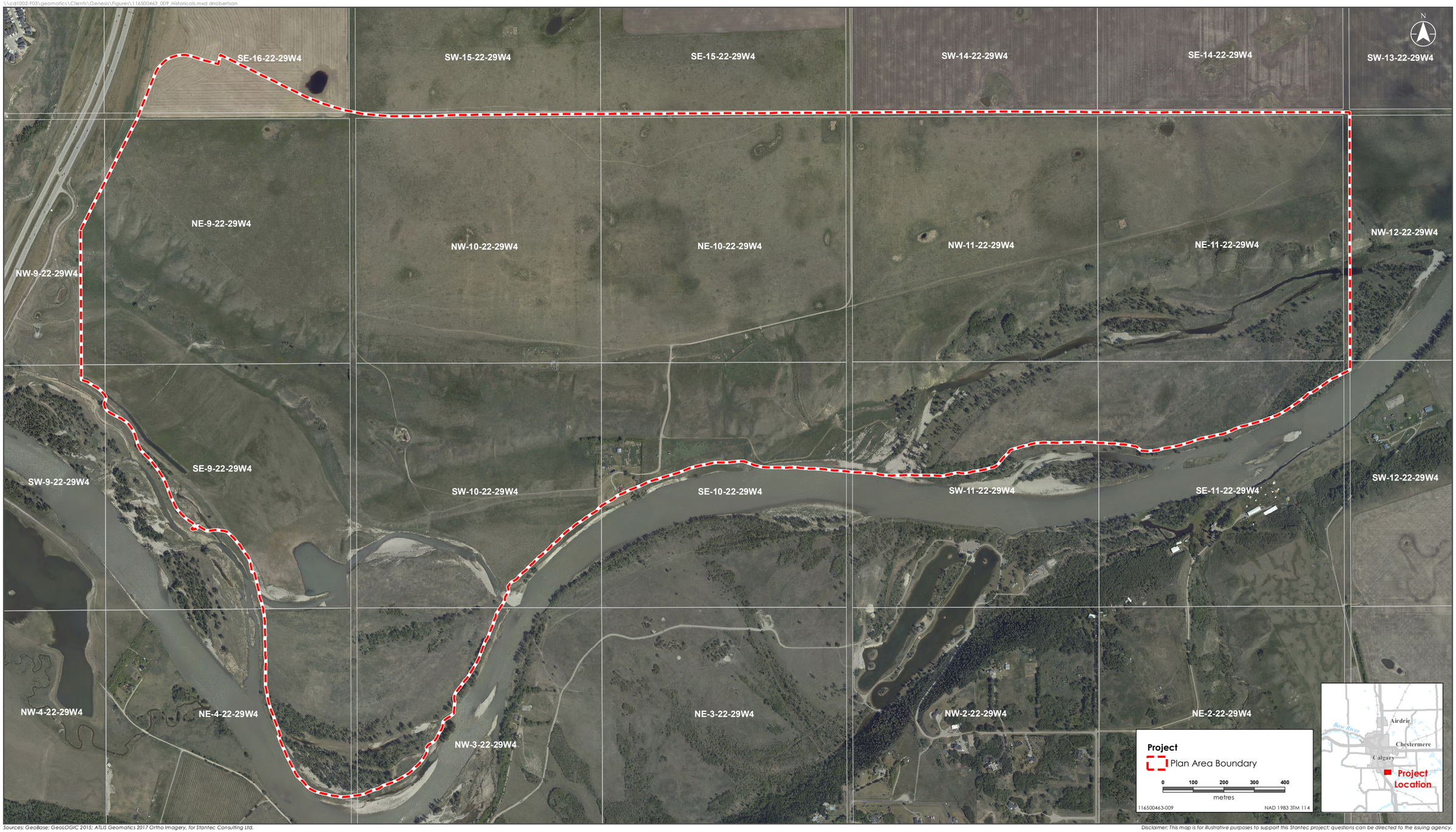


Sources: GeoBase; GeoLOGIC 2015; ATLIS Geomatics 2017 Ortho Imagery, for Stantec Consulting Ltd.

Disclaimer: This map is for illustrative purposes to support this Stantec project; questions can be directed to the issuing agency.

Historical Aerial Photograph
May, 2017

Figure B-13

Stantec

RICARDO RANCH AREA STRUCTURE PLAN
ECOLOGICAL INVENTORY

Appendix C

VEGETATION SURVEY DATA

TABLE C-1 – LAND COVER SURVEY SITES

Survey Site	Latin Name	Common Name	% Cover	Vegetation Community	Track Status	Nativity	Weed Status
Land Cover Sites							
SITE 001	*Artemisia frigida*	pasture sagewort	1	Loamy - Lo	-	Native	-
	Bouteloua gracilis	blue grama	1		-	Native	-
	Bromus inermis	smooth brome	5		-	Exotic	-
	Gaillardia aristata	gaillardia	1		-	Native	-
	Hesperostipa curtiseta	western porcupine grass	25		-	Native	-
	Pediomelum esculentum	Indian breadroot	1		-	Native	-
	Poa pratensis	Kentucky bluegrass	35		-	Native	-
	Rosa acicularis	prickly rose	1		-	Native	-
	Tragopogon dubius	common goat's-beard	1		-	Exotic	-
SITE 002	*Amelanchier alnifolia*	saskatoon	1	Thin Breaks - TB	-	Native	-
	Anemone multifida	cut-leaved anemone	1		-	Native	-
	Bromus inermis	smooth brome	70		-	Exotic	-
	Carex scirpoidea	rush-like sedge	1		-	Native	-
	Cirsium arvense	Canada thistle	1		-	Exotic	Noxious
	Dalea purpurea	purple prairie-clover	1		-	Native	-
	Dasiphora fruticosa	shrubby cinquefoil	20		-	Native	-
	Elaeagnus commutata	silverberry	8		-	Native	-
	Elymus trachycaulus ssp. trachycaulus	slender wheat grass	1		-	Native	-
	Gaillardia aristata	gaillardia	2		-	Native	-
	Galium boreale	northern bedstraw	1		-	Native	-
	Glycyrrhiza lepidota	wild licorice	1		-	Native	-
	Hedysarum alpinum	alpine hedysarum	1		-	Native	-
	Hesperostipa curtiseta	western porcupine grass	25		-	Native	-
	Liatris punctata	dotted blazingstar	1		-	Native	-
	Linum lewisii	wild blue flax	2		-	Native	-
	Lithospermum occidental	western false gromwel	1		T	Native	-
	Maianthemum stellatum	star-flowered Solomon's-seal	1		-	Native	-
	Monarda fistulosa	wild bergamot	1		-	Native	-

Survey Site	Latin Name	Common Name	% Cover	Vegetation Community	Track Status	Nativity	Weed Status
	Oenothera suffrutescens	scarlet butterflyweed	1		-	Native	-
	Poa pratensis	Kentucky bluegrass	5		-	Native	-
	Potentilla gracilis	graceful cinquefoil	1		-	Native	-
	Potentilla pensylvanica	prairie cinquefoil	1		-	Native	-
	Rosa acicularis	prickly rose	1		-	Native	-
	Sisyrinchium septentrionale	pale blue-eyed grass	1		-	Native	-
	Solidago missouriensis	low goldenrod	1		-	Native	-
	Solidago multiradiata	alpine goldenrod	1		-	Native	-
	Symphoricarpos occidentalis	buckbrush	2		-	Native	-
	Tragopogon dubius	common goat's-beard	1		-	Exotic	-
SITE 003	*Achillea millefolium*	common yarrow	1	Loamy - Lo	-	Native	-
	Agropyron cristatum	crested wheatgrass	5		-	Exotic	-
	Artemisia frigida	pasture sagewort	1		-	Native	-
	Artemisia ludoviciana	prairie sagewort	2		-	Native	-
	Astragalus agrestis	purple milk vetch	1		-	Native	-
	Bromus inermis	smooth brome	15		-	Exotic	-
	Erigeron pumilus	hairy fleabane	1		-	Native	-
	Medicago sativa	alfalfa	1		-	Exotic	-
	Poa pratensis	Kentucky bluegrass	75		-	Native	-
	Potentilla gracilis	graceful cinquefoil	1		-	Native	-
	Potentilla pensylvanica	prairie cinquefoil	1		-	Native	-
	Solidago missouriensis	low goldenrod	1		-	Native	-
	Symphoricarpos occidentalis	buckbrush	1		-	Native	-
	Tragopogon dubius	common goat's-beard	1		-	Exotic	-
	Vicia americana	wild vetch	1		-	Native	-
SITE 004	*Achillea millefolium*	common yarrow	1	Loamy - Lo	-	Native	-
	Artemisia ludoviciana	prairie sagewort	5		-	Native	-
	Carex duriuscula	low sedge	15		-	Native	-
	Cirsium arvense	Canada thistle	1		-	Exotic	Noxious
	Descurainia sophia	flixweed	1		-	Exotic	-
	Drymocallis arguta	white cinquefoil	1		-	Native	-

Survey Site	Latin Name	Common Name	% Cover	Vegetation Community	Track Status	Nativity	Weed Status
	Festuca hallii	plains rough fescue	20		-	Native	-
	Geranium bicknellii	Bicknell's geranium	1		-	Native	-
	Hesperostipa curtiseta	western porcupine grass	25		-	Native	-
	Pascopyrum smithii	western wheat grass	1		-	Native	-
	Poa pratensis	Kentucky bluegrass	25		-	Native	-
	Potentilla gracilis	graceful cinquefoil	1		-	Native	-
	Rosa acicularis	prickly rose	2		-	Native	-
	Symphoricarpos occidentalis	buckbrush	5		-	Native	-
	Tragopogon dubius	common goat's-beard	1		-	Exotic	-
	Vicia americana	wild vetch	1		-	Native	-
SITE 005	*Achillea millefolium*	common yarrow	1	Thin Breaks - TB	-	Native	-
	Artemisia frigida	pasture sagewort	1		-	Native	-
	Carex duriuscula	low sedge	70		-	Native	-
	Dalea purpurea	purple prairie-clover	1		-	Native	-
	Glycyrrhiza lepidota	wild licorice	1		-	Native	-
	Hesperostipa curtiseta	western porcupine grass	3		-	Native	-
	Liatris punctata	dotted blazingstar	1		-	Native	-
	Pascopyrum smithii	western wheat grass	15		-	Native	-
	Oenothera suffrutescens	scarlet butterflyweed	1		-	Native	-
	Nassella viridula	green needle grass	15		-	Native	-
	Poa pratensis	Kentucky bluegrass	5		-	Native	-
	Rosa acicularis	prickly rose	1		-	Native	-
	Symphoricarpos occidentalis	buckbrush	5		-	Native	-
	Vicia americana	wild vetch	1		-	Native	-
SITE 006	*Achillea millefolium*	common yarrow	1	Thin Breaks - TB	-	Native	-
	Anemone canadensis	Canada anemone	1		-	Native	-
	Artemisia ludoviciana	prairie sagewort	1		-	Native	-
	Bromus inermis	smooth brome	55		-	Exotic	-
	Campanula rotundifolia	harebell	1		-	Native	-
	Cirsium arvense	Canada thistle	5		-	Exotic	Noxious
	Elaeagnus commutata	silverberry	1		-	Native	-

Survey Site	Latin Name	Common Name	% Cover	Vegetation Community	Track Status	Nativity	Weed Status
	Galium boreale	northern bedstraw	2		-	Native	-
	Glycyrrhiza lepidota	wild licorice	1		-	Native	-
	Juncus balticus	wire rush	3		-	Native	-
	Maianthemum stellatum	star-flowered Solomon's-seal	1		-	Native	-
	Nassella viridula	green needle grass	1		-	Native	-
	Pascopyrum smithii	western wheat grass	1		-	Native	-
	Poa pratensis	Kentucky bluegrass	35		-	Native	-
	Rosa acicularis	prickly rose	3		-	Native	-
	Symphoricarpos occidentalis	buckbrush	5		-	Native	-
	Tragopogon dubius	common goat's-beard	1		-	Exotic	-
	Vicia americana	wild vetch	1		-	Native	-
	Achillea millefolium	common yarrow	1		-	Native	-
	Agropyron cristatum	crested wheatgrass	1		-	Exotic	-
	Artemisia frigida	pasture sagewort	1		-	Native	-
	Artemisia ludoviciana	prairie sagewort	3		-	Native	-
	Campanula rotundifolia	harebell	1		-	Native	-
	Dalea purpurea	purple prairie-clover	1		-	Native	-
	Gaillardia aristata	gaillardia	1		-	Native	-
	Galium boreale	northern bedstraw	1		-	Native	-
	Medicago lupulina	black medick	1		-	Exotic	-
SITE 007	*Medicago sativa*	alfalfa	1	Loamy - Lo	-	Exotic	-
	Oxytropis splendens	showy locoweed	1		-	Native	-
	Poa pratensis	Kentucky bluegrass	85		-	Native	-
	Potentilla gracilis	graceful cinquefoil	1		-	Native	-
	Rosa acicularis	prickly rose	1		-	Native	-
	Solidago missouriensis	low goldenrod	1		-	Native	-
	Symphoricarpos occidentalis	buckbrush	5		-	Native	-
	Thermopsis rhombifolia	golden bean	10		-	Native	-
	Tragopogon dubius	common goat's-beard	1		-	Exotic	-
	Vicia americana	wild vetch	1		-	Native	-

Survey Site	Latin Name	Common Name	% Cover	Vegetation Community	Track Status	Nativity	Weed Status
SITE 008	*Achillea millefolium*	common yarrow	1	Overflow - Ov	-	Native	-
	Amelanchier alnifolia	saskatoon	5		-	Native	-
	Bromus inermis	smooth brome	70		-	Exotic	-
	Campanula rotundifolia	harebell	1		-	Native	-
	Cirsium flodmanii	Flodman's thistle	1		-	Native	-
	Dasiphora fruticosa	shrubby cinquefoil	45		-	Native	-
	Elaeagnus commutata	silverberry	40		-	Native	-
	Erigeron glabellus	smooth fleabane	1		-	Native	-
	Fragaria virginiana	wild strawberry	2		-	Native	-
	Gaillardia aristata	gaillardia	1		-	Native	-
	Galium boreale	northern bedstraw	1		-	Native	-
	Helianthus annuus	common annual sunflower	2		-	Native	-
	Linaria vulgaris	common toadflax	1		-	Exotic	Noxious
	Linum lewisii	wild blue flax	1		-	Native	-
	Maianthemum stellatum	star-flowered Solomon's-seal	3		-	Native	-
	Monarda fistulosa	wild bergamot	1		-	Native	-
	Nassella viridula	green needle grass	1		-	Native	-
	Pascopyrum smithii	western wheat grass	5		-	Native	-
	Phleum pratense	timothy	1		-	Exotic	-
	Poa pratensis	Kentucky bluegrass	15		-	Native	-
	Sonchus arvensis	perennial sow-thistle	1		-	Exotic	Noxious
	Symphoricarpos occidentalis	buckbrush	15		-	Native	-
	Vicia americana	wild vetch	1		-	Native	-
SITE 009	*Arctium minus*	common burdock	1	Lotic (Deciduous) - LtcD	-	Exotic	Noxious
	Betula glandulosa	bog birch	15		-	Native	-
	Bromus inermis	smooth brome	70		-	Exotic	-
	Cirsium arvense	Canada thistle	3		-	Exotic	Noxious
	Cirsium flodmanii	Flodman's thistle	1		-	Native	-
	Dasiphora fruticosa	shrubby cinquefoil	1		-	Native	-
	Elaeagnus commutata	silverberry	1		-	Native	-

Survey Site	Latin Name	Common Name	% Cover	Vegetation Community	Track Status	Nativity	Weed Status
	Equisetum pratense	meadow horsetail	1		-	Native	-
	Euphorbia esula	leafy spurge	2		-	Exotic	Noxious
	Fragaria virginiana	wild strawberry	1		-	Native	-
	Gaillardia aristata	gaillardia	1		-	Native	-
	Galium boreale	northern bedstraw	1		-	Native	-
	Hesperostipa curtiseta	western porcupine grass	25		-	Native	-
	Monarda fistulosa	wild bergamot	1		-	Native	-
	Pascopyrum smithii	western wheat grass	15		-	Native	-
	Phalaris arundinacea	reed canary grass	1		-	Native	-
	Phleum pratense	timothy	1		-	Exotic	-
	Poa pratensis	Kentucky bluegrass	15		-	Native	-
	Populus balsamifera	balsam poplar	50		-	Native	-
	Populus tremuloides	aspen	35		-	Native	-
	Rosa acicularis	prickly rose	1		-	Native	-
	Solidago altissima	tall goldenrod	1		-	Native	-
	Symphoricarpos occidentalis	buckbrush	10		-	Native	-
	Tanacetum vulgare	common tansy	1		-	Exotic	Noxious
	Thalictrum venulosum	veiny meadow rue	1		-	Native	-
	Vicia americana	wild vetch	1		-	Native	-
	Zigadenus elegans	white camas	1		-	Native	-
SITE 010	*Achillea millefolium*	common yarrow	1	Overflow - Ov	-	Native	-
	Agoseris glauca	yellow false dandelion	1		-	Native	-
	Arctostaphylos uva-ursi	common bearberry	10		-	Native	-
	Campanula rotundifolia	harebell	1		-	Native	-
	Dasiphora fruticosa	shrubby cinquefoil	1		-	Native	-
	Elaeagnus commutata	silverberry	5		-	Native	-
	Erigeron caespitosus	tufted fleabane	1		-	Native	-
	Euphorbia esula	leafy spurge	1		-	Exotic	Noxious
	Festuca idahoensis	bluebunch fescue	30		-	Native	-
	Festuca rubra	red fescue	1		-	Native	-
	Fragaria virginiana	wild strawberry	1		-	Native	-

Survey Site	Latin Name	Common Name	% Cover	Vegetation Community	Track Status	Nativity	Weed Status
	Gaillardia aristata	gaillardia	1		-	Native	-
	Linaria vulgaris	common toadflax	1		-	Exotic	Noxious
	Linum lewisii	wild blue flax	1		-	Native	-
	Maianthemum stellatum	star-flowered Solomon's-seal	1		-	Native	-
	Phleum pratense	timothy	1		-	Exotic	-
	Plantago major	common plantain	1		-	Exotic	-
	Potentilla pensylvanica	prairie cinquefoil	1		-	Native	-
	Rosa acicularis	prickly rose	1		-	Native	-
	Solidago missouriensis	low goldenrod	1		-	Native	-
	Symphoricarpos occidentalis	buckbrush	10		-	Native	-
	Thermopsis rhombifolia	golden bean	1		-	Native	-
	Tragopogon dubius	common goat's-beard	1		-	Exotic	-
	Vicia americana	wild vetch	1		-	Native	-
SITE 011	*Achillea millefolium*	common yarrow	1	Thin Breaks - TB	-	Native	-
	Anemone canadensis	Canada anemone	1		-	Native	-
	Campanula rotundifolia	harebell	1		-	Native	-
	Cirsium arvense	Canada thistle	3		-	Exotic	Noxious
	Dasiphora fruticosa	shrubby cinquefoil	15		-	Native	-
	Fragaria virginiana	wild strawberry	1		-	Native	-
	Galium boreale	northern bedstraw	2		-	Native	-
	Glycyrrhiza lepidota	wild licorice	1		-	Native	-
	Lilium philadelphicum	western wood lily	1		-	Native	-
	Maianthemum stellatum	star-flowered Solomon's-seal	2		-	Native	-
	Medicago lupulina	black medick	1		-	Exotic	-
	Melilotus officinalis	yellow sweet-clover	1		-	Exotic	-
	Monarda fistulosa	wild bergamot	3		-	Native	-
	Phleum pratense	timothy	1		-	Exotic	-
	Poa pratensis	Kentucky bluegrass	75		-	Native	-
	Potentilla pensylvanica	prairie cinquefoil	1		-	Native	-
	Rosa acicularis	prickly rose	1		-	Native	-

Survey Site	Latin Name	Common Name	% Cover	Vegetation Community	Track Status	Nativity	Weed Status
	Sonchus arvensis	perennial sow-thistle	1		-	Exotic	Noxious
	Symphoricarpos occidentalis	buckbrush	10		-	Native	-
	Thalictrum venulosum	veiny meadow rue	1		-	Native	-
	Tragopogon dubius	common goat's-beard	1		-	Exotic	-
	Trifolium repens	white clover	1		-	Exotic	-
	Zigadenus elegans	white camas	1		-	Native	-
	Zizia aptera	heart-leaved Alexanders	1		-	Native	-
SITE 012	*Achillea millefolium*	common yarrow	1	Thin Breaks - TB	-	Native	-
	Anemone canadensis	Canada anemone	1		-	Native	-
	Artemisia ludoviciana	prairie sagewort	1		-	Native	-
	Bromus inermis	smooth brome	70		-	Exotic	-
	Cirsium arvense	Canada thistle	2		-	Exotic	Noxious
	Cirsium flodmanii	Flodman's thistle	1		-	Native	-
	Galium boreale	northern bedstraw	1		-	Native	-
	Lithospermum ruderale	woolly gromwell	1		-	Native	-
	Medicago sativa	alfalfa	1		-	Exotic	-
	Poa pratensis	Kentucky bluegrass	30		-	Native	-
	Rosa acicularis	prickly rose	1		-	Native	-
	Sonchus arvensis	perennial sow-thistle	1		-	Exotic	Noxious
	Symphoricarpos occidentalis	buckbrush	10		-	Native	-
	Tragopogon dubius	common goat's-beard	1		-	Exotic	-
SITE 013	*Anemone multifida*	cut-leaved anemone	1	Thin Breaks - TB	-	Native	-
	Antennaria parvifolia	small-leaved everlasting	1		-	Native	-
	Artemisia frigida	pasture sagewort	1		-	Native	-
	Artemisia ludoviciana	prairie sagewort	1		-	Native	-
	Avenula hookeri	Hooker's oat grass	5		-	Native	-
	Bromus inermis	smooth brome	10		-	Exotic	-
	Campanula rotundifolia	harebell	1		-	Native	-
	Dalea purpurea	purple prairie-clover	5		-	Native	-
	Gaillardia aristata	gaillardia	1		-	Native	-
	Galium boreale	northern bedstraw	1		-	Native	-

Survey Site	Latin Name	Common Name	% Cover	Vegetation Community	Track Status	Nativity	Weed Status
	Glycyrrhiza lepidota	wild licorice	1		-	Native	-
	Hesperostipa curtiseta	western porcupine grass	35		-	Native	-
	Heterotheca villosa	golden aster	1		-	Native	-
	Liatris punctata	dotted blazingstar	2		-	Native	-
	Linum lewisii	wild blue flax	1		-	Native	-
	Linum rigidum	yellow flax	1		-	Native	-
	Lithospermum ruderale	woolly gromwell	1		-	Native	-
	Nassella viridula	green needle grass	1		-	Native	-
	Poa pratensis	Kentucky bluegrass	15		-	Native	-
	Potentilla bipinnatifida	plains cinquefoil	1		-	Native	-
	Rosa acicularis	prickly rose	1		-	Native	-
	Solidago missouriensis	low goldenrod	3		-	Native	-
	Symphoricarpos occidentalis	buckbrush	10		-	Native	-
	Thermopsis rhombifolia	golden bean	3		-	Native	-
	Tragopogon dubius	common goat's-beard	1		-	Exotic	-
SITE 014	*Achillea millefolium*	common yarrow	3	Thin Breaks - TB	-	Native	-
	Artemisia ludoviciana	prairie sagewort	1		-	Native	-
	Bromus inermis	smooth brome	15		-	Exotic	-
	Campanula rotundifolia	harebell	1		-	Native	-
	Lygodesmia juncea	skeletonweed	1		-	Native	-
	Cirsium arvense	Canada thistle	1		-	Exotic	Noxious
	Geranium bicknellii	Bicknell's geranium	1		-	Native	-
	Lithospermum ruderale	woolly gromwell	1		-	Native	-
	Pascopyrum smithii	western wheat grass	1		-	Native	-
	Poa pratensis	Kentucky bluegrass	80		-	Native	-
	Solidago missouriensis	low goldenrod	2		-	Native	-
	Symphoricarpos occidentalis	buckbrush	5		-	Native	-
	Tragopogon dubius	common goat's-beard	1		-	Exotic	-
	Trifolium repens	white clover	1		-	Exotic	-
	Vicia americana	wild vetch	1		-	Native	-
SITE 015	*Achillea millefolium*	common yarrow	1	Loamy - Lo	-	Native	-

Survey Site	Latin Name	Common Name	% Cover	Vegetation Community	Track Status	Nativity	Weed Status
	Agropyron cristatum	crested wheatgrass	5		-	Exotic	-
	Artemisia frigida	pasture sagewort	2		-	Native	-
	Artemisia ludoviciana	prairie sagewort	1		-	Native	-
	Bromus inermis	smooth brome	5		-	Exotic	-
	Medicago sativa	alfalfa	1		-	Exotic	-
	Melilotus alba	white sweet-clover	1		-	Exotic	-
	Melilotus officinalis	yellow sweet-clover	1		-	Exotic	-
	Oenothera suffrutescens	scarlet butterflyweed	1		-	Native	-
	Oxytropis sericea	early yellow locoweed	1		-	Native	-
	Poa pratensis	Kentucky bluegrass	80		-	Native	-
	Solidago missouriensis	low goldenrod	2		-	Native	-
	Symphoricarpos occidentalis	buckbrush	2		-	Native	-
	Thermopsis rhombifolia	golden bean	4		-	Native	-
	Tragopogon dubius	common goat's-beard	1		-	Exotic	-
SITE 016	*Bromus inermis*	smooth brome	50	Tame Pasture (Non-Irrigated) – PN / Rural – Ru	-	Exotic	-
	Medicago sativa	alfalfa	15		-	Exotic	-
	Melilotus alba	white sweet-clover	5		-	Exotic	-
	Melilotus officinalis	yellow sweet-clover	20		-	Exotic	-
	Poa pratensis	Kentucky bluegrass	35		-	Native	-
	Thermopsis rhombifolia	golden bean	5		-	Native	-
	Tragopogon dubius	common goat's-beard	1		-	Exotic	-
	Vicia americana	wild vetch	1		-	Native	-
SITE 017	*Achillea millefolium*	common yarrow	2	Tame Pasture (Non-Irrigated) - PN	-	Native	-
	Antennaria parvifolia	small-leaved everlasting	1		-	Native	-
	Artemisia frigida	pasture sagewort	1		-	Native	-
	Artemisia ludoviciana	prairie sagewort	1		-	Native	-
	Astragalus agrestis	purple milk vetch	1		-	Native	-
	Bromus inermis	smooth brome	40		-	Exotic	-
	Heterotheca villosa	golden aster	1		-	Native	-
	Medicago sativa	alfalfa	10		-	Exotic	-
	Melilotus officinalis	yellow sweet-clover	2		-	Exotic	-

Survey Site	Latin Name	Common Name	% Cover	Vegetation Community	Track Status	Nativity	Weed Status
	Oxytropis sericea	early yellow locoweed	1		-	Native	-
	Oxytropis splendens	showy locoweed	2		-	Native	-
	Poa pratensis	Kentucky bluegrass	45		-	Native	-
	Potentilla bipinnatifida	plains cinquefoil	1		-	Native	-
	Sisyrinchium septentrionale	pale blue-eyed grass	1		-	Native	-
	Tragopogon dubius	common goat's-beard	1		-	Exotic	-
	Vicia americana	wild vetch	2		-	Native	-
SITE 018	*Allium textile*	prairie onion	1	Thin Breaks - TB	-	Native	-
	Artemisia frigida	pasture sagewort	5		-	Native	-
	Bouteloua gracilis	blue grama	5		-	Native	-
	Calamagrostis montanensis	plains reed grass	2		-	Native	-
	Carex duriuscula	low sedge	60		-	Native	-
	Erigeron caespitosus	tufted fleabane	1		-	Native	-
	Hesperostipa curtiseta	western porcupine grass	35		-	Native	-
	Liatris punctata	dotted blazingstar	1		-	Native	-
	Lupinus sericeus	silky perennial lupine	1		-	Native	-
	Lygodesmia juncea	skeletonweed	1		-	Native	-
	Oenothera suffrutescens	scarlet butterflyweed	1		-	Native	-
	Orthocarpus luteus	owl-clover	1		-	Native	-
	Poa pratensis	Kentucky bluegrass	35		-	Native	-
	Symphoricarpos occidentalis	buckbrush	15		-	Native	-
	Tragopogon dubius	common goat's-beard	1		-	Exotic	-
SITE 019	*Astragalus agrestis*	purple milk vetch	1	Thin Breaks - TB	-	Native	-
	Bromus inermis	smooth brome	85		-	Exotic	-
	Campanula rotundifolia	harebell	1		-	Native	-
	Cirsium arvense	Canada thistle	1		-	Exotic	Noxious
	Dasiphora fruticosa	shrubby cinquefoil	1		-	Native	-
	Galium boreale	northern bedstraw	1		-	Native	-
	Glycyrrhiza lepidota	wild licorice	2		-	Native	-
	Lactuca serriola	prickly lettuce	1		-	Exotic	-
	Linaria vulgaris	common toadflax	4		-	Exotic	Noxious

Survey Site	Latin Name	Common Name	% Cover	Vegetation Community	Track Status	Nativity	Weed Status
	Linum lewisii	wild blue flax	2		-	Native	-
	Maianthemum stellatum	star-flowered Solomon's-seal	1		-	Native	-
	Poa pratensis	Kentucky bluegrass	15		-	Native	-
	Rosa woodsii	common wild rose	5		-	Native	-
	Solidago altissima	tall goldenrod	1		-	Native	-
	Solidago missouriensis	low goldenrod	1		-	Native	-
	Sonchus arvensis	perennial sow-thistle	1		-	Exotic	Noxious
	Symphoricarpos occidentalis	buckbrush	10		-	Native	-
	Symphyotrichum falcatum	creeping white prairie aster	1		-	Native	-
	Tragopogon dubius	common goat's-beard	1		-	Exotic	-
SITE 020	*Bromus inermis*	smooth brome	10	Tame Pasture (Non-Irrigated) - PN	-	Exotic	-
	Dasiphora fruticosa	shrubby cinquefoil	1		-	Native	-
	Erucastrum gallicum	dog mustard	1		-	Exotic	-
	Hesperostipa curtiseta	western porcupine grass	1		-	Native	-
	Juncus balticus	wire rush	10		-	Native	-
	Lithospermum occidental	western false gromwel	2		T	Native	-
	Medicago lupulina	black medick	5		-	Exotic	-
	Medicago sativa	alfalfa	1		-	Exotic	-
	Phleum pratense	timothy	30		-	Exotic	-
	Plantago major	common plantain	1		-	Exotic	-
	Poa pratensis	Kentucky bluegrass	50		-	Native	-
	Ranunculus acris	tall buttercup	1		-	Exotic	Noxious
	Sonchus arvensis	perennial sow-thistle	1		-	Exotic	Noxious
	Symphoricarpos occidentalis	buckbrush	1		-	Native	-
	Taraxacum officinale	common dandelion	3		-	Exotic	-
	Thermopsis rhombifolia	golden bean	1		-	Native	-
	Trifolium pratense	red clover	5		-	Exotic	-
	Trifolium repens	white clover	35		-	Exotic	-
SITE 021	*Anemone multifida*	cut-leaved anemone	1	Thin Breaks - TB	-	Native	-
	Antennaria parvifolia	small-leaved everlasting	1		-	Native	-

Survey Site	Latin Name	Common Name	% Cover	Vegetation Community	Track Status	Nativity	Weed Status
	Apocynum androsaemifolium	spreading dogbane	3		-	Native	-
	Artemisia frigida	pasture sagewort	1		-	Native	-
	Bromus inermis	smooth brome	55		-	Exotic	-
	Campanula rotundifolia	harebell	1		-	Native	-
	Cirsium flodmanii	Flodman's thistle	1		-	Native	-
	Dalea purpurea	purple prairie-clover	1		-	Native	-
	Elaeagnus commutata	silverberry	5		-	Native	-
	Elymus lanceolatus	northern wheat grass	1		-	Native	-
	Erigeron caespitosus	tufted fleabane	1		-	Native	-
	Gaillardia aristata	gaillardia	1		-	Native	-
	Galium boreale	northern bedstraw	1		-	Native	-
	Glycyrrhiza lepidota	wild licorice	2		-	Native	-
	Helianthus nuttallii	common tall sunflower	1		-	Native	-
	Linum lewisii	wild blue flax	1		-	Native	-
	Maianthemum stellatum	star-flowered Solomon's-seal	1		-	Native	-
	Monarda fistulosa	wild bergamot	1		-	Native	-
	Oenothera suffrutescens	scarlet butterflyweed	1		-	Native	-
	Poa pratensis	Kentucky bluegrass	15		-	Native	-
	Solidago altissima	tall goldenrod	1		-	Native	-
	Solidago missouriensis	low goldenrod	1		-	Native	-
	Symphoricarpos occidentalis	buckbrush	3		-	Native	-
	Symphyotrichum falcatum	creeping white prairie aster	1		-	Native	-
	Thermopsis rhombifolia	golden bean	1		-	Native	-
SITE 022	*Achillea millefolium*	common yarrow	1	Thin Breaks - TB	-	Native	-
	Bromus inermis	smooth brome	5		-	Exotic	-
	Cirsium arvense	Canada thistle	2		-	Exotic	Noxious
	Medicago sativa	alfalfa	1		-	Exotic	-
	Pascopyrum smithii	western wheat grass	5		-	Native	-
	Poa pratensis	Kentucky bluegrass	85		-	Native	-
	Solidago altissima	tall goldenrod	1		-	Native	-

Survey Site	Latin Name	Common Name	% Cover	Vegetation Community	Track Status	Nativity	Weed Status
	Symphoricarpos occidentalis	buckbrush	15		-	Native	-
SITE 023	*Amelanchier alnifolia*	saskatoon	3	Thin Breaks - TB	-	Native	-
	Artemisia frigida	pasture sagewort	2		-	Native	-
	Astragalus bisulcatus	two-grooved milk vetch	1		-	Native	-
	Cirsium flodmanii	Flodman's thistle	1		-	Native	-
	Erigeron caespitosus	tufted fleabane	1		-	Native	-
	Hesperostipa curtiseta	western porcupine grass	15		-	Native	-
	Muhlenbergia cuspidata	plains muhly	20		-	Native	-
	Oenothera suffrutescens	scarlet butterflyweed	1		-	Native	-
	Prunus virginiana	choke cherry	5		-	Native	-
	Solidago missouriensis	low goldenrod	1		-	Native	-
	Tragopogon dubius	common goat's-beard	1		-	Exotic	-
SITE 024	*Achnatherum nelsonii* ssp. *dorei*	Columbia needle grass	10	Thin Breaks - TB	-	Native	-
	Amelanchier alnifolia	saskatoon	1		-	Native	-
	Apocynum androsaemifolium	spreading dogbane	30		-	Native	-
	Bromus inermis	smooth brome	35		-	Exotic	-
	Campanula rotundifolia	harebell	1		-	Native	-
	Cirsium arvense	Canada thistle	5		-	Exotic	Noxious
	Elaeagnus commutata	silverberry	1		-	Native	-
	Elymus trachycaulus ssp. *trachycaulus*	slender wheat grass	1		-	Native	-
	Equisetum pratense	meadow horsetail	1		-	Native	-
	Galium boreale	northern bedstraw	1		-	Native	-
	Helianthus nuttallii	common tall sunflower	1		-	Native	-
	Maianthemum stellatum	star-flowered Solomon's-seal	1		-	Native	-
	Monarda fistulosa	wild bergamot	1		-	Native	-
	Phleum pratense	timothy	2		-	Exotic	-
	Poa pratensis	Kentucky bluegrass	20		-	Native	-
	Populus balsamifera	balsam poplar	60		-	Native	-
	Ribes oxyacanthoides	northern gooseberry	1		-	Native	-

Survey Site	Latin Name	Common Name	% Cover	Vegetation Community	Track Status	Nativity	Weed Status
	Solidago gigantea	late goldenrod	10		-	Native	-
	Sonchus arvensis	perennial sow-thistle	1		-	Exotic	Noxious
	Vicia americana	wild vetch	1		-	Native	-
	Achnatherum nelsonii ssp. *dorei*	Columbia needle grass	35		-	Native	-
	Allium textile	prairie onion	1		-	Native	-
SITE 025	*Artemisia frigida*	pasture sagewort	1	Thin Breaks - TB	-	Native	-
	Bromus inermis	smooth brome	3		-	Exotic	-
	Cirsium flodmanii	Flodman's thistle	1		-	Native	-
	Glycyrrhiza lepidota	wild licorice	1		-	Native	-
	Gutierrezia sarothrae	broomweed	1		-	Native	-
	Linum lewisii	wild blue flax	1		-	Native	-
	Lithospermum occidental	western false gromwel	1		T	Native	-
	Pascopyrum smithii	western wheat grass	15		-	Native	-
	Poa pratensis	Kentucky bluegrass	5		-	Native	-
	Rosa acicularis	prickly rose	3		-	Native	-
	Solidago missouriensis	low goldenrod	2		-	Native	-
	Symphoricarpos occidentalis	buckbrush	1		-	Native	-
	Thermopsis rhombifolia	golden bean	1		-	Native	-
	Tragopogon dubius	common goat's-beard	1		-	Exotic	-
SITE 026	*Artemisia absinthium*	absinthe wormwood	1	Lotic (Herbaceous) - LtcH	-	Exotic	-
	Bromus inermis	smooth brome	40		-	Exotic	-
	Cirsium arvense	Canada thistle	1		-	Exotic	Noxious
	Symphoricarpos occidentalis	buckbrush	60		-	Native	-
SITE 027	*Achillea millefolium*	common yarrow	1	Lotic (Herbaceous) - LtcH	-	Native	-
	Artemisia absinthium	absinthe wormwood	15		-	Exotic	-
	Artemisia frigida	pasture sagewort	1		-	Native	-
	Bromus inermis	smooth brome	2		-	Exotic	-
	Erucastrum gallicum	dog mustard	5		-	Exotic	-
	Euphorbia esula	leafy spurge	1		-	Exotic	Noxious
	Glycyrrhiza lepidota	wild licorice	1		-	Native	-

Survey Site	Latin Name	Common Name	% Cover	Vegetation Community	Track Status	Nativity	Weed Status
	Hyoscyamus niger	black henbane	2		-	Exotic	Noxious
	Lappula squarrosa	bluebur	-		-	Exotic	-
	Medicago lupulina	black medick	1		-	Exotic	-
	Melilotus alba	white sweet-clover	1		-	Exotic	-
	Poa pratensis	Kentucky bluegrass	2		-	Native	-
	Populus balsamifera	balsam poplar	2		-	Native	-
	Sonchus arvensis	perennial sow-thistle	1		-	Exotic	Noxious
	Symphyotrichum puniceum var. puniceum	purple-stemmed aster	1		-	Native	-
	Tanacetum vulgare	common tansy	2		-	Exotic	Noxious
	Taraxacum officinale	common dandelion	1		-	Exotic	-
	Vicia americana	wild vetch	1		-	Native	-
SITE 028	*Allium textile*	prairie onion	1	Lotic (Deciduous) - LtcD	-	Native	-
	Amelanchier alnifolia	saskatoon	1		-	Native	-
	Bromus inermis	smooth brome	50		-	Exotic	-
	Campanula rotundifolia	harebell	1		-	Native	-
	Elaeagnus commutata	silverberry	5		-	Native	-
	Erigeron lonchophyllus	short-rayed fleabane	1		-	Native	-
	Galium aparine	cleavers	1		-	Exotic	-
	Galium boreale	northern bedstraw	3		-	Native	-
	Phleum pratense	timothy	1		-	Exotic	-
	Picea glauca	white spruce	1		-	Native	-
	Poa pratensis	Kentucky bluegrass	5		-	Native	-
	Populus balsamifera	balsam poplar	1		-	Native	-
	Populus tremuloides	aspen	80		-	Native	-
	Prosartes trachycarpa	fairybells	1		-	Native	-
	Prunus virginiana	choke cherry	1		-	Native	-
	Ribes oxyacanthoides	northern gooseberry	1		-	Native	-
	Rosa acicularis	prickly rose	1		-	Native	-
	Symphoricarpos occidentalis	buckbrush	15		-	Native	-
	Trifolium repens	white clover	1		-	Exotic	-

Survey Site	Latin Name	Common Name	% Cover	Vegetation Community	Track Status	Nativity	Weed Status
	Vicia americana	wild vetch	1		-	Native	-
SITE 029	*Achnatherum nelsonii* ssp. *dorei*	Columbia needle grass	10	Overflow - Ov	-	Native	-
	Achillea millefolium	common yarrow	1		-	Native	-
	Dasiphora fruticosa	shrubby cinquefoil	1		-	Native	-
	Hesperostipa curtiseta	western porcupine grass	10		-	Native	-
	Lithospermum occidental	western false gromwel	2		T	Native	-
	Monarda fistulosa	wild bergamot	1		-	Native	-
	Phleum pratense	timothy	1		-	Exotic	-
	Poa pratensis	Kentucky bluegrass	40		-	Native	-
	Solidago altissima	tall goldenrod	1		-	Native	-
	Symphoricarpos occidentalis	buckbrush	60		-	Native	-
	Tragopogon dubius	common goat's-beard	1		-	Exotic	-
SITE 030	*Achnatherum nelsonii* ssp. *dorei*	Columbia needle grass	10	Overflow - Ov	-	Native	-
	Achillea millefolium	common yarrow	1		-	Native	-
	Agoseris glauca	yellow false dandelion	1		-	Native	-
	Anemone cylindrica	long-fruited anemone	1		-	Native	-
	Cirsium flodmanii	Flodman's thistle	1		-	Native	-
	Erigeron glabellus	smooth fleabane	1		-	Native	-
	Gaillardia aristata	gaillardia	1		-	Native	-
	Hesperostipa curtiseta	western porcupine grass	5		-	Native	-
	Linaria vulgaris	common toadflax	10		-	Exotic	Noxious
	Linum lewisii	wild blue flax	1		-	Native	-
	Lithospermum occidental	western false gromwel	5		T	Native	-
	Oxytropis splendens	showy locoweed	2		-	Native	-
	Pascopyrum smithii	western wheat grass	5		-	Native	-
	Poa pratensis	Kentucky bluegrass	80		-	Native	-
	Solidago missouriensis	low goldenrod	1		-	Native	-
	Symphoricarpos occidentalis	buckbrush	5		-	Native	-
	Tragopogon dubius	common goat's-beard	1		-	Exotic	-
SITE 031	*Achillea millefolium*	common yarrow	1	Overflow - Ov	-	Native	-

Survey Site	Latin Name	Common Name	% Cover	Vegetation Community	Track Status	Nativity	Weed Status
	Cirsium flodmanii	Flodman's thistle	1		-	Native	-
	Dasiphora fruticosa	shrubby cinquefoil	2		-	Native	-
	Elaeagnus commutata	silverberry	65		-	Native	-
	Linaria vulgaris	common toadflax	15		-	Exotic	Noxious
	Monarda fistulosa	wild bergamot	1		-	Native	-
	Poa pratensis	Kentucky bluegrass	30		-	Native	-
	Solidago missouriensis	low goldenrod	1		-	Native	-
	Symphoricarpos occidentalis	buckbrush	5		-	Native	-
SITE 032	*Achillea millefolium*	common yarrow	2	Tame Pasture (Non-Irrigated) - PN	-	Native	-
	Anemone canadensis	Canada anemone	1		-	Native	-
	Antennaria parvifolia	small-leaved everlasting	1		-	Native	-
	Artemisia frigida	pasture sagewort	1		-	Native	-
	Astragalus agrestis	purple milk vetch	1		-	Native	-
	Bromus inermis	smooth brome	20		-	Exotic	-
	Cirsium arvense	Canada thistle	5		-	Exotic	Noxious
	Cirsium flodmanii	Flodman's thistle	1		-	Native	-
	Gaillardia aristata	gaillardia	1		-	Native	-
	Heterotheca villosa	golden aster	1		-	Native	-
	Medicago sativa	alfalfa	2		-	Exotic	-
	Melilotus officinalis	yellow sweet-clover	1		-	Exotic	-
	Phleum pratense	timothy	3		-	Exotic	-
	Poa pratensis	Kentucky bluegrass	65		-	Native	-
	Solidago altissima	tall goldenrod	1		-	Native	-
	Tragopogon dubius	common goat's-beard	1		-	Exotic	-
SITE 033	*Achillea millefolium*	common yarrow	1	Tame Pasture (Non-Irrigated) - PN	-	Native	-
	Anemone multifida	cut-leaved anemone	1		-	Native	-
	Antennaria parvifolia	small-leaved everlasting	1		-	Native	-
	Artemisia frigida	pasture sagewort	1		-	Native	-
	Bromus inermis	smooth brome	80		-	Exotic	-
	Cirsium flodmanii	Flodman's thistle	1		-	Native	-
	Drymocallis arguta	white cinquefoil	1		-	Native	-

Survey Site	Latin Name	Common Name	% Cover	Vegetation Community	Track Status	Nativity	Weed Status
	Glycyrrhiza lepidota	wild licorice	1		-	Native	-
	Heterotheca villosa	golden aster	1		-	Native	-
	Medicago sativa	alfalfa	1		-	Exotic	-
	Phleum pratense	timothy	1		-	Exotic	-
	Poa pratensis	Kentucky bluegrass	15		-	Native	-
	Rosa acicularis	prickly rose	1		-	Native	-
	Solidago altissima	tall goldenrod	1		-	Native	-
	Symphoricarpos occidentalis	buckbrush	1		-	Native	-
	Symphyotrichum ericoides	tufted white prairie aster	1		-	Native	-
	Tragopogon dubius	common goat's-beard	1		-	Exotic	-
	Vicia americana	wild vetch	1		-	Native	-
SITE 034	*Achnatherum nelsonii* ssp. *dorei*	Columbia needle grass	20	Thin Breaks - TB	-	Native	-
	Apocynum androsaemifolium	spreading dogbane	5		-	Native	-
	Artemisia frigida	pasture sagewort	3		-	Native	-
	Artemisia ludoviciana	prairie sagewort	3		-	Native	-
	Astragalus agrestis	purple milk vetch	1		-	Native	-
	Carex duriuscula	low sedge	20		-	Native	-
	Dalea purpurea	purple prairie-clover	3		-	Native	-
	Erigeron caespitosus	tufted fleabane	1		-	Native	-
	Festuca hallii	plains rough fescue	10		-	Native	-
	Glycyrrhiza lepidota	wild licorice	1		-	Native	-
	Heterotheca villosa	golden aster	2		-	Native	-
	Liatris punctata	dotted blazingstar	2		-	Native	-
	Linum lewisii	wild blue flax	1		-	Native	-
	Nassella viridula	green needle grass	45		-	Native	-
	Oenothera suffrutescens	scarlet butterflyweed	1		-	Native	-
	Pascopyrum smithii	western wheat grass	20		-	Native	-
	Physaria arenosa	great plains bladderpod	-		-	Native	-
	Rosa acicularis	prickly rose	1		-	Native	-
	Solidago altissima	tall goldenrod	1		-	Native	-

Survey Site	Latin Name	Common Name	% Cover	Vegetation Community	Track Status	Nativity	Weed Status
	Solidago missouriensis	low goldenrod	1		-	Native	-
	Symphyotrichum ericoides	tufted white prairie aster	1		-	Native	-
	Thermopsis rhombifolia	golden bean	2		-	Native	-
	Tragopogon dubius	common goat's-beard	1		-	Exotic	-
	Artemisia frigida	pasture sagewort	1		-	Native	-
	Astragalus agrestis	purple milk vetch	1		-	Native	-
	Bromus inermis	smooth brome	10		-	Exotic	-
SITE 035	*Medicago sativa*	alfalfa	1	Loamy - Lo	-	Exotic	-
	Poa pratensis	Kentucky bluegrass	80		-	Native	-
	Sphaeralcea coccinea	scarlet mallow	1		-	Native	-
	Symphoricarpos occidentalis	buckbrush	3		-	Native	-
	Tragopogon dubius	common goat's-beard	1		-	Exotic	-
SITE 036	*Bromus inermis*	smooth brome	80	Overflow - Ov	-	Exotic	-
	Cirsium arvense	Canada thistle	2		-	Exotic	Noxious
	Linaria vulgaris	common toadflax	3		-	Exotic	Noxious
	Lithospermum occidental	western false gromwel	5		T	Native	-
	Poa pratensis	Kentucky bluegrass	5		-	Native	-
	Ribes oxyacanthoides	northern gooseberry	1		-	Native	-
	Rosa acicularis	prickly rose	1		-	Native	-
	Symphoricarpos occidentalis	buckbrush	65		-	Native	-
SITE 037	*Achnatherum nelsonii* ssp. *dorei*	Columbia needle grass	10	Thin Breaks - TB	-	Native	-
	Artemisia ludoviciana	prairie sagewort	1		-	Native	-
	Astragalus agrestis	purple milk vetch	1		-	Native	-
	Bouteloua gracilis	blue grama	10		-	Native	-
	Festuca hallii	plains rough fescue	10		-	Native	-
	Liatris punctata	dotted blazingstar	1		-	Native	-
	Lygodesmia juncea	skeletonweed	2		-	Native	-
	Nassella viridula	green needle grass	60		-	Native	-
	Oenothera suffrutescens	scarlet butterflyweed	1		-	Native	-
	Pascopyrum smithii	western wheat grass	20		-	Native	-

Survey Site	Latin Name	Common Name	% Cover	Vegetation Community	Track Status	Nativity	Weed Status
	Solidago altissima	tall goldenrod	1		-	Native	-
	Sphaeralcea coccinea	scarlet mallow	5		-	Native	-
	Symphyotrichum ericoides	tufted white prairie aster	2		-	Native	-
	Thermopsis rhombifolia	golden bean	1		-	Native	-
	Tragopogon dubius	common goat's-beard	1		-	Exotic	-
SITE 038	*Artemisia absinthium*	absinthe wormwood	1	Lotic (Deciduous) - LtcD	-	Exotic	-
	Bromus inermis	smooth brome	80		-	Exotic	-
	Cirsium arvense	Canada thistle	1		-	Exotic	Noxious
	Galium boreale	northern bedstraw	1		-	Native	-
	Geranium bicknellii	Bicknell's geranium	1		-	Native	-
	Linaria vulgaris	common toadflax	2		-	Exotic	Noxious
	Phleum pratense	timothy	1		-	Exotic	-
	Populus balsamifera	balsam poplar	70		-	Native	-
	Prosartes trachycarpa	fairybells	1		-	Native	-
	Solidago altissima	tall goldenrod	1		-	Native	-
	Symphoricarpos occidentalis	buckbrush	2		-	Native	-
	Taraxacum officinale	common dandelion	1		-	Exotic	-
	Vicia americana	wild vetch	2		-	Native	-
SITE 039	*Apocynum androsaemifolium*	spreading dogbane	1	Thin Breaks - TB	-	Native	-
	Betula occidentalis	water birch	1		-	Native	-
	Bromus inermis	smooth brome	20		-	Exotic	-
	Campanula rotundifolia	harebell	1		-	Native	-
	Cirsium arvense	Canada thistle	20		-	Exotic	Noxious
	Equisetum pratense	meadow horsetail	10		-	Native	-
	Gaillardia aristata	gaillardia	1		-	Native	-
	Galium boreale	northern bedstraw	1		-	Native	-
	Glycyrrhiza lepidota	wild licorice	1		-	Native	-
	Juncus balticus	wire rush	1		-	Native	-
	Juniperus horizontalis	creeping juniper	1		-	Native	-
	Monarda fistulosa	wild bergamot	1		-	Native	-

Survey Site	Latin Name	Common Name	% Cover	Vegetation Community	Track Status	Nativity	Weed Status
	Nassella viridula	green needle grass	10		-	Native	-
	Phleum pratense	timothy	1		-	Exotic	-
	Poa pratensis	Kentucky bluegrass	3		-	Native	-
	Populus balsamifera	balsam poplar	60		-	Native	-
	Populus tremuloides	aspen	30		-	Native	-
	Prunus virginiana	choke cherry	3		-	Native	-
	Ribes oxyacanthoides	northern gooseberry	1		-	Native	-
	Shepherdia canadensis	Canada buffaloberry	5		-	Native	-
	Solidago altissima	tall goldenrod	1		-	Native	-
	Solidago missouriensis	low goldenrod	1		-	Native	-
	Sonchus arvensis	perennial sow-thistle	10		-	Exotic	Noxious
	Symphoricarpos occidentalis	buckbrush	10		-	Native	-
	Symphyotrichum laeve	smooth aster	1		-	Native	-
	Taraxacum officinale	common dandelion	1		-	Exotic	-

TABLE C-2 – WATERBODY SURVEY SITES

Survey Site	Latin Name	Common Name	% Cover	Vegetation Community	Track Status	Nativity	Weed Status
Waterbody Sites							
SITE 001	*Anthoxanthum hirtum*	sweet grass	1	Lotic Herbaceous - LtcH	-	Native	-
	Artemisia biennis	biennial sagewort	1		-	Native	-
	Bromus inermis	smooth brome	5		-	Exotic	-
	Carex aquatilis	water sedge	80		-	Native	-
	Carex atherodes	awned sedge	10		-	Native	-
	Carex pellita	woolly sedge	5		-	Native	-
	Carex praegracilis	graceful sedge	5		-	Native	-
	Carex sartwellii	Sartwell's sedge	30		-	Native	-
	Cirsium arvense	Canada thistle	1		-	Exotic	Noxious
	Equisetum arvense	common horsetail	5		-	Native	-
	Equisetum palustre	marsh horsetail	5		-	Native	-
	Hordeum jubatum	foxtail barley	1		-	Native	-
	Mentha arvensis	wild mint	1		-	Native	-
	Persicaria amphibia	water smartweed	2		-	Native	-
	Phalaris arundinacea	reed canary grass	1		-	Native	-
	Poa palustris	fowl bluegrass	3		-	Native	-
	Scirpus microcarpus	small-fruited bulrush	5		-	Native	-
	Sonchus arvensis	perennial sow-thistle	1		-	Exotic	Noxious
	Symphoricarpos occidentalis	buckbrush	2		-	Native	-
	Taraxacum officinale	common dandelion	2		-	Exotic	-
	Thlaspi arvense	stinkweed	1		-	Exotic	-
	Typha latifolia	common cattail	30		-	Native	-
	Urtica dioica	common nettle	2		-	Exotic	-
	Vicia americana	wild vetch	1		-	Native	-
SITE 002	*Achillea millefolium*	common yarrow	1	Lentic Seasonal - LenS / Seasonal Marsh (W02)	-	Native	-
	Anthoxanthum hirtum	sweet grass	5		-	Native	-
	Arctium lappa	great burdock	1		-	Exotic	Noxious
	Bromus inermis	smooth brome	5		-	Exotic	-
	Carex atherodes	awned sedge	75		-	Native	-

Survey Site	Latin Name	Common Name	% Cover	Vegetation Community	Track Status	Nativity	Weed Status
	Chenopodium album	lamb's-quarters	1		-	Exotic	-
	Cirsium arvense	Canada thistle	1		-	Exotic	Noxious
	Juncus balticus	wire rush	20		-	Native	-
	Linaria vulgaris	common toadflax	1		-	Exotic	Noxious
	Matricaria discoidea	pineappleweed	1		-	Exotic	-
	Mentha arvensis	wild mint	1		-	Native	-
	Persicaria amphibia	water smartweed	1		-	Native	-
	Polygonum arenastrum	prostrate knotweed	1		-	Exotic	-
	Phalaris arundinacea	reed canary grass	5		-	Native	-
	Plantago major	common plantain	1		-	Exotic	-
	Poa pratensis	Kentucky bluegrass	5		-	Native	-
	Ranunculus macounii	Macoun's buttercup	1		-	Native	-
	Rosa acicularis	prickly rose	1		-	Native	-
	Rumex occidentalis	western dock	1		-	Native	-
	Taraxacum officinale	common dandelion	1		-	Exotic	-
	Thlaspi arvense	stinkweed	1		-	Exotic	-
	Trifolium repens	white clover	1		-	Exotic	-
SITE 003	*Alopecurus aequalis*	short-awned foxtail	2	Lentic Seasonal - LenS / Seasonal Marsh (W03)	-	Native	-
	Bromus inermis	smooth brome	15		-	Exotic	-
	Carex atherodes	awned sedge	85		-	Native	-
	Chenopodium album	lamb's-quarters	1		-	Exotic	-
	Cirsium arvense	Canada thistle	1		-	Exotic	Noxious
	Erucastrum gallicum	dog mustard	1		-	Exotic	-
	Persicaria amphibia	water smartweed	2		-	Native	-
	Polygonum arenastrum	prostrate knotweed	1		-	Exotic	-
	Phalaris arundinacea	reed canary grass	5		-	Native	-
	Plantago major	common plantain	1		-	Exotic	-
	Poa pratensis	Kentucky bluegrass	10		-	Native	-
	Potentilla anserina	silverweed	2		-	Native	-
	Ranunculus macounii	Macoun's buttercup	3		-	Native	-
	Trifolium repens	white clover	1		-	Exotic	-

Survey Site	Latin Name	Common Name	% Cover	Vegetation Community	Track Status	Nativity	Weed Status
SITE 004	*Alopecurus aequalis*	short-awned foxtail	5	Lentic Seasonal - LenS / Seasonal Marsh (W04)	-	Native	-
	Bromus inermis	smooth brome	30		-	Exotic	-
	Carex atherodes	awned sedge	30		-	Native	-
	Eleocharis palustris	creeping spike-rush	2		-	Native	-
	Persicaria amphibia	water smartweed	20		-	Native	-
	Polygonum arenastrum	prostrate knotweed	3		-	Exotic	-
SITE 005	*Bromus inermis*	smooth brome	1	Lentic Temporary - LenT Temporary Marsh (W05)	-	Exotic	-
	Carex atherodes	awned sedge	50		-	Native	-
	Cirsium arvense	Canada thistle	1		-	Exotic	Noxious
	Polygonum arenastrum	prostrate knotweed	1		-	Exotic	-
	Poa pratensis	Kentucky bluegrass	60		-	Native	-
	Taraxacum officinale	common dandelion	1		-	Exotic	-
	Trifolium repens	white clover	1		-	Exotic	-
SITE 006	*Bromus inermis*	smooth brome	10	Lentic Temporary - LenT Temporary Marsh (W06)	-	Exotic	-
	Carex atherodes	awned sedge	70		-	Native	-
	Polygonum arenastrum	prostrate knotweed	1		-	Exotic	-
	Phalaris arundinacea	reed canary grass	15		-	Native	-
	Poa pratensis	Kentucky bluegrass	10		-	Native	-
	Taraxacum officinale	common dandelion	1		-	Exotic	-
SITE 007	*Alopecurus aequalis*	short-awned foxtail	3	Lentic Temporary - LenT Temporary Marsh (W07)	-	Native	-
	Bromus inermis	smooth brome	5		-	Exotic	-
	Carex atherodes	awned sedge	75		-	Native	-
	Persicaria amphibia	water smartweed	2		-	Native	-
	Poa pratensis	Kentucky bluegrass	2		-	Native	-
SITE 008	*Bromus inermis*	smooth brome	10	Lentic Seasonal - LenS / Seasonal Marsh (W08)	-	Exotic	-
	Carex atherodes	awned sedge	80		-	Native	-
	Chenopodium album	lamb's-quarters	1		-	Exotic	-
	Juncus balticus	wire rush	10		-	Native	-
	Polygonum arenastrum	prostrate knotweed	1		-	Exotic	-
	Poa pratensis	Kentucky bluegrass	10		-	Native	-
SITE 009	*Alopecurus aequalis*	short-awned foxtail	25		-	Native	-

Survey Site	Latin Name	Common Name	% Cover	Vegetation Community	Track Status	Nativity	Weed Status
	Beckmannia syzigachne	slough grass	5	Lentic Seasonal - LenS / Seasonal Marsh (W09)	-	Native	-
	Bromus inermis	smooth brome	20		-	Exotic	-
	Carex atherodes	awned sedge	60		-	Native	-
	Persicaria amphibia	water smartweed	1		-	Native	-
	Polygonum arenastrum	prostrate knotweed	2		-	Exotic	-
	Phalaris arundinacea	reed canary grass	5		-	Native	-
	Poa pratensis	Kentucky bluegrass	25		-	Native	-
	Ranunculus macounii	Macoun's buttercup	1		-	Native	-
SITE 010	*Bromus inermis*	smooth brome	25	Lentic Temporary - LenT Temporary Marsh (W10)	-	Exotic	-
	Carex atherodes	awned sedge	20		-	Native	-
	Polygonum arenastrum	prostrate knotweed	1		-	Exotic	-
	Poa pratensis	Kentucky bluegrass	20		-	Native	-
SITE 011	*Bromus inermis*	smooth brome	20	Lentic Temporary - LenT Temporary Marsh (W11)	-	Exotic	-
	Carex atherodes	awned sedge	60		-	Native	-
	Persicaria amphibia	water smartweed	1		-	Native	-
	Polygonum arenastrum	prostrate knotweed	1		-	Exotic	-
	Poa pratensis	Kentucky bluegrass	10		-	Native	-
SITE 012	*Bromus inermis*	smooth brome	30	Lentic Temporary - LenT Temporary Marsh (W12)	-	Exotic	-
	Carex atherodes	awned sedge	10		-	Native	-
	Persicaria amphibia	water smartweed	10		-	Native	-
	Phalaris arundinacea	reed canary grass	10		-	Native	-
SITE 013	*Bromus inermis*	smooth brome	5	Lentic Seasonal - LenS / Seasonal Marsh (W01)	-	Exotic	-
	Carex atherodes	awned sedge	5		-	Native	-
	Carex pellita	woolly sedge	5		-	Native	-
	Eleocharis palustris	creeping spike-rush	1		-	Native	-
	Persicaria amphibia	water smartweed	1		-	Native	-
	Persicaria amphibia var. emersa	water smartweed	1		-	Native	-
	Poa pratensis	Kentucky bluegrass	5		-	Native	-
SITE 014	*Bromus inermis*	smooth brome	40	Lentic Temporary - LenT Temporary Marsh	-	Exotic	-
	Carex atherodes	awned sedge	5		-	Native	-

Survey Site	Latin Name	Common Name	% Cover	Vegetation Community	Track Status	Nativity	Weed Status
	Persicaria amphibia var. emersa	water smartweed	1	(W13)	-	Native	-
	Phalaris arundinacea	reed canary grass	5		-	Native	-
	Poa pratensis	Kentucky bluegrass	20		-	Native	-
	Taraxacum officinale	common dandelion	1		-	Exotic	-
SITE 015	*Alopecurus aequalis*	short-awned foxtail	3	Lentic Temporary - LenT Temporary Marsh (W14)	-	Native	-
	Carex atherodes	awned sedge	5		-	Native	-
	Chenopodium album	lamb's-quarters	5		-	Exotic	-
	Persicaria amphibia	water smartweed	1		-	Native	-
	Persicaria amphibia var. emersa	water smartweed	1		-	Native	-
	Phalaris arundinacea	reed canary grass	15		-	Native	-
	Polygonum arenastrum	common knotweed	1		-	Native	-
SITE 016	*Carex atherodes*	awned sedge	5	Lentic Temporary - LenT Temporary Marsh (W15)	-	Native	-
	Chenopodium album	lamb's-quarters	1		-	Exotic	-
	Monolepis nuttalliana	spear-leaved goosefoot	1		-	Native	-
	Persicaria amphibia	water smartweed	1		-	Native	-
	Persicaria amphibia var. emersa	water smartweed	1		-	Native	-
	Phalaris arundinacea	reed canary grass	75		-	Native	-
	Poa pratensis	Kentucky bluegrass	10		-	Native	-
	Polygonum arenastrum	common knotweed	1		-	Native	-
	Tragopogon dubius	common goat's-beard	1		-	Exotic	-
SITE 017	*Bromus inermis*	smooth brome	10	Lentic Temporary - LenT Temporary Marsh (W16)	-	Exotic	-
	Carex atherodes	awned sedge	5		-	Native	-
	Chenopodium album	lamb's-quarters	1		-	Exotic	-
	Monolepis nuttalliana	spear-leaved goosefoot	1		-	Native	-
	Persicaria amphibia	water smartweed	5		-	Native	-
	Phalaris arundinacea	reed canary grass	40		-	Native	-
	Poa pratensis	Kentucky bluegrass	10		-	Native	-
	Polygonum arenastrum	common knotweed	1		-	Exotic	-
	Ranunculus macounii	Macoun's buttercup	1		-	Native	-
	Taraxacum officinale	common dandelion	1		-	Exotic	-

Survey Site	Latin Name	Common Name	% Cover	Vegetation Community	Track Status	Nativity	Weed Status
SITE 018	*Bromus inermis*	smooth brome	15	Lentic Temporary - LenT Temporary Marsh (W17)	-	Exotic	-
	Carex atherodes	awned sedge	15		-	Native	-
	Persicaria amphibia var. emersa	water smartweed	1		-	Native	-
	Phalaris arundinacea	reed canary grass	10		-	Native	-
	Poa pratensis	Kentucky bluegrass	75		-	Native	-
	Taraxacum officinale	common dandelion	1		-	Exotic	-
SITE 019	*Bromus inermis*	smooth brome	40	Lentic Temporary - LenT Temporary Marsh (W18)	-	Exotic	-
	Carex atherodes	awned sedge	5		-	Native	-
	Phalaris arundinacea	reed canary grass	20		-	Native	-
	Poa pratensis	Kentucky bluegrass	15		-	Native	-
	Taraxacum officinale	common dandelion	1		-	Exotic	-
SITE 020	*Bromus inermis*	smooth brome	5	Lentic Temporary - LenT Temporary Marsh (W19)	-	Exotic	-
	Carex atherodes	awned sedge	2		-	Native	-
	Phalaris arundinacea	reed canary grass	90		-	Native	-
	Poa pratensis	Kentucky bluegrass	5		-	Native	-
SITE 021	*Bromus inermis*	smooth brome	5	Lentic Temporary - LenT Temporary Marsh (W20)	-	Exotic	-
	Carex atherodes	awned sedge	2		-	Native	-
	Phalaris arundinacea	reed canary grass	90		-	Native	-
	Poa pratensis	Kentucky bluegrass	5		-	Native	-
SITE 023	*Alopecurus aequalis*	short-awned foxtail	10	Lentic Seasonal - LenS / Seasonal Slope Marsh (W26S)	-	Native	-
	Beckmannia syzigachne	slough grass	1		-	Native	-
	Betula occidentalis	water birch	1		-	Native	-
	Bromus inermis	smooth brome	3		-	Exotic	-
	Carex pellita	woolly sedge	20		-	Native	-
	Cirsium arvense	Canada thistle	1		-	Exotic	Noxious
	Elaeagnus commutata	silverberry	1		-	Native	-
	Eleocharis palustris	creeping spike-rush	15		-	Native	-
	Equisetum palustre	marsh horsetail	5		-	Native	-
	Glyceria striata	fowl manna grass	5		-	Native	-
	Glycyrrhiza lepidota	wild licorice	1		-	Native	-

Survey Site	Latin Name	Common Name	% Cover	Vegetation Community	Track Status	Nativity	Weed Status
	Juncus balticus	wire rush	40		-	Native	-
	Maianthemum stellatum	star-flowered Solomon's-seal	1		-	Native	-
	Mentha arvensis	wild mint	1		-	Native	-
	Plantago major	common plantain	1		-	Exotic	-
	Platanthera hyperborea	northern green orchid	1		-	Native	-
	Poa palustris	fowl bluegrass	30		-	Native	-
	Potentilla anserina	silverweed	2		-	Native	-
	Primula pauciflora	darkthroat shootingstar	1		-	Native	-
	Ranunculus sceleratus	celery-leaved buttercup	1		-	Native	-
	Salix sp.	willow sp.	17		-	Native	-
	Solidago gigantea	late goldenrod	1		-	Native	-
	Sonchus arvensis	perennial sow-thistle	5		-	Exotic	Noxious
	Urtica dioica	common nettle	1		-	Native	-
	Vicia americana	wild vetch	1		-	Native	-
	Viola nephrophylla	bog violet	1		-	Native	-
	Zizia aptera	heart-leaved Alexanders	1		-	Native	-
SITE 024	*Carex aquatilis*	water sedge	30	Lentic Seasonal - LenS / Seasonal Slope Marsh (W27S)	-	Native	-
	Carex pellita	woolly sedge	15		-	Native	-
	Elaeagnus commutata	silverberry	1		-	Native	-
	Glyceria striata	fowl manna grass	5		-	Native	-
	Juncus balticus	wire rush	20		-	Native	-
	Poa palustris	fowl bluegrass	10		-	Native	-
	Ranunculus sceleratus	celery-leaved buttercup	1		-	Native	-
	Salix sp.	willow sp.	1		-	Native	-
	Sonchus arvensis	perennial sow-thistle	2		-	Exotic	Noxious
	Viola nephrophylla	bog violet	1		-	Native	-
SITE 025	*Alopecurus aequalis*	short-awned foxtail	5	Lentic Seasonal - LenS / Seasonal Slope Marsh (W28S)	-	Native	-
	Betula occidentalis	water birch	10		-	Native	-
	Carex pellita	woolly sedge	15		-	Native	-
	Elaeagnus commutata	silverberry	2		-	Native	-

Survey Site	Latin Name	Common Name	% Cover	Vegetation Community	Track Status	Nativity	Weed Status
	Eleocharis palustris	creeping spike-rush	10		-	Native	-
	Glyceria striata	fowl manna grass	30		-	Native	-
	Juncus balticus	wire rush	10		-	Native	-
	Pedicularis groenlandica	elephant's-head	1		-	Native	-
	Potentilla anserina	silverweed	1		-	Native	-
	Primula pauciflora	darkthroat shootingstar	2		-	Native	-
	Ranunculus cymbalaria	seaside buttercup	1		-	Native	-
	Salix sp.	willow sp.	1		-	Native	-
	Schoenoplectus tabernaemontani	common great bulrush	15		-	Native	-
	Sonchus arvensis	perennial sow-thistle	2		-	Exotic	Noxious
	Viola nephrophylla	bog violet	1		-	Native	-
SITE 026	*Alopecurus aequalis*	short-awned foxtail	1	Lentic (Open Water) / Anthropogenic Pond A01	-	Native	-
	Artemisia ludoviciana	prairie sagewort	1		-	Native	-
	Cirsium arvense	Canada thistle	1		-	Exotic	Noxious
	Descurainia sophia	flixweed	1		-	Exotic	-
	Elaeagnus commutata	silverberry	1		-	Native	-
	Eleocharis palustris	creeping spike-rush	1		-	Native	-
	Juncus balticus	wire rush	1		-	Native	-
	Juncus bufonius	toad rush	10		-	Native	-
	Lappula squarrosa	bluebur	1		-	Exotic	-
	Phalaris arundinacea	reed canary grass	1		-	Native	-
	Plantago major	common plantain	1		-	Exotic	-
	Poa palustris	fowl bluegrass	10		-	Native	-
	Potentilla anserina	silverweed	1		-	Native	-
	Ranunculus cymbalaria	seaside buttercup	1		-	Native	-
	Rumex crispus	curled dock	1		-	Exotic	-
	Sonchus arvensis	perennial sow-thistle	1		-	Exotic	Noxious
	Thlaspi arvense	stinkweed	3		-	Exotic	-
	Trifolium repens	white clover	1		-	Exotic	-
	Urtica dioica	common nettle	1		-	Native	-

Survey Site	Latin Name	Common Name	% Cover	Vegetation Community	Track Status	Nativity	Weed Status
SITE 027	*Bromus inermis*	smooth brome	10	Lentic Seasonal - LenS / Seasonal Slope Marsh (W29S)	-	Exotic	-
	Carex atherodes	awned sedge	10		-	Native	-
	Carex pellita	woolly sedge	40		-	Native	-
	Carex rostrata	beaked sedge	20		-	Native	-
	Elymus trachycaulus ssp. trachycaulus	slender wheat grass	1		-	Native	-
	Juncus balticus	wire rush	10		-	Native	-
	Mentha arvensis	wild mint	1		-	Native	-
	Poa palustris	fowl bluegrass	20		-	Native	-
	Potentilla anserina	silverweed	1		-	Native	-
	Salix exigua	narrow-leaf willow	1		-	Native	-
	Sonchus arvensis	perennial sow-thistle	1		-	Exotic	Noxious
	Triglochin palustris	slender arrow-grass	1		-	Native	-
SITE 028	*Anemone canadensis*	Canada anemone	1	Lentic Seasonal - LenS / Seasonal Slope Marsh (W29S)	-	Native	-
	Betula occidentalis	water birch	1		-	Native	-
	Carex pellita	woolly sedge	5		-	Native	-
	Cirsium arvense	Canada thistle	1		-	Exotic	Noxious
	Dasiphora fruticosa	shrubby cinquefoil	2		-	Native	-
	Elaeagnus commutata	silverberry	1		-	Native	-
	Equisetum palustre	marsh horsetail	2		-	Native	-
	Juncus balticus	wire rush	80		-	Native	-
	Maianthemum stellatum	star-flowered Solomon's-seal	1		-	Native	-
	Mentha arvensis	wild mint	1		-	Native	-
	Phleum pratense	timothy	1		-	Exotic	-
	Platanthera hyperborea	northern green orchid	1		-	Native	-
	Poa palustris	fowl bluegrass	15		-	Native	-
	Primula pauciflora	darkthroat shootingstar	1		-	Native	-
	Ranunculus cymbalaria	seaside buttercup	1		-	Native	-
	Ranunculus sceleratus	celery-leaved buttercup	1		-	Native	-
	Rosa acicularis	prickly rose	1		-	Native	-
	Sonchus arvensis	perennial sow-thistle	1		-	Exotic	Noxious

Survey Site	Latin Name	Common Name	% Cover	Vegetation Community	Track Status	Nativity	Weed Status
	Taraxacum officinale	common dandelion	1		-	Exotic	-
	Zizia aptera	heart-leaved Alexanders	1		-	Native	-
	Carex atherodes	awned sedge	5		-	Native	-
SITE 029	*Carex pellita*	woolly sedge	15	Lentic (Open Water) / Anthropogenic Pond A03	-	Native	-
	Cirsium arvense	Canada thistle	1		-	Exotic	Noxious
	Juncus balticus	wire rush	40		-	Native	-
	Phalaris arundinacea	reed canary grass	10		-	Native	-
	Poa pratensis	Kentucky bluegrass	15		-	Native	-
	Sonchus arvensis	perennial sow-thistle	1		-	Exotic	Noxious
	Tanacetum vulgare	common tansy	15		-	Exotic	Noxious
	Taraxacum officinale	common dandelion	1		-	Exotic	-
	Typha latifolia	common cattail	15		-	Native	-
SITE 030	*Carex atherodes*	awned sedge	10	Lentic Seasonal - LenS / Seasonal Marsh (W32)	-	Native	-
	Carex pellita	woolly sedge	40		-	Native	-
	Carex utriculata	small bottle sedge	5		-	Native	-
	Cirsium arvense	creeping thistle	1		-	Exotic	Noxious
	Eleocharis acicularis	needle spike-rush	3		-	Native	-
	Juncus balticus	wire rush	60		-	Native	-
	Medicago lupulina	black medick	1		-	Exotic	-
	Phleum pratense	timothy	3		-	Exotic	-
	Plantago major	common plantain	1		-	Exotic	-
	Poa palustris	fowl bluegrass	30		-	Native	-
	Ranunculus acris	tall buttercup	1		-	Exotic	Noxious
	Sonchus arvensis	perennial sow-thistle	1		-	Exotic	Noxious
	Taraxacum officinale	common dandelion	2		-	Exotic	-
	Trifolium repens	white clover	3		-	Exotic	-
	Vicia americana	wild vetch	1		-	Native	-
SITE 031	*Betula occidentalis*	water birch	2	Lentic Seasonal - LenS / Seasonal Slope Marsh (W21S)	-	Native	-
	Bromus inermis	smooth brome	5		-	Exotic	-
	Carex aurea	golden sedge	1		-	Native	-
	Carex viridula	green sedge	5		-	Native	-

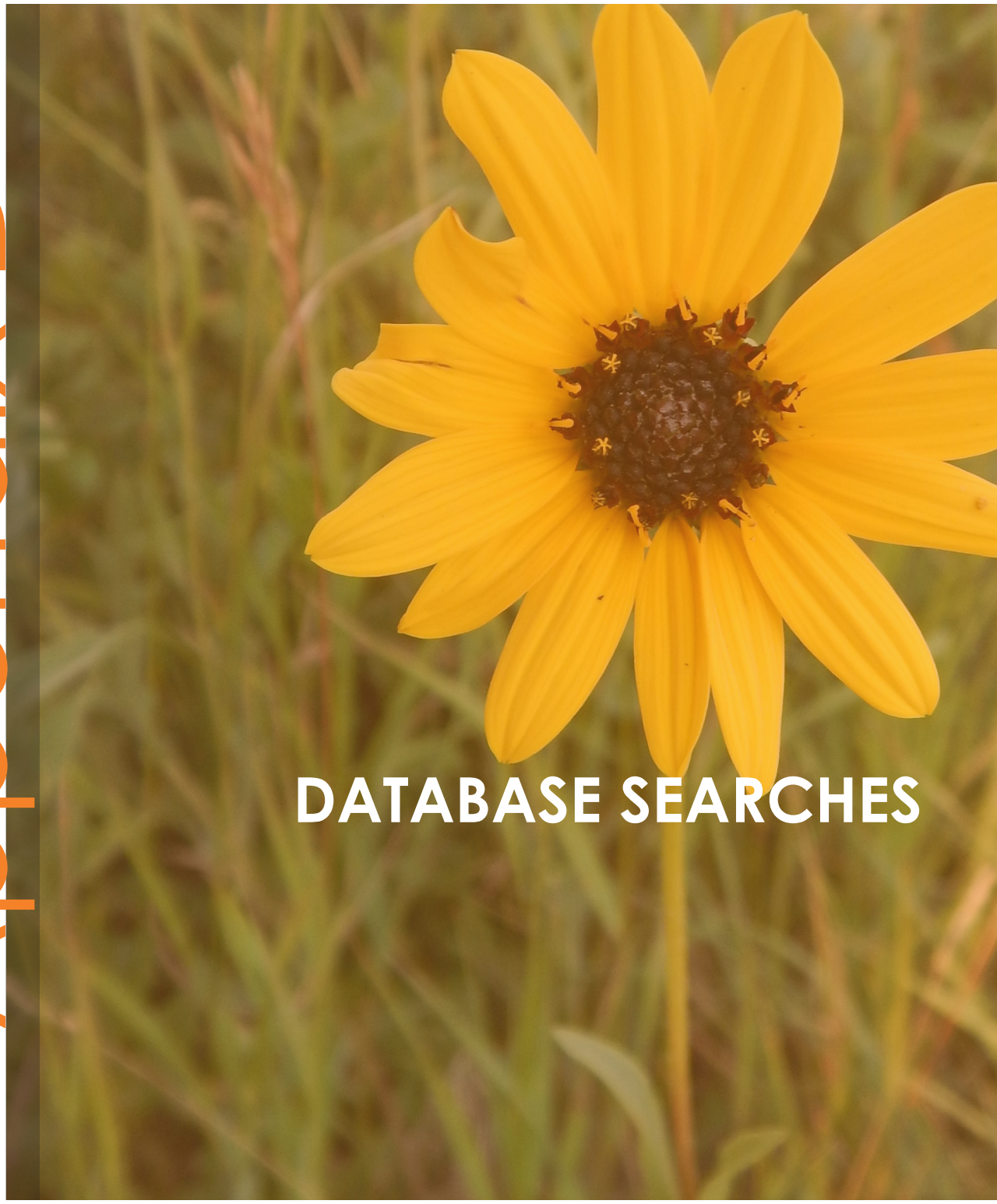
Survey Site	Latin Name	Common Name	% Cover	Vegetation Community	Track Status	Nativity	Weed Status
	Carex pellita	woolly sedge	10		-	Native	-
	Dasiphora fruticosa	shrubby cinquefoil	1		-	Native	-
	Elaeagnus commutata	silverberry	5		-	Native	-
	Eleocharis acicularis	needle spike-rush	20		-	Native	-
	Equisetum palustre	marsh horsetail	5		-	Native	-
	Juncus balticus	wire rush	20		-	Native	-
	Juncus bufonius	toad rush	5		-	Native	-
	Mentha arvensis	wild mint	1		-	Native	-
	Platanthera hyperborea	northern green orchid	1		-	Native	-
	Potentilla anserina	silverweed	1		-	Native	-
	Salix sp.	willow sp.	1		-	Native	-
	Schoenoplectus acutus	great bulrush	20		-	Native	-
	Triglochin maritima	seaside arrow-grass	1		-	Native	-
	Triglochin palustris	slender arrow-grass	1		-	Native	-
	Viola nephrophylla	bog violet	1		-	Native	-
SITE 032	*Alopecurus aequalis*	short-awned foxtail	1	Lentic Seasonal - LenS / Seasonal Slope Marsh (W22S)	-	Native	-
	Betula occidentalis	water birch	1		-	Native	-
	Carex aquatilis	water sedge	15		-	Native	-
	Carex aurea	golden sedge	2		-	Native	-
	Carex pellita	woolly sedge	5		-	Native	-
	Carex praegracilis	graceful sedge	5		-	Native	-
	Dasiphora fruticosa	shrubby cinquefoil	1		-	Native	-
	Eleocharis acicularis	needle spike-rush	5		-	Native	-
	Equisetum palustre	marsh horsetail	1		-	Native	-
	Glyceria striata	fowl manna grass	5		-	Native	-
	Juncus alpinoarticulatus	alpine rush	2		-	Native	-
	Juncus balticus	wire rush	25		-	Native	-
	Juncus nodosus	knotted rush	2		-	Native	-
	Oenothera biennis	yellow evening-primrose	1		-	Native	-
	Poa palustris	fowl bluegrass	5		-	Native	-
	Potentilla anserina	silverweed	1		-	Native	-

Survey Site	Latin Name	Common Name	% Cover	Vegetation Community	Track Status	Nativity	Weed Status
	Salix sp.	willow sp.	1		-	Native	-
	Schoenoplectus acutus var. acutus	great bulrush	30		-	Native	-
	Sium suave	water parsnip	1		-	Native	-
	Sonchus arvensis	perennial sow-thistle	1		-	Exotic	Noxious
	Triglochin palustris	slender arrow-grass	1		-	Native	-
	Viola nephrophylla	bog violet	1		-	Native	-
	Zizia aptera	heart-leaved Alexanders	1		-	Native	-
	Betula occidentalis	water birch	1		-	Native	-
	Carex aquatilis	water sedge	15		-	Native	-
	Carex aurea	golden sedge	3		-	Native	-
	Carex pellita	woolly sedge	15		-	Native	-
	Carex praegracilis	graceful sedge	10		-	Native	-
	Dasiphora fruticosa	shrubby cinquefoil	1		-	Native	-
SITE 033	*Glyceria striata*	fowl manna grass	1	Lentic Seasonal - LenS / Seasonal Slope Marsh (W23S)	-	Native	-
	Juncus alpinoarticulatus	alpine rush	2		-	Native	-
	Juncus balticus	wire rush	20		-	Native	-
	Juncus nodosus	knotted rush	5		-	Native	-
	Phalaris arundinacea	reed canary grass	5		-	Native	-
	Poa palustris	fowl bluegrass	15		-	Native	-
	Ribes oxyacanthoides	northern gooseberry	1		-	Native	-
	Salix sp.	willow sp.	1		-	Native	-
	Schoenoplectus acutus	great bulrush	5		-	Native	-
	Sium suave	water parsnip	1		-	Native	-
	Solidago gigantea	late goldenrod	1		-	Native	-
	Sonchus arvensis	perennial sow-thistle	1		-	Exotic	Noxious
	Triglochin palustris	slender arrow-grass	1		-	Native	-
SITE 036	*Betula occidentalis*	water birch	8	Lentic Seasonal - LenS / Seasonal Slope Marsh (W33S)	-	Native	-
	Carex aquatilis	water sedge	10		-	Native	-
	Carex aurea	golden sedge	3		-	Native	-
	Carex pellita	woolly sedge	5		-	Native	-

Survey Site	Latin Name	Common Name	% Cover	Vegetation Community	Track Status	Nativity	Weed Status
	Carex utriculata	small bottle sedge	40		-	Native	-
	Cirsium arvense	Canada thistle	1		-	Exotic	Noxious
	Cornus stolonifera	red-osier dogwood	15		-	Native	-
	Eleocharis palustris	creeping spike-rush	3		-	Native	-
	Equisetum pratense	meadow horsetail	4		-	Native	-
	Glyceria striata	fowl manna grass	2		-	Native	-
	Maianthemum stellatum	star-flowered Solomon's-seal	1		-	Native	-
	Mentha arvensis	wild mint	3		-	Native	-
	Poa pratensis	Kentucky bluegrass	2		-	Native	-
	Ranunculus macounii	Macoun's buttercup	1		-	Native	-
	Ribes oxyacanthoides	northern gooseberry	3		-	Native	-
	Rosa arkansana	prairie rose	1		-	Native	-
	Rubus idaeus	wild red raspberry	1		-	Native	-
	Solidago gigantea	late goldenrod	1		-	Native	-
	Sonchus arvensis	perennial sow-thistle	1		-	Exotic	Noxious
	Typha latifolia	common cattail	70		-	Native	-
	Urtica dioica	common nettle	1		-	Native	-
	Viola nephrophylla	bog violet	1		-	Native	-
SITE 037	*Actaea rubra*	red and white baneberry	1	Lentic Temporary - LenT / Temporary Slope Marsh (W38S)	-	Native	-
	Amelanchier alnifolia	saskatoon	1		-	Native	-
	Anemone canadensis	Canada anemone	1		-	Native	-
	Arctium lappa	great burdock	1		-	Exotic	Noxious
	Betula occidentalis	water birch	1		-	Native	-
	Calamagrostis stricata spp. inexpansa	northern reed grass	5		-	Native	-
	Carex pellita	woolly sedge	10		-	Native	-
	Cirsium arvense	creeping thistle	2		-	Exotic	Noxious
	Cornus stolonifera	red-osier dogwood	2		-	Native	-
	Dasiphora fruticosa	shrubby cinquefoil	1		-	Native	-
	Equisetum arvense	common horsetail	5		-	Native	-
	Galeopsis tetrahit	hemp-nettle	2		-	Exotic	-

Survey Site	Latin Name	Common Name	% Cover	Vegetation Community	Track Status	Nativity	Weed Status
	Galium boreale	northern bedstraw	1		-	Native	-
	Hordeum jubatum	foxtail barley	1		-	Native	-
	Juncus balticus	wire rush	1		-	Native	-
	Lappula occidentalis	western bluebur	1		-	Native	-
	Linaria vulgaris	common toadflax	3		-	Exotic	Noxious
	Maianthemum stellatum	star-flowered Solomon's-seal	1		-	Native	-
	Mentha arvensis	wild mint	1		-	Native	-
	Phleum pratense	timothy	1		-	Exotic	-
	Poa pratensis	Kentucky bluegrass	4		-	Native	-
	Prunus pensylvanica	pin cherry	1		-	Native	-
	Prunus virginiana	choke cherry	3		-	Native	-
	Ribes oxyacanthoides	northern gooseberry	1		-	Native	-
	Rosa woodsii	common wild rose	1		-	Native	-
	Rubus idaeus	wild red raspberry	1		-	Native	-
	Salix bebbiana	beaked willow	8		-	Native	-
	Sonchus arvensis	perennial sow-thistle	1		-	Exotic	Noxious
	Symphoricarpos occidentalis	buckbrush	2		-	Native	-
	Taraxacum officinale	common dandelion	1		-	Exotic	-
	Thalictrum venulosum	veiny meadow rue	1		-	Native	-
	Urtica dioica	common nettle	1		-	Native	-
	Viola nephrophylla	bog violet	1		-	Native	-

Appendix D



DATABASE SEARCHES

Search ACIMS Data

Date: 11/7/2017
Requestor: Consultant
Reason for Request: Element Occurrence Search
SEC: 10 **TWP:** 022 **RGE:** 29 **MER:** 4

Alberta Parks

Non-sensitive EOs: 3 (*Data Updated:July 2015*)

M-RR-TTT-SS	EO_ID	ECODE	S_RANK	SNAME	SCOMNAME	LAST_OBS_D
4-29-022-10	23039	PDBOR0S030	S3	Lithospermum occidentale	western false gromwell	20-Sep-13
4-29-022-10	24424	PDBRA27080	S3	Rorippa curvipes	blunt-leaved watercress	12-Sep-06
4-29-022-10	23750	PDBOR0S030	S3	Lithospermum occidentale	western false gromwell	8-Jul-06

Next Steps: See FAQ

Sensitive EOs: 0 (*Data Updated:July 2015*)

M-RR-TTT	EO_ID	ECODE	S_RANK	SNAME	SCOMNAME	LAST_OBS_D

No Sensitive EOs Found: Next Steps - See FAQ

Protected Areas: 0 (*Data Updated:May 2015*)

M-RR-TTT-SS	PROTECTED AREA NAME	TYPE	IUCN

No Protected Areas Found

Crown Reservations/Notations: 0 (*Data Updated:May 2015*)

M-RR-TTT-SS	NAME	TYPE

No Crown Reservations/Notations Found

.

Fish and Wildlife Internet Mapping Tool (FWIMT)

(source database: Fish and Wildlife Management Information System (FWMIS))

Species Summary Report

Report Created: 2-Mar-2018 13:15

Species present within the current extent :

Fish Inventory	Wildlife Inventory	Stocked Inventory
BROOK STICKLEBACK	ALDER FLYCATCHER	RAINBOW TROUT
BROOK TROUT	AMERICAN BITTERN	
BROWN TROUT	AMERICAN KESTREL	
BULL TROUT	AMERICAN WHITE PELICAN	
BURBOT	BAIRD'S SPARROW	
CUTTHROAT TROUT X RAINBOW TF	BALD EAGLE	
FATHEAD MINNOW	BALTIMORE ORIOLE	
LAKE CHUB	BANK SWALLOW	
LONGNOSE DACE	BARN SWALLOW	
LONGNOSE SUCKER	BLACK TERN	
MOUNTAIN WHITEFISH	BLACK-NECKED STILT	
NORTHERN PIKE	COMMON YELLOWTHROAT	
PEARL DACE	EASTERN KINGBIRD	
RAINBOW TROUT	FORSTER'S TERN	
WHITE SUCKER	GREAT BLUE HERON	
YELLOW PERCH	LEAST FLYCATCHER	
	LITTLE BROWN BAT	
	OSPREY	
	PRAIRIE FALCON	
	RED BAT	
	SILVER-HAIRED BAT	
	SORA	
	TRUMPETER SWAN	
	WANDERING GARTER SNAKE	
	WESTERN GREBE	
	WESTERN SMALL-FOOTED BAT	
	WESTERN WOOD-PEWEE	

Buffer Extent

Centroid (X,Y):	Projection	Centroid: (Qtr Sec Twp Rng Mer)	Radius or Dimensions
574392, 5631333	10-TM AEP Forest	SW 10 22 29 4	11886, 9746 meters

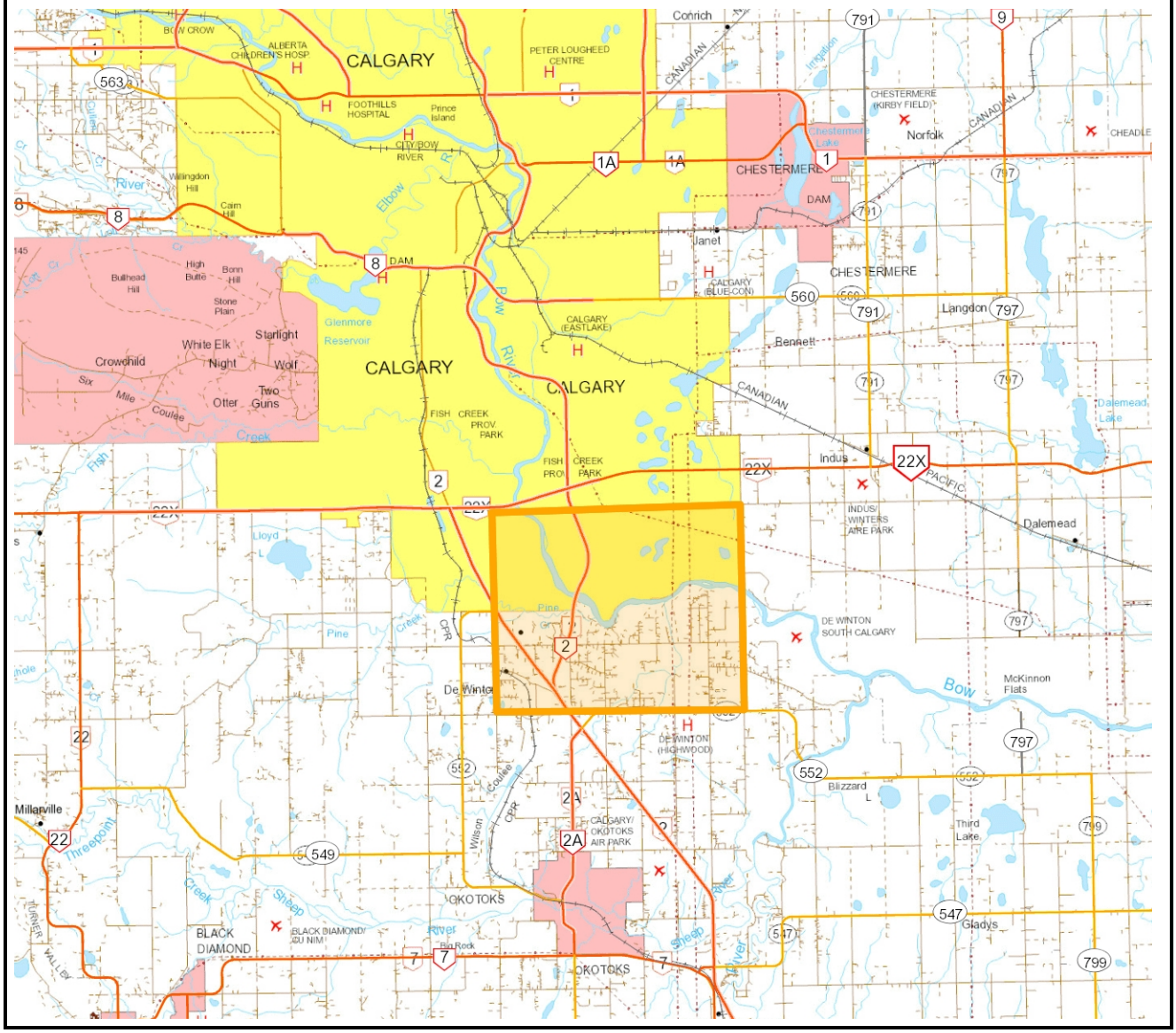
Contact Information

For contact information, please visit:

http://aep.alberta.ca/about-us/contact-us/fisheries-wildlife-management-area-contacts.aspx

2-Mar-2018 13:15

Map Results



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Appendix E

SOILS SURVEY DATA

TABLE E-1 – LAND COVER SOIL SURVEY SITES

Site	Texture	Soil Moisture	Depth (cm)	Depth to Saturation (cm)	Soil Horizon	Soil Matrix	Matrix %	Soil Redox	Redox %
Land Cover Soil Survey Sites									
SITE 001	Sandy Loam	Sub-Mesic	0 - 29	-	A	10 YR 3/3	100	-	-
SITE 002	Loam	Mesic	0 - 29	-	A	2.5 Y 2/1	100	-	-
SITE 003	Loam	Sub-Mesic	0 - 25	-	A	10 YR 2/2	100	-	-
SITE 004	Clay Loam	Mesic	0 - 29	-	A	10 YR 2/2	100	-	-
SITE 005	Loam	Sub-Mesic	0 - 29	-	A	10 YR 2/2	100	-	-
SITE 006	Loam	Mesic	0 - 29	-	A	10 YR 2/2	100	-	-
SITE 007	Loam	Sub-Mesic	0 - 29	-	A	10 YR 2/2	99	-	-
	Silt	Sub-Mesic	29	-	A	10 YR 4/3	1	-	-
SITE 008	Sandy Clay Loam	Mesic	0 - 29	-	A	10 YR 4/2	100	-	-
SITE 009	Sandy Clay Loam	Mesic	0 - 29	-	A	10 YR 4/2	100	-	-
SITE 010	Sandy Clay Loam	Sub-Xeric	0 - 29	-	A	2.5 Y 4/2	100	-	-
SITE 011	Clay Loam	Mesic	0 - 29	-	A	10 YR 3/2	100	-	-
SITE 012	Silty Clay Loam	Mesic	0 - 29	-	A	10 YR 2/1	100	-	-
SITE 013	Silt Loam	Xeric	0 - 20	-	A	10 YR 3/2	100	-	-
SITE 014	Loam	Mesic	0 - 20	-	A	10 YR 2/1	100	-	-
SITE 015	Loam	Mesic	0 - 29	-	A	10 YR 2/1	100	-	-
SITE 016	Loam	Mesic	0 - 29	-	A	10 YR 2/1	100	-	-
SITE 017	Sandy Loam	Sub-Mesic	0 - 29	-	A	10 YR 3/1	100	-	-
SITE 018	Loam	Sub-Mesic	0 - 29	-	A	10 YR 2/2	100	-	-
SITE 019	Silt Loam	Sub-Mesic	0 - 29	-	A	10 YR 3/3	100	-	-
SITE 020	Clay Loam	Sub-Mesic	0 - 29	-	A	2.5 Y 3/2	100	-	-
SITE 021	Silt Loam	Xeric	0 - 10	-	A	2.5 Y 4/2	100	-	-
SITE 022	Loam	Mesic	0 - 29	-	A	10 YR 2/1	100	-	-
SITE 023	Silt	Xeric	0 - 29	-	A	2.5 YR 6/2	100	-	-
SITE 024	Loam	Mesic	0 - 29	-	A	10 YR 3/2	95	-	-
						2.5 YR 4/2	5	-	-
SITE 025	Silt Loam	Xeric	0 - 29	-	A	2.5 Y 3/2	100	-	-

Site	Texture	Soil Moisture	Depth (cm)	Depth to Saturation (cm)	Soil Horizon	Soil Matrix	Matrix %	Soil Redox	Redox %
SITE 026	Sand	Xeric	0 - 5	-	A	2.5 YR 4/2	100	-	-
	Silt	Xeric	5 - 24	-	B	2.5 Y 4/2	100	-	-
SITE 027	Sand	-	0 - 10	-	A	2.5 Y 4/2	100	-	-
	Silt	-	10	-	B	2.5 Y 4/2	100	-	-
SITE 028	Silt Loam	Sub-Mesic	0 - 29	-	A	10 YR 3/2	100	-	-
SITE 029	Silt Loam	Mesic	0 - 29	-	A	10 YR 3/1	85	-	-
	Silt	Mesic	29	-	A	2.5 Y 4/2	15	-	-
SITE 030	Silt Loam	Mesic	0 - 29	-	A	10 YR 3/2	100	-	-
SITE 031	Loamy Sand	Sub-Mesic	0 - 29	-	A	10 YR 2/2	100	-	-
SITE 032	Loam	Mesic	0 - 29	-	A	10 YR 2/2	100	-	-
SITE 033	Loam	Mesic	0 - 29	-	A	10 YR 3/2	100	-	-
SITE 034	Sandy Clay Loam	Xeric	0 - 29	-	A	2.5 YR 6/1	90	-	-
	Sandy Clay	Xeric	29	-	A	2.5 YR 5/3	10	-	-
SITE 035	Sandy Loam	Mesic	0 - 29	-	A	10 YR 2/2	100	-	-
SITE 036	Silt Loam	Mesic	0 - 29	-	A	10 YR 3/2	100	-	-
SITE 037	Clay Loam	Xeric	0 - 29	-	A	2.5 YR 5/1	100	-	-
SITE 038	Loam	Mesic	0 - 5	-	A	10 YR 2/2	100	-	-
	Sand	Mesic	5 - 24	-	B	2.5 Y 4/2	100	-	-
SITE 039	Clay Loam	Mesic	0 - 29	-	A	2.5 Y 4/2	99	-	-
						5 YR 5/8	1	-	-

TABLE E-2 – WATERBODY SOIL SURVEY SITES

Site	Texture	Soil Moisture	Depth (cm)	Depth to Saturation (cm)	Soil Horizon	Soil Matrix	Matrix %	Soil Redox	Redox %
Waterbody Soil Survey Sites									
SITE 001	Clay	Sub-Hygric	0 - 29	-	A	10 YR 2/1	98	Gley 2 2.5/5PB	2
SITE 002	Clay Loam	Sub-Hygric	0 - 29	-	A	10 YR 2/2	100	-	-
SITE 003	Clay Loam	Mesic	0 - 29	-	A	10 YR 2/1	95	5 YR 4/6	5
SITE 004	Clay Loam	Mesic	0 - 20	-	A	10 YR 2/1	100	-	-
	Sandy Clay	Mesic	20 - 29	-	B	2.5 Y 4/2	80	5 YR 4/4	20
SITE 005	Clay Loam	Mesic	0 - 29	-	A	10 YR 2/1	99	5 YR 4/6	1
SITE 006	Clay Loam	Mesic	0 - 20	-	A	10 YR 2/1	100	-	-
	Clay	Mesic	20 - 29	-	B	2.5 Y 4/1	80	2.5 YR 3/6	20
SITE 007	Clay Loam	Mesic	0 - 29	-	A	10 YR 2/1	100	-	-
SITE 008	Clay Loam	Sub-Hygric	0 - 29	-	A	10 YR 2/1	100	-	-
SITE 009	Clay Loam	Sub-Hygric	0 - 29	-	A	10 YR 2/1	100	-	-
SITE 010	Clay Loam	Sub-Hygric	0 - 29	-	A	10 YR 2/1	100	-	-
SITE 011	Clay Loam	Sub-Hygric	0 - 29	-	A	10 YR 2/1	100	-	-
SITE 012	Clay Loam	Mesic	0 - 29	-	A	10 YR 2/1	100	-	-
SITE 013	Clay Loam	Mesic	0 - 25	-	A	10 YR 2/1	100	-	-
	Silt	Mesic	25 - 29	-	B	5 Y 6/1	90	7.5 YR 6/8	10
SITE 014	Clay Loam	Mesic	0 - 29	-	A	10 YR 2/1	100	-	-
SITE 015	Clay Loam	Mesic	0 - 29	-	A	10 YR 2/2	98	2.5 YR 3/6	2
SITE 016	Clay Loam	Mesic	0 - 29	-	A	10 YR 2/2	100	-	-
SITE 017	Clay Loam	Mesic	0 - 29	-	A	10 YR 2/2	100	-	-
SITE 018	Clay Loam	Mesic	0 - 29	-	A	10 YR 2/2	100	-	-
SITE 019	Clay Loam	Mesic	0 - 29	-	A	10 YR 2/2	100	-	-
SITE 020	Clay Loam	Mesic	0 - 29	-	A	10 YR 2/1	100	-	-
SITE 021	Clay Loam	Mesic	0 - 29	-	A	10 YR 2/1	100	-	-
SITE 023	Silt Loam	Hydric	0 - 15	0	A	10 YR 2/1	100	-	-
SITE 024	Sandy Loam	Hydric	0 - 20	0	A	10 YR 2/1	100	-	-
SITE 025	Sandy Loam	Hydric	0 - 29	0	A	10 YR 2/1	100	-	-
SITE 026	Sand	Sub-Hygric	0 - 15	-	A	2.5 Y 3/1	100	-	-

Site	Texture	Soil Moisture	Depth (cm)	Depth to Saturation (cm)	Soil Horizon	Soil Matrix	Matrix %	Soil Redox	Redox %
SITE 027	Sandy Clay	Hygric	0 - 29	-	A	10 YR 2/1	100	-	-
SITE 028	Sandy Clay Loam	Hygric	0 - 29	-	A	10 YR 2/1	100	-	-
SITE 029	Sandy Clay Loam	Sub-Hydric	0 - 29	10	A	2.5 Y 4/1	99	7.5 YR 5/6	1
SITE 030	Silty Clay Loam	Sub-Hygric	0 - 29	-	A	2.5 Y 3/2	98	7.5 YR 4/6	2
SITE 031	Silty Clay Loam	Hydric	0 - 29	0	A	2.5 Y 2/1	100	-	-
SITE 032	Clay Loam	Sub-Hygric	0 - 29	-	A	2.5 Y 3/2	98	5 YR 4/6	2
SITE 033	Sandy Clay Loam	Hydric	0 - 29	0	A	10 YR 2/2	100	-	-
SITE 036	Sand	Hydric	0 - 29	0	A	2.5 Y 5/1	1	-	-
	Clay Loam	Hydric	29	0	A	2.5 Y 2/1	98	-	-

Appendix F

WILDLIFE SURVEY DATA

TABLE F-1 – SOMC POTENTIALLY OCCURRING WITHIN PLAN AREA

Common Name	Scientific Name	SARA Status[1]	COSEWIC Status[2]	AESCC Status[3]	Alberta General Status[4]	Habitat Association
Birds						
trumpeter swan	*Cygnus buccinator*	-	Not at Risk	Special Concern	Sensitive	Shallow lakes, marshes and ponds, wooded swamps - migration
white-winged scoter	*Melanitta fusca*	-	-	-	Sensitive	Ponds, lakes and oxbows in open country
sharp-tailed grouse	*Tympanuchus phasianellus*	-	-	-	Sensitive	Native grassland and tame pasture
pied-billed grebe	*Podilymbus podiceps*	-	-	-	Sensitive	Seasonal or permanent wetlands with emergent vegetation
horned grebe	*Podiceps auritus*	Special Concern (Schedule 1)	Special concern	-	Sensitive	Small, shallow, graminoid ponds and marshes
western grebe	*Aechmophorus occidentalis*	Special Concern (Schedule 1)	Special Concern	Threatened	At Risk	Lakes and marshes with large open area – most likely during migration
common nighthawk	*Chordeiles minor*	Threatened (Schedule 1)	Threatened	-	Sensitive	Grassland, clear-cut areas of forest, gravel
yellow rail	*Coturnicops noveboracensis*	Special Concern (Schedule 1)	Special Concern	-	Undetermined	Sedge marsh
sora	*Porzana Carolina*	-	-	-	Sensitive	Seasonal or semi-permanent graminoid marsh or wet meadows
sandhill crane	*Grus Canadensis*	-	-	-	Sensitive	Isolated bogs, marshes, swamps; cultivated fields - during migration
black-necked stilt	*Himantopus*	-	-	-	Sensitive	Wetl pastures, pools, marshes or lakes, mudflats.
upland sandpiper	*Bartramia longicauda*	-	-	-	Sensitive	Pasture, wet meadows
long-billed curlew	*Numenius americanus*	-	-	-	Sensitive	Grasslands
buff-breasted sandpiper	*Calidris subruficollis*	Special Concern (Schedule 1)	Special Concern	-	-	Upland borders wetlands –during migration

Common Name	Scientific Name	SARA Status[1]	COSEWIC Status[2]	AESCC Status[3]	Alberta General Status[4]	Habitat Association
black tern	*Childonias niger*	-	-	-	Sensitive	Shallow marshes, semi-permanent ponds
Forster's tern	*Sterna forsteri*	-	-	-	Sensitive	Islands or floating vegetation in marshes or streams
American white pelican	*Pelecanos erythrorynchos*	-	-	-	Sensitive	Islands on lakes for breeding, forage in marshes, lakes, or rivers
American bittern	*Botarus lentiginosus*	-	-	-	Sensitive	Graminoid marsh
great blue heron	*Ardea Herodias*	-	-	-	Sensitive	Swamps or islands on lakes
black-crowned night-heron	*Nycticorax nycticorax*	-	-	-	Sensitive	Swamps, streams, rivers, marshes
osprey	*Pandion haliaetus*	-	-	-	Sensitive	Large trees, typically broadleaf, and man-made structures near waterbodies with fish
bald eagle	*Haliaeetus leucocephalus*	-	Not at Risk	-	Sensitive	Large trees, typically broadleaf, and man-made structures near waterbodies with fish
northern goshawk	*Accipiter gentilis (atricapillus)*	-	Not at Risk	-	Sensitive	Mature mixed and broadleaf forest
broad-winged hawk	*Buteo platypterus*	-	-	-	Sensitive	Broadleaf or coniferous forest
ferruginous hawk	*Buteo regalis*	Threatened (Schedule 1)	Threatened	Endangered	At Risk	Dry native grasslands, pasture
golden eagle	*Aquila chrysaetos*	-	Not at Risk	-	Sensitive	Grassland, shrubland, riparian and coniferous forest
northern pygmy owl	*Glaucidium gnoma*	-	-	-	Sensitive	Mature coniferous forest; open forests
barred owl	*Strix varia*	-	-	Special concern	Sensitive	Broadleaf or mixed forest
great gray owl	*Strix nebulosa*	-	Not at Risk	-	Sensitive	Coniferous forest
short-eared owl	*Asio flammeus*	Special Concern (Schedule 1)	Special Concern	-	May be at Risk	Grasslands and meadows
pileated woodpecker	*Dryocopus pileatus*	-	-	-	Sensitive	Mixed and broadleaf forest

Common Name	Scientific Name	SARA Status[1]	COSEWIC Status[2]	AESCC Status[3]	Alberta General Status[4]	Habitat Association
American kestrel	*Falco sparverius*	-	-	-	Sensitive	Grassland, meadows, agricultural fields with broadleaf or mixedwood tree stands
peregrine falcon	*Falco peregrinus (anatum/ tundrius)*	Special Concern (Schedule 1)	Not at Risk	Threatened	At Risk	Cliffs, grassland, shrubland
prairie falcon	*Falco mexicanus*	-	Not at Risk	Special concern	Sensitive	Cliff; grassland, shrubland
olive-sided flycatcher	*Contopus cooperi*	Threatened (Schedule 1)	Threatened	-	May Be at Risk	Coniferous and mixed forests, near open areas/edges; burns, with tall trees, dead standing trees
western wood-pewee	*Contopus sordidulus*	-	-	-	May Be At Risk	Broadleaf and mixed forest near riparian zones
alder flycatcher	*Empidonax alnorum*	-	-	-	Sensitive	Open broadleaf and mixed forest
least flycatcher	*Empidonax minimus*	-	-	-	Sensitive	Open broadleaf and mixed forest
eastern phoebe	*Sayornis phoebe*	-	-	-	Sensitive	Open broadleaf or mixed forest near water
eastern kingbird	*Tyrranus tyrranus*	-	-	-	Sensitive	Open shrublands and woodlots, often near water
loggerhead shrike	*Lanius ludovicianus*	Threatened (Schedule 1)	Threatened	Special Concern	Sensitive	Shrubland and native prairie
purple martin	*Progne subis*	-	-	-	Sensitive	Shrubland and native prairie
bank swallow	*Riparia riparia*	Threatened (Schedule 1)	Threatened	-	-	Banks of river, streams, and wetlands
barn swallow	*Hirundo rustica*	Threatened (Schedule 1)	Threatened	-	Sensitive	Near water in grassland, shrubland, open forest
Sprague's pipit	*Anthus spragueii*	Threatened (Schedule 1)	Threatened	Special Concern	Sensitive	Native grasslands and pasture
evening grosbeak	*Coccothrauste s vespertinus*	-	Special Concern	-	-	Various habitats during winter.
bobolink	*Dolichonyx orizivorus*	Threatened (Schedule 1)	Threatened	-	Sensitive	Pastures, hayfields and meadows

Common Name	Scientific Name	SARA Status[1]	COSEWIC Status[2]	AESCC Status[3]	Alberta General Status[4]	Habitat Association
Baltimore oriole	*Icterus galbuta*	-	-	-	Sensitive	Mixed and broadleaf forest
rusty blackbird	*Euphagus carolinus*	Special Concern (Schedule 1)	Special Concern	-	Sensitive	Wet coniferous and mixed forest, fens, bogs, swamps – during migration
common yellowthroat	*Geothlypis trichas*	-	-	-	Sensitive	Graminoid marsh, shrubby and wooded swamp
western tanager	*Piranga ludoviciana*	-	-	-	Sensitive	Coniferous and mixed forest
Mammals						
silver-haired bat	*Lasionycteris noctivagans*	-	-	-	Sensitive	Mature/old-growth forests with cavities,
eastern red bat	*Lasiurus borealis*	-	-	-	Sensitive	Broadleaf and mixed forest
western small-footed myotis	*Myotis ciliolabrum*	-	-	Special Concern	Sensitive	Grasslands, badlands.
little brown myotis	*Myotis lucifugus*	Endangered (Schedule 1)	Endangered	-	May Be at Risk	Mature/old-growth forests with cavities, rock crevices, buildings
bobcat	*Lynx rufus*	-	-	-	Sensitive	Forests, grassland, shrubland, coulees
long-tailed weasel	*Mustela frenata*	-	Not at Risk	-	May Be at Risk	Grassland, shrubland, forest, agricultural land, marshes
Amphibians						
northern leopard frog	*Lithobates pipiens*	Special Concern (Schedule 1)	Special Concern	Threatened	At Risk	Graminoid marsh, swamps, shallow open water with emergent vegetation
western toad	*Anaxyrus boreas*	Special Concern (Schedule 1)	Special Concern	-	Sensitive	
Canadian toad	*Anaxyurus hemiophrys*	-	-	Data Deficient	May Be at Risk	
western (barred) tiger salamander	*Ambystoma mavortium*	No Status (No Schedule)	Special Concern	-	Secure	Semi-permanent and permanent wetlands

Common Name	Scientific Name	SARA Status[1]	COSEWIC Status[2]	AESCC Status[3]	Alberta General Status[4]	Habitat Association
Reptiles						
wandering garter snake	*Thamnophis elegans vagrans*	-	-	-	Sensitive	Grassland, open forest, meadows, riparian areas, south facing slopes and escarpments
plains garter snake	*Thamnophis radix*	-	-	-	Sensitive	
red-sided garter snake	*Thamnophis sirtalis*	-	-	-	Sensitive	

[1] – listed Endangered, Threatened, or Special Concern by SARA Public Registry (Government of Canada 2017b);

[2] – listed Endangered, Threatened, or Special Concern by COSEWIC (COSEWIC 2017);

[3] – listed species legally protected under the AWA (AESCC 2015);

[4] – listed At Risk, May be at Risk, or Sensitive under the Alberta Wild Species General Listing of 2015 (Government of Alberta 2017a);

"-" – Dash indicates no status or non-occurring.

TABLE F-2 – LANDSCAPE COVER TYPES SURVEYED PER TRANSECT IN WINTER TRACK COUNT SURVEY

Transect (m)	Lotic (Deciduous)	Lotic (Herbaceous)	Lotic (River)	Overflow	Thin Breaks	Loamy	Tame Pasture & Rural
	Percent (%)						
A (1,050)	-	-	-	-	-	-	100
B (1,400)	8	-	8	20	15	5	44
C (1,500)	18	-	14	28	12	27	1
D (1,250)	-	-	-	-	-	-	100
E (600)	60	12	-	-	16	12	-
F (650)	32	8	-	31	25	4	-
G (700)	23	4	-	51	19	3	-
H (725)	22	15	-	14	23	27	-
Plan Area (7,875)	**16**	**3**	**4**	**17**	**12**	**10**	**37**

"-" – Dash indicates absence of species track counts

TABLE F-3 – RELATIVE ABUNDANCE (TRACKS/KM-DAY) OF WILDLIFE SPECIES PER LANDSCAPE COVER TYPE IN WINTER TRACK COUNT SURVEY

Landscape Cover (m)	upland game bird	small rodent	porcu pine	coyote	ermine	least weasel	deer spp.	Species Richness	Km-Days Sampled
	Tracks/km-Day								
Lotic (Deciduous) (1275)	0.01	0.06	-	0.13	-	0.01	0.41	5	6.35
Lotic (Herbaceous) (265)	-	0.10	-	1.64	-	-	1.53	3	1.41
Lotic (River) (320)	-	-	0.18	2.09	-	-	0.27	3	1.42
Overflow (1370)	-	-	-	0.13	0.06	-	0.32	3	6.70
Thin Breaks (970)	0.05	0.07	-	0.26	0.04	-	1.03	5	4.77
Loamy (785)	-	-	-	0.42	-	-	-	1	3.84
Tame Pasture (2890)	-	0.05	-	0.01	-	-	0.07	3	13.3
Plan Area (7875)	**0.21**	**0.67**	**0.05**	**3.05**	**0.28**	**0.05**	**7.03**	**7**	**38.98**

"-" – Dash indicates absence of species track counts

TABLE F-4 – DOMINANT SITE TYPES PER BREEDING BIRD SURVEY STATION

Station	Dominant Landscape Cover Types Surveyed (ha) per Station	Landscape Features
A	Thin Breaks/ Lentic (Seasonal)/Loamy	grassland, grassland slopes
B	Lotic (Deciduous)/Overflow	grassland
C	Overflow	grassland and shrubland habitat types
D	Lotic (Deciduous)/Lotic (Herbaceous)	-
E	Think Breaks	grassland slopes
F	Lotic (Herbaceous)/Thin Breaks	grassland slopes
G	Tame Pasture	-
H	Tame Pasture	-
I	Tame Pasture	-
J	Tame Pasture	-
K	Tame Pasture	-
L	Tame Pasture	-
M	Thin Breaks[1]/Lentic (Seasonal)	grassland slopes
N	Loamy/Thin Break/Lentic (Seasonal)	grassland, grassland slopes
O	Tame Pasture	-
P	Thin Break/Loamy	grassland, grassland slopes
Q	Lotic (Deciduous)/Overflow	grassland and shrubland habitat types
R	Lotic (River)/Lotic (Deciduous)	-

TABLE F-5 – BREEDING BIRD SURVEY RESULTS

Common Name	Scientific Name	Breeding Territories per Station																	Total
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	
common goldeneye	*Bucephala clangula*	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	**2**
common merganser	*Mergus merganus*	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**1**
yellow-bellied sapsucker	*Sphyrapicus petechia*	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	**2**
downy woodpecker	*Picoides pubescens*	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	**3**
northern flicker	*Colaptes auratus*	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	1	1	**4**
western wood-pewee	***Contopus sordidulus***	-	2	-	2	1	-	-	-	-	-	-	-	-	-	-	-	1	5	**11**
least flycatcher	***Empidonax minimus***	-	1	-	2	1	1	-	-	-	-	-	-	-	-	-	-	2	-	**7**
western kingbird	*Tyrannus verticalis*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**
eastern kingbird	***Tyrannus tyrannus***	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-	2	**4**
warbling vireo	*Vireo gilvus*	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	2	**4**
mourning dove	*Zenaida macroura*	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**1**

Common Name	Scientific Name	Breeding Territories per Station																	Total
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	
tree swallow	*Tachycineta bicolor*	1	1	-	1	1	1	-	-	-	-	-	-	1	1	-	-	1	2	10
northern rough-winged swallow	*Stelgidopteryx serripennis*	-	-	-	-	1	1	-	-	-	-	-	-	1	-	-	-	-	-	3
bank swallow	***Riparia riparia***	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	2
black-capped chickadee	*Poecile atricapillus*	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
white-breasted nuthatch	*Sitta carolinensis*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
house wren	*Troglodytes aedon*	4	5	-	5	4	1	-	-	-	-	-	-	1	2	-	-	5	9	36
American robin	*Turdus migratorius*	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
gray catbird	*Dumetella carolinensis*	1	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	3
European starling	*Sturnus vulgaris*	-	2	-	1	2	-	-	-	-	-	-	-	-	1	-	-	-	2	8
cedar waxwing	*Bombycilla cedrorum*	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	3
yellow warbler	*Setophaga petechia*	-	1	1	6	1	1	-	-	-	-	-	-	-	-	-	-	1	1	12
clay-colored sparrow	*Spizella pallida*	1	4	3	-	1	2	-	-	-	-	-	-	5	2	-	6	1	-	25
vesper sparrow	*Pooecetes gramineus*	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	1	-	-	3
savannah sparrow	*Passerculus sandwichensis*	-	-	5	-	-	5	2	4	2	4	6	4	8	5	3	4	2	-	54
Baird's sparrow	***Ammodramus bairdii***	-	-	-	-	-	-	-	2	-	2	1	5	-	-	-	-	-	-	10
Le Conte's sparrow	*Ammodramus leconteii*	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
song sparrow	*Melospiza melodia*	-	-	-	2	1	1	-	-	-	-	-	-	-	-	-	-	-	2	6
western meadowlark	*Sturnella neglecta*	1	-	-	-	-	-	2	3	2	2	1	4	-	1	-	2	-	-	18
red-winged blackbird	*Agelaius phoeniceus*	1	-	-	1	2	3	-	-	-	-	-	-	-	-	-	-	-	-	7
brown-headed cowbird	*Molothrus ater*	-	1	-	1	1	2	-	-	-	-	-	-	-	-	-	-	2	2	9
Baltimore oriole	***Icterus galbula***	-	-	-	1	3	-	-	-	-	-	-	-	-	-	-	-	1	3	8
American goldfinch	*Spinus tristis*	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	4	-	6
Total Number of Territories		**10**	**22**	**10**	**27**	**27**	**20**	**4**	**9**	**4**	**8**	**8**	**13**	**19**	**14**	**3**	**13**	**22**	**35**	**267**
Species Richness		**7**	**13**	**4**	**15**	**19**	**11**	**2**	**3**	**2**	**3**	**3**	**3**	**8**	**8**	**1**	**4**	**12**	**14**	**33**

***Bold** style font indicates SOMC

TABLE F-6 – DOMINANT SITE TYPES PER BAT AUTOMATED ACOUSTIC DETECTOR STATION

Station	Landscape Cover Type	Landscape Features
A	Lotic (Deciduous)/Lotic (Herbaceous)	deciduous trees and water
B	Overflow/Lotic (Deciduous)	deciduous trees, grassland and shrubland
C	Loamy/Tame Pasture	grassland
D	Loamy/Tame Pasture/Rural Residence	grassland, farm buildings

TABLE F-7 – ALL WILDIFE SPECIES OBSERVED IN THE PLAN AREA

Common Name	Scientific Name	SARA Status (Schedule)[1]	COSEWIC Status[2]	AESCC Status[3]	Alberta General Status[4]
Birds					
Canada goose	*Branta canadensis*	-	-	-	Secure
tundra swan	*Cygnus colunbianus*	-	-	-	Secure
blue-winged teal	*Spatula discors*	-	-	-	Secure
northern shoveler	*Spatula clypteata*	-	-	-	Secure
gadwall	*Mareca strepera*	-	-	-	Secure
American wigeon	*Mareca Americana*	-	-	-	Secure
mallard	*Anas platyrynchos*	-	-	-	Secure
lesser scaup	*Aythya affinis*	-	-	-	Secure
common goldeneye	*Bucephala clangula*	-	-	-	Secure
common merganser	*Mergus merganus*	-	-	-	Secure
ruby-throated hummingbird	*Archilochus colubris*	-	-	-	Secure
mourning dove	*Zenaida macroura*	-	-	-	Secure
sora	***Porzana carolina***	**-**	**-**	**-**	**Sensitive**
killdeer	*Charadrius vociferous*	-	-	-	Secure
spotted sandpiper	*Actitis macularius*	-	-	-	Secure
solitary sandpiper	*Tringa solitaria*	-	-	-	Secure
lesser yellowlegs	*Tringa flavipes*	-	-	-	Secure
greater yellowlegs	*Tringa melanoleuca*	-	-	-	Secure
Franklin's gull	*Leucophaeus pipixcan*	-	-	-	Secure
double-crested cormorant	*Phalacrocorax auritus*	-	-	-	Secure
American white pelican	***Pelecanus erythrorynchos***	**-**	**-**	**-**	**Sensitive**
great blue heron	***Ardea herodias***	**-**	**-**	**-**	**Sensitive**
osprey	***Pandion haliaetus***	**-**	**-**	**-**	**Sensitive**

Common Name	Scientific Name	SARA Status (Schedule)[1]	COSEWIC Status[2]	AESCC Status[3]	Alberta General Status[4]
bald eagle	***Haliaeetus leucocephalus***	**-**	**-**	**-**	**Sensitive**
red-tailed hawk	*Buteo jamaicensis*	-	-	-	Secure
Swainson's hawk	*Buteo swainsoni*	-	-	-	Secure
northern harrier	*Circus hudsonius*	-	-	-	Secure
great horned owl	*Bubo virginianus*	-	-	-	Secure
belted kingfisher	*Megaceryle alcyon*	-	-	-	Secure
yellow-bellied sapsucker	*Sphyrapicus petechia*	-	-	-	Secure
downy woodpecker	*Picoides pubescens*	-	-	-	Secure
northern flicker	*Colaptes auratus*	-	-	-	Secure
pileated woodpecker	***Dryocopus pileatus***	**-**	**-**	**-**	**Sensitive**
American kestrel	***Falco sparverius***	**-**	**-**	**-**	**Sensitive**
merlin	*Falco columbarius*	-	-	-	Secure
western wood-pewee	***Contopus sordidulus***	**-**	**-**	**May Be At Risk**	**Sensitive**
least flycatcher	***Empidonax minimus***	**-**	**-**	**-**	**Sensitive**
western kingbird	*Tyrannus verticalis*	-	-	-	Secure
eastern kingbird	***Tyrannus tyrannus***	**-**	**-**	**-**	**Sensitive**
warbling vireo	*Vireo gilvus*	-	-	-	Secure
black-billed magpie	*Pica hudsonia*	-	-	-	Secure
American crow	*Corvus brachyrynchos*	-	-	-	Secure
common raven	*Corvus corax*	-	-	-	Secure
tree swallow	*Tachycineta bicolor*	-	-	-	Secure
northern rough-winged swallow	*Stelgidopteryx serripennis*	-	-	-	Secure
bank swallow	***Riparia riparia***	**Threatened (Schedule 1)**	**Threatened**	**-**	**Sensitive**
cliff swallow	*Petrochelidon pyrrhonota*	-	-	-	Secure
black-capped chickadee	*Poecile atricapillus*	-	-	-	Secure
white-breasted nuthatch	*Sitta carolinensis*	-	-	-	Secure
house wren	*Troglodytes aedon*	-	-	-	Secure
marsh wren	*Cistothorus palustris*	-	-	-	Secure
American robin	*Turdus migratorius*	-	-	-	Secure
gray catbird	*Dumetella carolinensis*	-	-	-	Secure
European starling	*Sturnus vulgaris*	-	-	-	Exotic/Alien
cedar waxwing	*Bombycilla cedrorum*	-	-	-	Secure

Common Name	Scientific Name	SARA Status (Schedule)[1]	COSEWIC Status[2]	AESCC Status[3]	Alberta General Status[4]
American goldfinch	*Spinus tristis*	-	-	-	Secure
clay-colored sparrow	*Spizella pallida*	-	-	-	Secure
vesper sparrow	*Pooecetes gramineus*	-	-	-	Secure
savannah sparrow	*Passerculus sandwichensis*	-	-	-	Secure
Baird's sparrow	***Ammodramus bairdii***	**Special Concern (Schedule 1)**	**Special Concern**	**-**	**Sensitive**
Le Conte's sparrow	*Ammodramus leconteii*	-	-	-	Secure
Nelson's sparrow	*Ammodrammus nelsonii*	-	-	-	Secure
song sparrow	*Melospiza melodia*	-	-	-	Secure
Lincoln's sparrow	*Melospiza lincolnii*	-	-	-	Secure
western meadowlark	*Sturnella neglecta*	-	-	-	Secure
red-winged blackbird	*Agelaius phoeniceus*	-	-	-	Secure
brown-headed cowbird	*Molothrus ater*	-	-	-	Secure
Baltimore oriole	***Icterus galbula***	**-**	**-**	**-**	**Sensitive**
yellow warbler	*Setophaga petechia*	-	-	-	Secure
Mammals					
Richardson's ground squirrel	*Spermophilus richardsonii*	-	-	-	Secure
muskrat	*Ondatra zibethicus*	-	-	-	Secure
deer mouse	*Peromyscus maniculatus*	-	-	-	Secure
beaver	*Castor canadensis*	-	-	-	Secure
porcupine	*Erethizon dorsatum*	-	-	-	Secure
white-tailed jackrabbit	*Lepus townsendii*	-	-	-	Secure
silver-haired bat	***Lasionycteris noctivagans***	**-**	**-**	**-**	**Sensitive**
eastern red bat	***Lasiurus borealis***	**-**	**-**	**-**	**Sensitive**
western small-footed myotis	***Myotis ciliolabrum***	**-**	**-**	**-**	**Sensitive**
little-brown myotis	***Myotis lucifugus***	**Threatened (Schedule 1)**	**Threatened**	**-**	**May Be At Risk**
red fox	*Vulpes vulpes*	-	-	-	Secure
coyote	*Canis latrans*	-	-	-	Secure
least weasel	*Mustela nivalis*	-	-	-	Secure
ermine	*Mustela erminea*	-	-	-	Secure
American badger	***Taxidea taxus taxus***	**-**	**Special Concern**	**Data Deficient**	**Sensitive**
raccoon	*Procyon lotor*	-	-	-	Secure

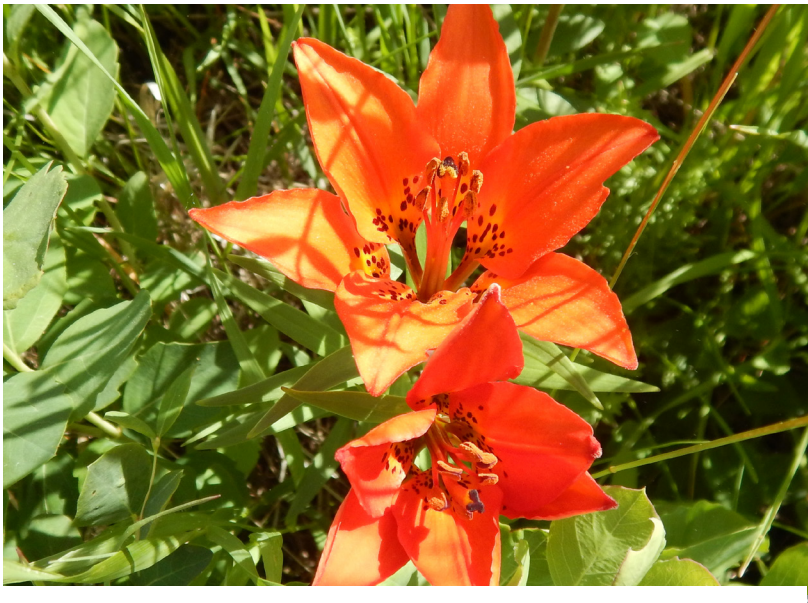
Common Name	Scientific Name	SARA Status (Schedule)[1]	COSEWIC Status[2]	AESCC Status[3]	Alberta General Status[4]
mule deer	*Odocoileus hemionus*	-	-	-	Secure
white-tailed deer	*Odocoileus virginianius*	-	-	-	Secure
moose	*Alces americanus*	-	-	-	Secure
Amphibians					
Boreal chorus frog	*Pseudacris maculata*	-	-	-	Secure
Wood frog	*Lithobates sylvaticus*	-	-	-	Secure

[1] – listed Endangered, Threatened, or Special Concern by SARA Public Registry (Government of Canada 2017b);
[2] – listed Endangered, Threatened, or Special Concern by COSEWIC (COSEWIC 2017);
[3] – listed species legally protected under the AWA (AESCC 2015);
[4] – listed At Risk, May be at Risk, or Sensitive under the Alberta Wild Species General Listing of 2015 (Government of Alberta 2017a);
***Bold** style font indicates SOMC;
"-" – Dash indicates no status.

TABLE F-8 – POTENTIAL SETBACK DISTANCES FOR ACTIVE WIDLIFE HABITAT FEATURES OBSERVED OR POTENTIALLY OCCURRING[1] IN THE PLAN AREA

Species or Species group	Scientific Name	Potential Breeding Season Setback[2] (m)
waterfowl/waterbirds	-	50 – 100
sensitive raptors	-	100 – 1,000
bald eagle	*Haliaeetus leucocephalus*	1,000
great blue heron	*Ardea herodias*	1,000
red-tailed hawk	*Buteo jamaicensis*	100
swainson's hawk	*Buteo Swainsoni*	100
great horned owl	*Bubo virginianus*	100
pileated woodpecker	*Dryocopus pileatus*	100
common raven	*Corvus corax*	30 – 50
bank swallow	*Riparia riparia*	50
Baird's sparrow	*Ammodrammus bairdii*	100
other migratory songbirds	-	30 – 50
Coyote	*Canis latrans*	50 – 100
American badger	*Taxus taxidea*	100

[1] - based on field results and/or available databases
[2] - setbacks shown are limited to the breeding season. All setbacks and restricted activity periods shown are subject to change through consultation with AEP and are dependent on the combination of the level of disturbance of proposed construction activities and ambient disturbance levels experienced at specific breeding sites and other potential contributing factors. All consultation shall be completed prior to final determination of setbacks.



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RICARDO RANCH

AREA STRUCTURE PLAN

Ecological Inventory