



# Final Report

## Historical Resources Impact Assessment Town of Drumheller Drumheller Resiliency and Flood Mitigation Program – Midland and Newcastle

ASA Permit 22-051



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**Historical resources impact assessment  
Town of Drumheller  
Drumheller Resiliency and Flood Mitigation  
program – Midland and Newcastle:  
final report**

**ASA permit 22-051**

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## EXECUTIVE SUMMARY

This report details the results of a Historic Resources Impact Assessment, which included in-field survey, subsurface investigation, as well as the writing and submission of this final report, incorporating the archaeological permit obligations as set out by the *Guidelines for Archaeological Permit Holders in Alberta*, the *Archaeological and Palaeontological Research Permit Regulation (Alberta Regulation 254/2002)*, and the *Historical Resources Act*, as well as the associated *Historical Resources Act Requirements* document (HRA Number: 4956-20-0069-002).

The investigation was conducted on June 20, 2022. Surface examination and backhoe testing (n=9) failed to result in the recovery of new historic resource sites in the two Target Areas agreed to in the Permit; in addition, no new historic resource sites were encountered in a third Target Area undertaken as part of the client's due diligence process. All tests produced evidence of near-surface disturbance overlying substantial silt deposits. No new sites were recorded, and no previously recorded sites were revisited.

As a result of the HRIA, **it is recommended that the Town of Drumheller, Drumheller Resiliency and Flood Mitigation Program – Midland & Newcastle are granted *Historical Resources Act* Approval as per the survey plans in Appendix A and in accordance with the *Historical Resources Act* Requirements (HRA Number: 4956-20-0069-002).** These recommendations are subject to the approval of Alberta Culture and Status of Women.

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## 1.0 INTRODUCTION

A Historic Resources Impact Assessment (HRIA) was conducted for the Town of Drumheller, Drumheller Resiliency and Flood Mitigation Program – Midland & Newcastle (the Project), following the receipt of archaeological research permit 22-051 on May 19, 2022. *Historical Resources Act* Requirements for an archaeological HRIA were issued for the entirety of the Drumheller Resiliency and Flood Mitigation under the *Historical Resources Act*; this permit addresses only those portions pertaining to the Midland & Newcastle dikes. The *Historical Resources Act* Approval with Conditions cites high potential to affect historic resources, with requirements for addressing all areas of high archaeological potential including, but not limited to, undisturbed terrain that has not been assessed systematically under previous HRIAs, including a deep testing program in areas of significant sedimentation (HRA Number: 4956-20-0069-001). Archaeological survey and in-field site assessment were conducted on June 20, 2022, during which no new historic resource sites were identified in the Project area. No previously recorded sites were revisited, as none were within the project footprint.

This report details the physical and cultural history of the area, and the methodologies used during the current HRIA; these are in accordance with the *Guidelines for Archaeological Permit Holders in Alberta*, the *Archaeological and Palaeontological Research Permit Regulation* (Alberta Regulation 254/2002), and the *Historical Resources Act*. Ensuing sections detail the results of the pre-field research and the in-field archaeological survey, with development recommendations for the Project.

## 2.0 SCOPE

The Town of Drumheller is developing the Drumheller Resiliency and Flood Mitigation project, which consists of a series of dikes on the north and south side of the Red Deer River, within and near the Town of Drumheller. The current Project is only a small portion of this program and is referred to as Midland & Newcastle. The current dike work includes designing improvements and upgrades to the existing Midland & Newcastle dikes, which further includes an upgraded design flow of 1,850 m<sup>3</sup>/s along the Red Deer River, with consideration for adaptive emergency response management allowing for emergency dike raises to manage flows of 2,100 m<sup>3</sup>/s and greater. With the current design flow rate, the dike would need to be raised about 0.8 to 1.25 m along most of the alignment with select earth fill and widened to provide the minimum 6 m top width and 3 horizontal:1 vertical side slopes.

Midland & Newcastle upgrades occur on both the north and south side of the Red Deer River. The Midland upgrade occurs just south of Highway 838 and west of 25<sup>th</sup> Street NW, paralleling the road north-south to the former railway bed (Figure 1). The upgrades in the Newcastle portion are located where Riverside Avenue West meets Newcastle Trail and in Newcastle Beach Park off the end of 10<sup>th</sup> Street SW, respectively. All three areas have experienced substantial surface disturbance in the past as landscaping and nearby construction have altered the landscape.

Archaeological survey, which included foot-traversing and visual inspection, as well as deep subsurface testing, occurred on June 20, 2022. The results of this assessment are preceded by a discussion of the environmental and cultural background of the project area, as well as the methodologies used to ensure compliance with the *Historical Resources Act*.

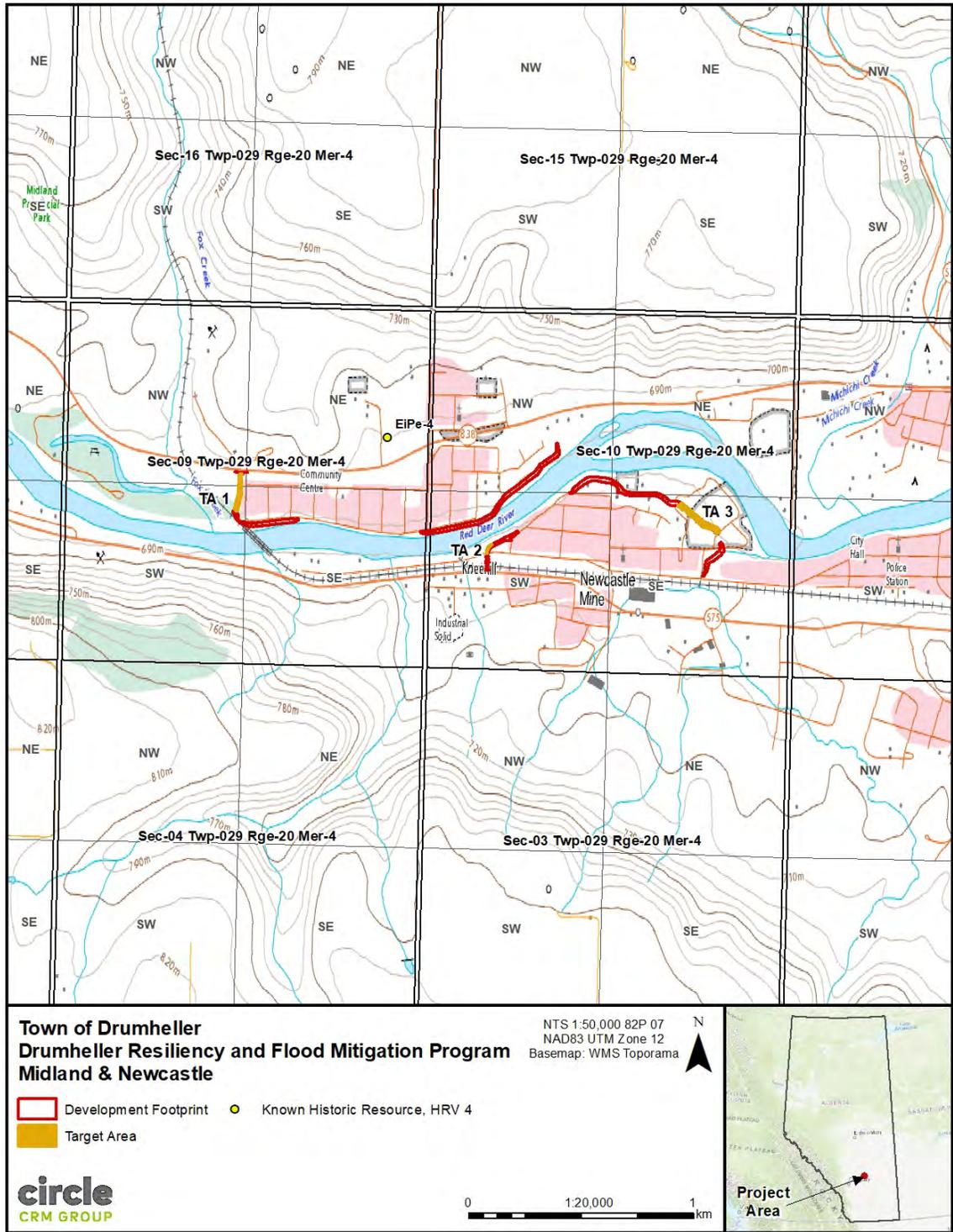


Figure 1. The location of the current proposed development.

### **3.0 BACKGROUND**

Pre-field research was conducted to ensure a clear understanding of the development area in terms of the environmental surroundings, the archaeology, and the local history as it pertains to the potential for identifying further cultural deposits. This research includes, but is not limited to, the review of relevant references, existing site forms, and reports for previous investigations, as well as updated information with regard to known and previously unrecorded sites and local histories. Comparing the location, as well as the context and significance, of known sites in relation to topographic and historic maps will reveal the potential for identifying further archaeological sites, as well as further identifying the extent of necessary field investigations.

#### **3.1 PROJECT HISTORY**

*Historical Resources Act* Requirements were issued for the Drumheller Resiliency and Flood Mitigation Office (of the Town of Drumheller) for the Drumheller Resiliency and Flood Mitigation on October 30, 2020, under HRA Number 4956-20-0069-001. This application was made for the project on a large scale, with requirements for HRIA in “all areas of high archaeological potential including, but not limited to, undisturbed terrain in areas that have not been assessed systematically under previous Historic Resource Impact Assessment studies, and areas in proximity to previously recorded archaeological and historic sites.” The Requirements also listed site-specific conditions to confirm the relationship between the footprint of the proposed project and previously recorded sites EiPd-1 and EiPd-3 (Appendix B).

In the summer of 2021, HRIA was conducted for the Dike D component of the Drumheller Resiliency and Flood Mitigation, just north of downtown Drumheller, following the receipt of archaeological research permit 21-112 on July 12, 2021. Archaeological survey and in-field site assessment were conducted on July 13 and 16, 2021, supplemented with geotechnical borehole data and historic photos; no new

historic resource sites were identified, and the project was granted *Historical Resources Act* Approval on September 10, 2021 (HRA Number: 4956-20-0069-002).

In 2022, a series of Historic Resource applications and Statements of Justification (SoJs) were submitted for various portions of the Drumheller Resiliency and Flood Mitigation project (Table 1). A preliminary SoJ was produced for the Midland & Newcastle portions of the project, but was not submitted; the resulting recommendations for HRIA coupled with the existing *Historical Resources Act* Requirements negated the need for the SoJ submission. As such, a permit application to complete HRIA for Midland & Newcastle was submitted and completed. The results of the HRIA are detailed in this report.

Project Component	Submission	Submission Date	Application #	Results	HRA Number~
n/a – all	HR* Application	Unknown	Unknown	HRA^ Requirements	-001
Dike D	HRIA Final Report	August 4, 2021	021188017	HRA Approval with Conditions	-002
Midland & Newcastle	Permit Application	May 18, 2022	022557778	HRIA completed, HRA Approval pending report review	-002
North Drumheller Dikes B & C	SoJ	May 10, 2022	022320874	HRA Approval with Conditions	-003
Willow Estates	SoJ	May 10, 2022	022530950	HRA Approval with Conditions	-004
Speedway Borrow Site	SoJ	May 10, 2022	022531096	HRA Approval	-005

Table 1. Summary of project components for the Drumheller Resiliency and Flood Mitigation (\*HR=Historic Resources; ^HRA=*Historical Resources Act*; ~=all HRA numbers are preceded with 4956-20-0069).

## 3.2 ENVIRONMENT

The earliest evidence for human occupation in Alberta dates back almost 12,000 years, during the Pleistocene-Holocene transition, when the Cordilleran and Laurentide ice sheets began to retreat, creating a habitable corridor along the eastern slopes of the Rocky Mountains (Dyke 2004; Frison & Bonnicksen 1996; see also Catto & Mandryk 1990; Wedel 1953). The beginning of the Holocene period witnessed increases in temperature and decreases in precipitation, to which human populations were forced to continually adapt. Continued climatic variations have resulted in the development of a wide-ranging biotic landscape. These landscapes have been classified into a number of natural regions, according to landscape patterns, vegetation, soil, and physiographic features, as well as other features, such as climate, topography, geology, and wildlife distribution patterns (NRC 2006; see also Fenton *et al.* 2013; Strong & Leggat 1992).

The proposed development occurs within the Northern Fescue Natural Subregion of the Grasslands Natural Region (Figure 2). The Grasslands Natural Region covers approximately 14.4% of the province, is the warmest and most arid region in Alberta, and includes the Dry Mixedgrass, Foothills Fescue, Northern Fescue, and Mixedgrass Natural Subregions. It comprises a broad area of southern Alberta generally referred to as the prairies, which is bounded to the west by the Rocky Mountains and to the north by the Parkland Natural Region. Substantial portions of the Region exhibit gently undulating plains, with hilly uplands in its northern portions and rolling terrain consistent with higher elevation areas to the west (NRC 2006). Precipitation varies with latitude and proximity to the front ranges of the Rocky Mountains.

The Northern Fescue Natural Subregion occupies a 50 to 80 km wide crescent, bordered on the north by the Central Parkland Subregion and on the south and west by the Dry Mixedgrass, Mixedgrass, and Foothills Fescue Subregions. Elevations range from 650 m near the Alberta-Saskatchewan border to nearly 1,100 m in the Hands Hills and southeast of Drumheller (Adams *et al.* 2005; NRC 2006).

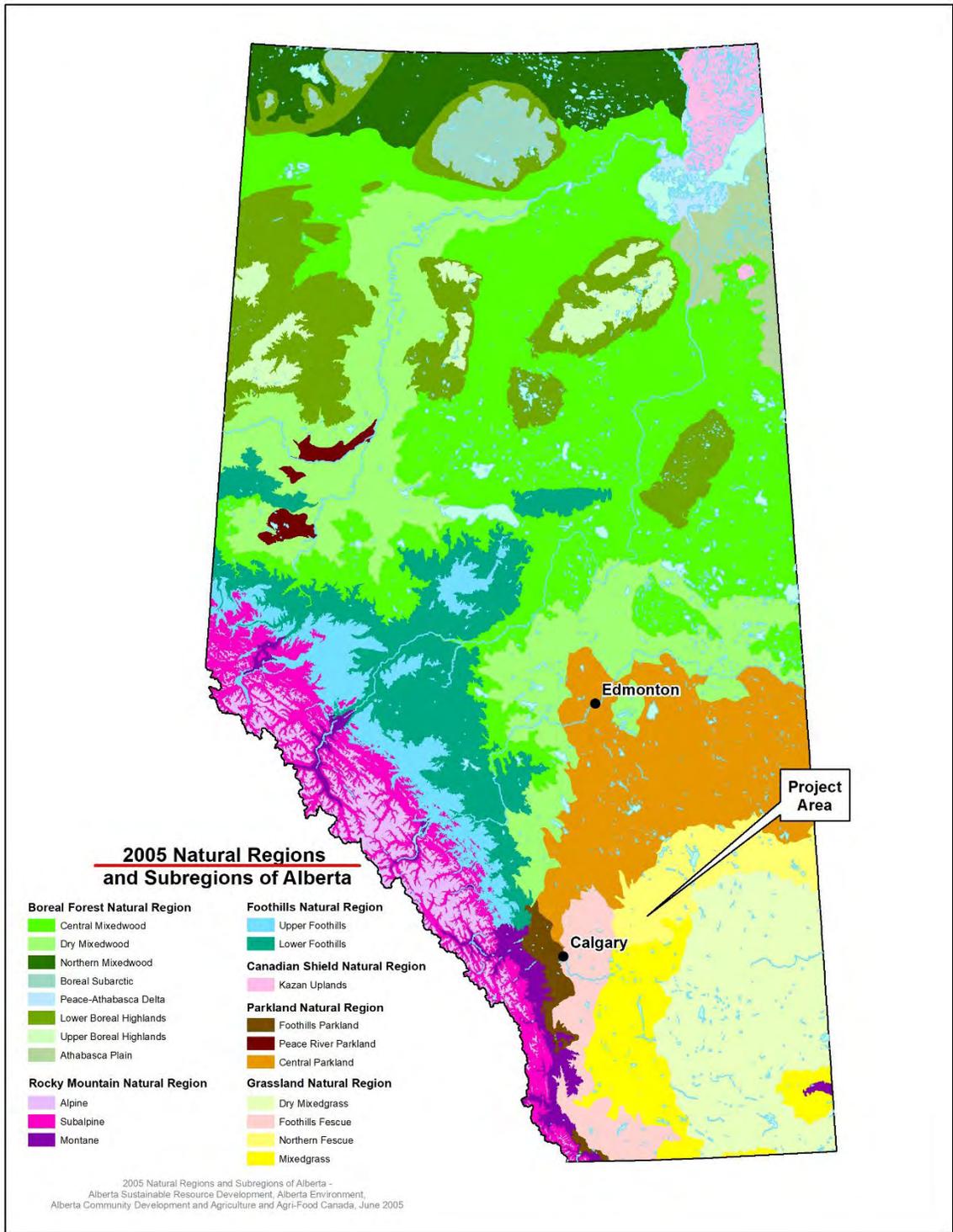


Figure 2. Project location within ecoregions of Alberta.

Native prairies in the Northern Fescue include many of the same species that occur in the adjacent Dry Mixedgrass and Mixedgrass Subregions. Vegetation is characterized by plains rough fescue on reference sites, which differentiates this subregion from other grassland regions. Other species include minimal amounts of aspen and some balsam poplar on moist lowland sites. This minimal aspen growth also differentiates the Northern Fescue from other Grassland regions, where it grows much more frequently.

Orthic Dark Brown Chernozems are dominant in this subregion, but there are some notable exceptions. Roughly 25% of the subregion, predominately in the central plains, is dominated by Solonchic soils. Black Chernozoms also occur at the upper elevations. The underlying geology consists of a central, gently undulating plain, bordered by the hummocky and rolling Neutral Hills on the east and the Hand Hills, Wintering Hills, and Drumheller basin to the west and south (Shetsen 1990).

The underlying bedrock is mainly a mixture of Cretaceous sediments, composed of marine shales, sandstones, and mudstones with some coal seams (NRC 2006). Characteristic wildlife populations historically included bison, and many threatened species or species of concern are within the Grassland Natural Region (NRC 2006; Strong & Leggat 1992). The Grasslands Region contains many animal species that are found nowhere else in Alberta. These include the swift fox, great sage-grouse, mountain plover, painted turtle, short-horned lizard, and western rattlesnake. The sand plains and dune fields contain a number of rare species, including the Ord's kangaroo rat and the western hog-nosed snake. The Richardson's ground squirrel is an important food source for a number of predators such as the hawk and the American badger, and other mammals use the squirrel's dens for shelter. This species is currently in decline, which is problematic for the other species which rely on it for food or to provide burrows. Rocky outcrops and the badlands provide important nesting grounds for many species of birds, such as the golden eagle and the prairie falcon, and various bat species, as well as snakes that may have their hibernacula here.

The Northern Fescue Subregion is primarily used for agriculture, with 55% of the area being cultivated annually. Wheat, barley, and canola production are the main crops, and domestic grazing occurs across the remainder of the area. There is also oil and gas activity and coal mining in the area. With a relatively long summer season, recreational camping is also very popular (*ibid.*). While past development may have destroyed a number of archaeological sites, a great many remain unidentified. This land use is not restricted to modern times; historic land uses, i.e., hunting activities, historic settlements, and construction, have also had a profound effect on the culture history of Alberta and the Great Plains.

### **3.3 CULTURE HISTORY**

The chronological sequence that defines the culture history of the Alberta Plains is based primarily on projectile point styles (Figure 3). First defined in the late 1960s (Reeves 1969; Wormington & Forbis 1965), the culture-historical model for the Plains defines three main periods prior to European contact; namely, the Early Prehistoric (11,500 – 7,500 BP), the Middle Prehistoric (7,500 – 2,000 BP), and the Late Prehistoric (2,000 – 250 BP); these periods have been further defined with the identification, recovery, and analysis of new materials (Peck 2011; Vickers 1986). In addition, the Protohistoric Period is defined by the introduction of trade goods (ca. 250 BP) and ends with the first documented written contact with Europeans. European contact marks the beginning of the Historic Period, which extends to approximately 50 years ago.

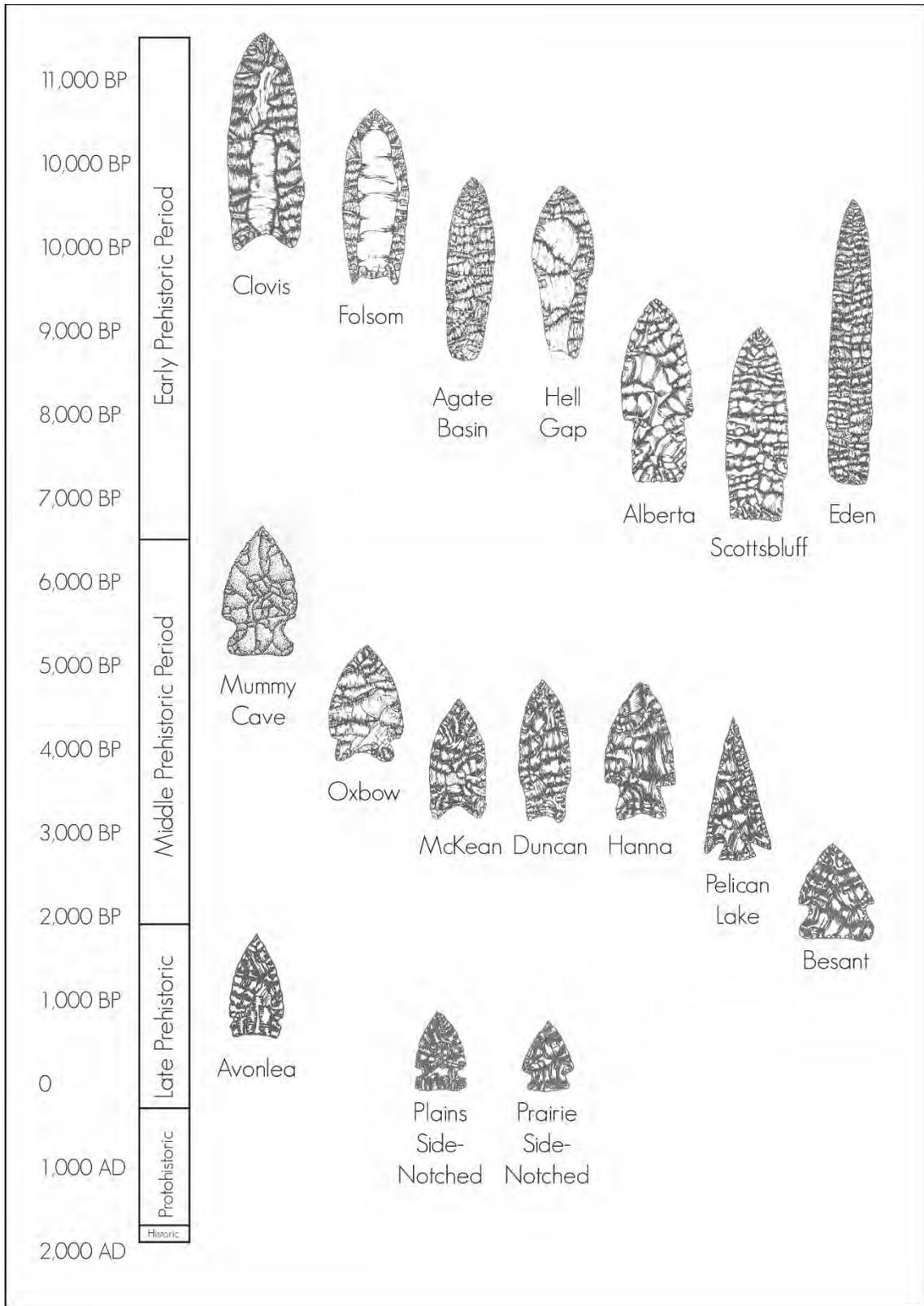


Figure 3. Culture-historical model of southern Alberta (from Dyck 1983; Vickers 1986).

The Early Prehistoric Period is characterized by spear points and big game hunting, the earliest example of which in the province is represented by the Clovis point (ca. 11,000 – 10,900 BP). This highly distinctive, often fluted, projectile point has been found across the North American continent and is presently the only point type recovered in association with mammoth and other megafaunal remains. Clovis points are frequently interpreted as representing subsistence strategies aimed at exploiting species of the now-extinct megafauna, which in Alberta likely occupied the margins of glacial lakes and tundra following the retreat of the post-Pleistocene glaciers (Churcher & Wilson 1979). In Alberta, Clovis points have thus far primarily been identified in surface finds and artifact collections; however, one Clovis point was recovered in situ from an excavated component in 2019 (Krahulic 2020; Reeves 1969; Wormington & Forbis 1965). Recently, a surface find of a Clovis point was found northwest of the Cypress Hills near Veinerville (Peck & Hudecek-Cuffe 2016).

Subsequent point types of the Early Prehistoric Period, such as Goshen and Folsom points (ca. 10,900 – 10,200 BP), are also poorly represented in southern Alberta. Similarly, Basally Thinned Triangular (ca. 10,500 BP) points are relatively rare and mostly limited to surface finds, with some exceptions (Jankuta & McKay 2017; Reeves 1975). These typically isolated finds have proven stubbornly difficult to attribute to broader cultural constellations or socio-economic processes, but are generally held to represent early exploitation of Alberta's post-glacial environment that grew out of older traditions present in the Intermountain West, and that on the plains developed towards traditions adapted to communal bison hunting.

The Hell Gap-Agate Basin Complex (10,200 – 9,200 BP) is also poorly represented by in situ finds in southern Alberta. The diagnostic projectile points include Agate Basin points, which are long and narrow, and Hell Gap points, which are similar but with wide shoulders. The focus of these sites appears to be on bison traps. The Lindoe site, just north of the Cypress Hills near Medicine Hat, is a massive bison bone bed in apparent association with a Hell Gap point (Bryan 2000).

A more well-defined cultural complex to appear in the Northern Plains is the Cody Complex, which appears to have emerged in the Southern Plains and gradually spread north to the Northern Plains, likely in conjunction with a warming trend with an increasingly arid climate (Frison 1991). Associated with specialized bison hunting, the Cody Complex was first defined in 1951 at the Horner Site, a bison kill site located near Cody, east of Yellowstone National Park in Wyoming. The complex is characterized by Alberta, Eden, and Scottsbluff points, as well as the distinctive Cody knife, a bifacially worked asymmetrical knife. Since its initial description, Cody Complex sites have become relatively well documented in the Northern Plains, as well as in the Central and Northern Rocky Mountain Basins, and appear to have replaced earlier hunting traditions (Stanford 1999). In Alberta, Cody Complex sites are relatively common in comparison to previous site types, and include the Fletcher site (Forbis 1968), as well as a bison kill site south of Taber (Wormington & Forbis 1965); a Scottsbluff component was also identified during excavations at Hunter Valley, north of Cochrane (de Guzman 2010). Sites have also been found west of the Porcupine Hills along the Oldman River (Van Dyke 1994), as well as in the Bow Valley near Banff (Fedje 1988).

The disappearance of the Cody Complex marks the end of the Early Prehistoric Period, and it has been suggested that subsequent Country Hills points represent a transitional phase to the Middle Prehistoric Period (Peck 2011). The end of the Early Prehistoric Period and the onset of the Middle Prehistoric Period is also associated with a shift to a warmer and drier climate. This shift is referred to alternately as the Altithermal (Antevs 1955), the Neo-Atlantic Climatic Episode (Wendland & Bryson 1970), or the Hypsithermal (Deevey & Flint 1957), and is accompanied by a northerly expansion of grassland ecozones into Alberta and Saskatchewan (Wendland 1978), as well as an eastward expansion of short-grass prairie at the expense of pre-existing long-grass prairie environments (Reeves 1973). While specialized communal bison hunting remained the predominant subsistence strategy in the Northern Plains, this climatic shift is accompanied in some parts, such as the Gowen sites in Saskatchewan, by the adoption of broad-spectrum resource exploitation (Walker 1992).

Overall, the onset of the Middle Prehistoric Period is characterized by the appearance of smaller, side and corner-notched projectile points, and a shift from thrusting spear points to atlatls and dart points. The Stampede site (DjOn-28) is located in the Cypress Hills. The site provides an unprecedented record of the Middle Prehistoric Period. The base of the deposits of the Stampede site has not been reached, but the earliest culture-bearing levels with diagnostic artifacts produced a Mummy Cave (7,300 – 4,500 BP) complex assemblage. The Mummy Cave complex is an intrusive cultural complex that originated east of the Plains (Reeves 1969). Based partly on the sequence at the Stampede site, the Mummy Cave complex has been subdivided into smaller archaeological cultural units (Peck 2011; Peck & Hudecek-Cuffe 2019). Mummy Cave extends until ca. 6,700 BP, but ends with the eruption of Mount Mazama (Peck 2011). Subsequent complexes include Maple Leaf (6,300 – 5,200 BP), Calderwood (5,200 – 4,700 BP), and Estevan (4,900 – 4,500 BP), all of which slightly pre-date the Oxbow phase. Evidence of these other archaeological cultural units can also be found at Head-Smashed-In (Reeves 1978) and Majorville Cairn (Calder 1977), as well as the Long Creek site near Estevan in Saskatchewan (Wettlaufer & Mayer-Oakes 1960; Wormington & Forbis 1965).

The Estevan Phase sites immediately pre-date the Oxbow complex; both phases represent firsts in prehistory, with large amounts of fire-broken rock (FBR) occurring for the first time at Estevan sites and stone boiling pits first identified at Oxbow sites (Peck 2011). Subsequent complexes include Oxbow (4,500 – 4,100 BP), McKean (4,200 – 3,500 BP), Pelican Lake-Bracken (3,600 – 2,100 BP), and Besant (2,100 – 1,350 BP), all of which are well represented in the archaeological record. Bracken (ca. 2,800 – 2,100 BP) likely descends from Pelican Lake and represents the first large tipi encampments, with increased bison killing and enlarged camps; Bracken points are similar to Pelican Lake, but appear morphologically chunkier (*ibid.*). During the Bracken Phase, there is an intrusion, ca. 2,500 BP, of unique material attributed to the Outlook (ca. 2,500 BP) Phase, which exhibits substantial amounts of brown chalcedony that may originate from the Middle Missouri area. Peck (2011) also suggests that instead of Sonota being a

subphase of the Besant, Sonota actually supersedes the Besant, using both atlatls and pottery, representing the transition to the Late Prehistoric Period.

The Late Prehistoric Period is characterized by a trend towards increased sedentism and the introduction of the bow and arrow. Pottery is also present, albeit not extensively, and likely represents a technology borrowed from cultures to the east or southeast. Projectile points, which are generally side-notched, become smaller and more finely worked, and overall represent the most consistently uniform traditions since the Early Prehistoric Period. These are broadly represented by the Avonlea phase (1,350 – 1,100 BP), followed by the Old Women’s phase (1,100 – 250 BP). Materials from both phases have been recovered together, dating to ca. 1,100 BP, suggesting a relationship between the two phases (*ibid.*). The appearance of these phases is accompanied by the exploitation of new quarries in southern and central Montana.

The Late Prehistoric Period is characterized by site re-use and intensified use of bison jumps and pounds (Brumley & Dau 1988). At sites such as Head-Smashed-In, where bison jumps have been affected since the Middle Prehistoric Period, bone beds associated with Avonlea period materials are up to four times as thick as preceding Pelican Lake-Bracken phases, and are indicative of more intense and repeated use of the jump (Brink 2008; Reeves 1990). Evidence of intentional burning of killing floor refuse also appears at mass bison kill sites with the Avonlea phase (Reeves 1990), suggesting a need to reduce waste material to prepare for future jumps. Accompanying these changes is a geographical reorientation of sites as compared to preceding periods. Fewer materials are recovered from outlying prairie lands away from valleys and waterways than during the Pelican Lake phase (Brumley & Dau 1988; Meyer *et al.* 2016), suggesting landscape use concentrating settlement patterns and resource use towards the river valleys away from the prairie hinterlands. However, these patterns are not ubiquitous. For example, winter camp sites in the Oldman Basin are often significantly smaller, suggesting less frequent occupation in comparison to both the preceding Pelican Lake-Bracken phases and the subsequent Old Women’s phase (Van Dyke *et al.* 1990). In contrast, Avonlea winter camps south of the Oldman Basin near Belly River, and to its

north at Trout Creek, are typically larger and indicative of repeated occupation (Byrne 1973; Quigg 1974). The implication of these patterns is currently unclear but reflects variation in socio-economic behaviour on the local level not previously observed to the same extent during preceding periods.

The Old Women's phase (1,100 – 225 BP) represents the last Precontact phase on the Alberta plains and appears to develop directly out of the preceding Avonlea phase, with the possibility of a transitional phase between the two (see Forbis 1960). For example, at the site of Empress (EfOo-130), a co-occurrence of Avonlea and Old Woman's phase materials, including pottery, has been noted in three separate excavations at the site (Hudecek-Cuffe 1992; Reeves 1977). Projectile points from the Old Women's phase are characterized by small, triangular side-notched arrow points, and have historically been grouped into Prairie and Plains Side-Notched varieties (Forbis 1962; Peck 2011; Vickers 1986). The type site for these points is the Old Women's Buffalo Jump near Cayley (Forbis 1962). Since its description, a large number of these points have been recovered from excavated contexts throughout southern Alberta. In comparison to preceding Avonlea points, points of the Old Women's phase are typically less finely made and reflect greater variation in style while utilizing more locally sourced raw materials in their manufacture. Of particular note is the introduction of small black chert pebbles in biface and point production.

The introduction of European trade goods marks the Protohistoric Period. A continued variant of the Old Women's phase persists, with similar projectile point and pottery forms; however, items of European manufacture have entered the archaeological record, reflecting first contacts with "encroaching civilization" (Byrne 1973). These include metal projectile points and glass beads, such as those recovered from the Saamis site in Medicine Hat (Milne Brumley 1978). The One Gun phase (ca. 200 BP) has also been identified as a distinct complex of the Protohistoric Period, primarily represented by the Cluny Site, a fortified earth lodge village on the Bow River east of Calgary (Byrne 1973; Forbis 1977).

While these trade goods are indicative of European contact, there is no written documentation of this exchange until the arrival of Anthony Henday, an explorer for the Hudson's Bay Company, in 1754. The competitive fur trade led to the increased establishment of posts throughout the prairies and encouraged explorers and mappers to expand their horizons. Explorers such as Peter Pond, Alexander Mackenzie, David Thompson, Simon Fraser, Peter Fidler, and later, John Palliser expanded fur trade, as well as western scientific knowledge, north and west, establishing important new posts and establishing new areas for trade and settlement.

Around this same time, in 1870, John A. Macdonald and his Canadian government's National Policy sought to build the Dominion of Canada, establishing high protective tariffs, constructing a transcontinental railway, and encouraging immigration and settlement of western Canada. In 1873, the North West Mounted Police were established, with posts erected throughout the province. In 1874, the first of three treaties affecting Alberta's First Nations groups were signed, followed by Treaties 6, 7 and 8, which were signed in 1876 (central Alberta), 1877 (southern Alberta) and 1899 (northern Alberta), respectively. In 1895, Clifford Sifton, Minister of the Interior, began a relentless campaign that promoted settlement in western Canada. In the following years, more than one million people from around the world followed his call, establishing farms and homesteads throughout the area (see Heritage Community Foundation 2005a, 2005b).

### **3.4 PREVIOUS WORK**

The majority of newly identified historic resource sites continue to be discovered in the course of HRIAs in association with future developments. Known historic resource sites are recorded on Archaeological and Historic Site Inventory Data forms, which are kept on file with the Historic Resources Management Branch of Alberta Culture, Multiculturalism and Status of Women. Newly identified archaeological sites are designated a Borden number (Borden 1952) and assigned a historic resource value (HRV) ranging from 1 to 4 in decreasing significance; sites with an HRV 1 are generally World

Heritage Sites or Provincial Historic Resources, while sites with an HRV 4 indicate potential significance. Sites with no further significance are assigned an HRV of 0.

### **3.4.1 Archaeological Sites**

There are no known archaeological sites recorded within the proposed Project. However, there is one site within 1 km of the development area. EiPe-4 (HRV 4) is a precontact multi-component site that includes a historic foundation and two stone circles. The site is approximately 400 m north of the Midland portion of the development area. As the site is well outside the development footprint, it will not be impacted by the development area.

Notably, the two sites listed on the initial *Historical Resources Act* Requirements are located 16.8 km (EiPd-1) and 12.8 km (EiPd-3) from current project boundaries and will not be subject to impact. As such, these sites were not subject to revisit under the current permit.

### **3.4.2 Historic Sites**

Historic sites are designated unique HS numbers; these sites often co-occur at locations with archaeological sites, but exhibit the historic or 'built heritage' portion of the site; i.e., standing structures and above-ground features, as opposed to the archaeological portion; i.e., buried, or once-buried, cultural material. Much of the recorded information is limited to general location and site name, as many site forms have not been updated for over 10 to 20 years. Regardless, their presence is indicative of historic occupation in the area. There are no known Historic sites within 1 km of the proposed Project area.

## 4.0 RESEARCH DESIGN

As per the HRA Approval with Conditions, target areas are those illustrated and discussed in the Permit; these include well-defined landforms situated along the Red Deer River that have not experienced impacts from previous dike development or other impacts to deep sediments. One additional target area was added following permit issuance, as part of the proponent's due diligence program. Target areas were selected through review of WMS Toporama and ESRI World Imagery; review of this material revealed undisturbed and potentially relatively well-defined landforms situated along the Red Deer River, where there is potential for intact, deeply buried cultural material. Review of known historic resource sites also revealed a single (stone feature site) on lands well back from the river's edges. Areas not recommended for HRIA include those areas evidently disturbed by previous dike construction and other forms of infrastructure development with deep impacts. While not all of the target areas will require a surface survey due to disturbance, all of these target areas will be subject to subsurface testing using a backhoe to ensure sediments are sampled at depth.

## 5.0 METHODOLOGY

Field investigations are conducted in accordance with the *Historical Resources Act*, the Guidelines for Archaeological Permit Holders in Alberta, the Archaeological and Palaeontological Research Permit Regulation (Alberta Regulation 254/2002), and all applicable Historic Resources Management Branch (HRMB) “Survey Notes” and “Information Bulletins,” with the objective of identifying previously unknown archaeological and historic sites within the project area, as well as assessing the impact of the current development to any known heritage resources.

Fieldwork was undertaken in summer conditions (i.e., under snow-free and frost-free conditions). Traditional techniques of archaeological survey were employed, including pedestrian reconnaissance of the Project, along with examination of exposures, and deep testing with the aid of a backhoe due to the presence of significant sedimentation. Backhoe testing was to be carried out at systematic intervals, ca. 20 m, across the Target Areas adjacent to the Red Deer River, as these landforms were thought to exhibit moderate to high potential for deep deposition and/or the identification of intact buried cultural material. Exposures were rare, and the surface was observed to have largely been disturbed by land levelling (TA 1), nearby construction (TA 2), and manicured lawns (TA 3). As the landscape in all three Target Areas had been heavily terraformed, shovel tests were not deemed a viable approach to assessing the subsurface, especially after backhoe tests produced evidence for disturbance down to at least 20 cm below surface (cmbs), with disturbance extending down to 100 cmbs in one trench. Subsurface testing occurred at the discretion of the permit-holding archaeologist, within the largely undifferentiated, terraformed floodplain area.

Subsurface testing was confined to the project boundary and was limited to backhoe testing. Backhoe tests measured 1 x 3 m and were excavated to the depth of the backhoe arm, ca. 3.3 m, which invariably terminated in sterile gleysols or very deep undifferentiated silts across the project area (Figure 4). Representative stratigraphy was noted for all backhoe tests, and photographs and detailed notes were taken, before all tests were returned as best as possible to their original state.

The following section details the field investigations conducted with regard to the Drumheller Resiliency and Flood Mitigation project; reporting is in accordance with the *Historical Resources Act*, the *Guidelines for Archaeological Permit Holders in Alberta*, and the *Archaeological and Palaeontological Research Permit Regulation* (Alberta Regulation 254/2002), as well as the associated *Historical Resources Act Requirements* (HRA Number: 4956-20-0069-002).



Figure 4. Typical backhoe test, Target Area 1, showing floodplain and flood sediments on the surface (with Hwy 838 in middle background and trees in small drainage on right).

## 6.0 RESULTS

The purpose of the HRIA was to assess historic resources which may be impacted or in conflict with the proposed development. Field investigations, including ground reconnaissance and subsurface testing, were conducted on June 20, 2022. The landscape within the Project is dominated by the floodplain on the north and south side of the Red Deer River within the Town of Drumheller. Portions of the Project area were targeted for HRIA due to the perceived high potential of impacting historic resources along depositional environments associated with the Red Deer River. Within the Project, two Target Areas were agreed upon in the permit application as the HRIA Target Areas, with a third Target Area added in conversation with the client as part of their due diligence process; this area was just east of the existing berm on the floodplain of the Red Deer River in the Newcastle Beach Park. Subsurface inspections were conducted for all three Target Areas (Table 2).

Location	Topography / Vegetation	# of Backhoe Tests (BHT)	Historic Resources	Recommendation
Target Area 1	Terraformed, floodplain / grasses and cottonwoods	4 BHT	n/a	HRA* Approval
Target Area 2	Surficially disturbed floodplain / grasses and shrubs	2 BHT	n/a	HRA* Approval
Target Area 3	Terraformed floodplain / manicured lawn	3 BHT	n/a	HRA* Approval

Table 2. Summary of HRIA under the current permit (\*HRA = Historical Resources Act).

## 6.1 TARGET AREA 1

Target Area 1 covered a 14 m wide by 170 m long corridor located immediately west of a drainage paralleling 25<sup>th</sup> Street NW, south of Hwy 838, and north of a former rail line (Figure 5). The overall Project continues farther to the south and then curves to the east to parallel the north bank of the Red Deer River; however, this area has already been impacted by prior flood mitigation efforts. The terrain is flat due to land leveling, presumably for further housing that did not expand west. Two large cottonwood stumps were noted about mid way north-south in the Target Area, suggesting terraforming occurred but fill was not brought into the area. The land is currently vacant with the remnants of a tarmac road on parts of the east side. This area is bound to the north by Hwy 838, to the south by a slough adjacent to a former rail line bed, to the east by a small drainage and the western edge of the Town of Drumheller, and to the west by land that has been cleared but not terraformed (Figure 6 and Figure 7). Vegetation consists of quack grass and other invasive species while the evidence of cottonwood trees is suggested by their stumps and their presence in the drainage immediately to the east.

The Target Area was selected for deep testing as it is a floodplain adjacent to the Red Deer River, providing a depositional environment with potential for deeply buried cultural material. It was selected with full knowledge that the surficial sediments were likely somewhat disturbed during the construction of the nearby subdivision to the east. A total of four backhoe tests (BHT) were conducted to sample the subsurface sediments moving back from the river's edge, with spacing of approximately 20 m apart. Surface examination observed the presence of a partial tarmac roadway in portions of the development area (Figure 8).

The stratigraphy of the tests confirmed that the surface had been disturbed, to at least 50 cm below surface (cmbs) or more, with undisturbed, massive, undifferentiated silts present beneath the disturbance (Figure 9; Appendix D). In the three most southern backhoe tests (BHT 1, 2, 3), massive, undifferentiated silts overlaid sands and gravels at about 300 cmbs, while in the northern most backhoe test (BHT 4), the silts overlaid clay at 200 cmbs.

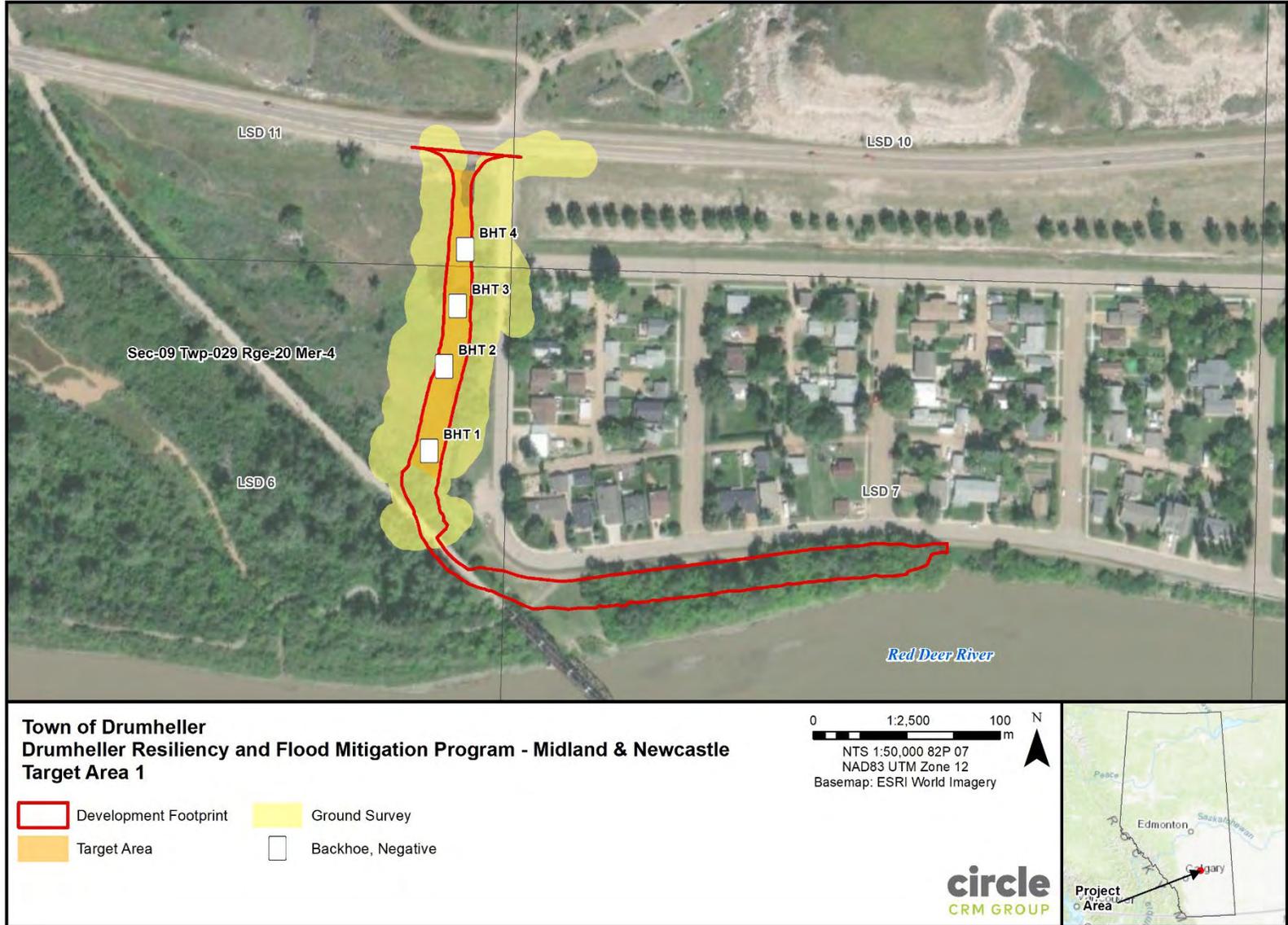


Figure 5. Map of Target Area 1 illustrating backhoe test locations (BHT 1 to 4).



Figure 6. Northern end of Target Area 1 illustrating level terrain and invasive grass with cottonwood trees in drainage to east (right), view north.



Figure 7. Target Area 1 from rail line bed, at south, facing north across the entire terraformed 170 m long by 14 m wide area, towards Hwy 838.



Figure 8. Tarmac present in portions of Target Area 1, with BHT 4 in background.



Figure 9. Soil profile of BHT 1 on the floodplain in Target Area 1. The lack of an Ah Horizon, indicating disturbance, is clearly visible.

The upper sediments consisted of a light to medium grey-brown undifferentiated silt in all four tests. Three of the tests (BHT 1, 3, and 4) contained evidence of disturbance, including a fragment of a culvert, coal and red shale slag, brick, and a few pieces of porcelain and glass. The depth of this disturbance layer varied by BHT; 50 cmbs in BHT 1, 52 cmbs in BHT 3, and 100 cmbs in BHT 4 (Appendices C & D). The lower sediments (massive, undifferentiated silts overlying sands, gravels, and clay) appear to be intact. Importantly, no palaeosols were observed and almost no rock was observed from the silt layers until they came in contact with sand, gravel, or clay at depth. Thus, observing any inclusions (e.g., cultural items) in the silts would be very easy (see Appendix C). However, all of these sediments were sterile for cultural materials.

## 6.2 TARGET AREA 2

Target Area 2 covers a 10 m wide by 30 m long corridor located immediately west of a gravel road that intersects Newcastle Trail as a gravel alley extension of 2<sup>nd</sup> Avenue West on the south side of the Red Deer River (Figure 10). The overall Project continues farther to the northeast, paralleling the Red Deer River, and to the south, across the Red Deer River floodplains. Target Area 2 focusses on a portion of the dike where the Red Deer River floodplain appears to be undisturbed by a previous roadway immediately adjacent to its south bank. The terrain is relatively flat, with undisturbed lands to the west and a roadway immediately to the east. The surface showed signs of disturbance from vehicle traffic with some abandoned yard waste (i.e., tree branches). Otherwise, the land is vacant. This area is bound to the north by a sharp drop-off to the Red Deer River and the Red Deer River itself, to the south by Newcastle Trail, to the east by a gravel road, and to the west by undisturbed river bank and floodplain (Figure 11). Vegetation consists of quack grass and other invasive species, again suggesting disturbance.

The Target Area was selected for deep testing as it is a floodplain adjacent to the Red Deer River, providing a depositional environment with potential for deeply buried cultural material. It was selected not realising there was an existing gravel alley at the location; in conversation with the client, it was arranged to test immediately west of the gravel alley to avoid disrupting traffic flow in the area. A total of two backhoe tests were conducted to sample the subsurface sediments moving back from the river's edge, with spacing of approximately 20 m. Surface examination observed the evidence of vehicular traffic in the area despite it not being part of the roadway.

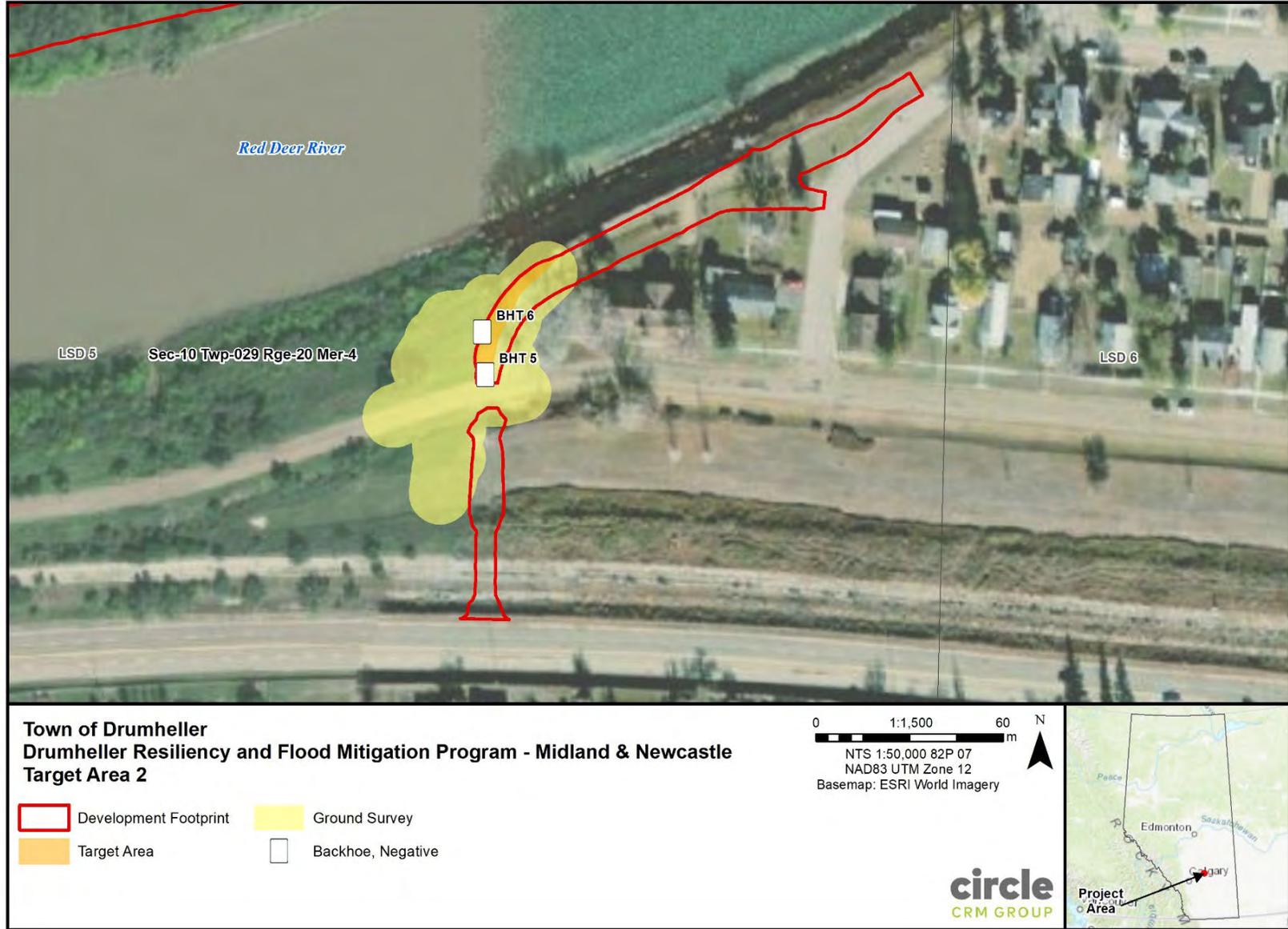


Figure 10. Map of Target Area 2 illustrating backhoe test locations (BHT 5 and 6).



Figure 11. The south end of Target Area 2 illustrating BHT 5, view north, with Newcastle Trail in foreground, the gravel alley to the east (right), and BHT 6 in the background just left of the guard rail.

The stratigraphy of the tests confirmed that the surface had been disturbed to at least 60 cmbs or more, but that undisturbed, massive, undifferentiated silts were present beneath the disturbance (Figure 12; Appendix D). In both backhoe tests (BHT 5 and 6), the massive, undifferentiated silts extend to at least 360 cmbs, and possibly more than 400 cmbs (Appendices C & D). In BHT 5, at about 121 cmbs, a 1 cm thick organic layer (Figure 13) extended across about 2 m of the backhoe trench; two bison bone (distal tibia and portion of *os coxae*) were inferred to have been recovered from this layer due to the type of sediments sticking to their surface. The bones did not exhibit cut marks and an inspection of the backhoe walls did not reveal anymore material (see Appendix C).



Figure 12. Soil profile of BHT 6 on the floodplain in Target Area 2. The lack of an Ah horizon, indicating disturbance, is clearly visible.



Figure 13. Soil profile of BHT 5 on the floodplain in Target Area 2, illustrating thin organic layer at about 121 cmbs (red arrow).

### 6.3 TARGET AREA 3

The location of Target Area 3 was not included in the Permit application. However, in conversation with the client, Target Area 3 was added to the project as part of the client's due diligence process. Target Area 3 was added as it is a 10 m wide by 200 m long corridor located immediately east of the existing dike in Newcastle Beach Park on the floodplain of the Red Deer River (Figure 14). The overall Project continues farther to the west, paralleling the south bank of the Red Deer River; however, in this area the floodplain has already been impacted by prior flood mitigation efforts. The area examined under the current permit includes terrain that is flat due to land levelling for the previous dike and the development of the park, but is otherwise intact. The land is currently a picnic area and sports field landscape. This area is bound to the north by the Red Deer River floodplain and the river itself, to the south and west by the currently existing dike, and to the east by a gravel roadway within the park (Figure 15 and Figure 16). Vegetation consists of quack grass and other invasive species, while the evidence of cottonwood trees is suggested by their stumps and their presence in the drainage immediately to the east. The vegetation consists of manicured lawns and large, old growth cottonwood trees that populate the entire area of Target Area 3.

The Target Area was selected for deep testing as it is a floodplain adjacent to the Red Deer River, providing a depositional environment with potential for deeply buried cultural material. It was added to the permit with full knowledge that the surficial sediments were likely somewhat disturbed during the construction of the nearby dike and picnic area. A total of three backhoe tests were conducted to sample the subsurface sediments moving parallel to the river's edge, with spacing of approximately 70 m apart. As already noted, surface examination observed the presence of a manicured lawn with picnic tables immediately adjacent to the existing dike structure.

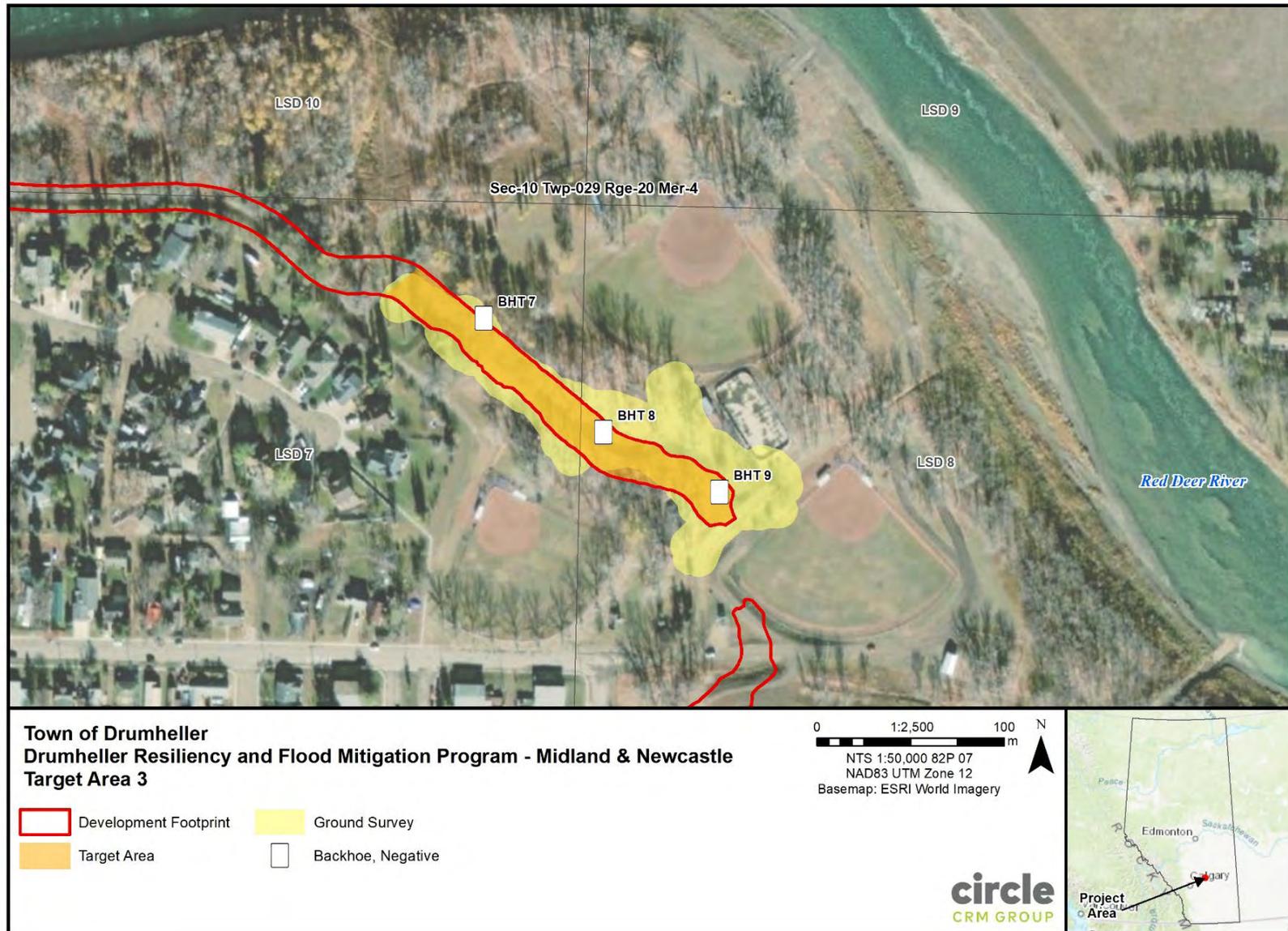


Figure 14. Map of Target Area 3 illustrating backhoe test locations (BHT 7 to 9).

The stratigraphy of the tests confirmed that the surface has largely been disturbed with no obvious Ah Horizon in two of the three tests (i.e., BHT 8 and 9), indicating surface stripping has occurred (Appendix D). Immediately beneath the stripped Ah are massive, undifferentiated silts to at least 100 cmbs (Appendices C & D).

In BHT 9, the remains of an old irrigation system, in the form of a 1" pipe, was found at 15 cmbs in the silts. Beneath the silts lie gleysols and groundwater at 200 cmbs or deeper. Importantly, no palaeosols were observed and almost no rock was observed from the silt layers (see Appendix C). No cultural material was identified.



Figure 15. BHT 9 at east end of Target Area 3 illustrating the existing dike (left) and old growth trees and floodplain terrain (centre and right), view northwest.



Figure 16. BHT 7 at west end of Target Area 3 illustrating the dike (left) with old growth trees and floodplain (centre and right), view west.

## 7.0 SUMMARY AND RECOMMENDATIONS

On June 20, 2022, an HRIA was conducted for the Town of Drumheller, Drumheller Resiliency and Flood Mitigation Program – Midland & Newcastle, located just west of downtown in the Town of Drumheller, on the north and south banks of the Red Deer River.

As per the *HRA* Approval with Conditions, parts of Project lands with high archaeological potential were subject to pedestrian reconnaissance, examination of exposures, as well as deep mechanized testing (n=9), to assess deeper sedimentations (HRA Number: 4956-20-0069-002). Significantly, the client added a Target Area to those selected as part of their due diligence process for the project.

The stratigraphic profiles observed during the excavation of backhoe tests in Target Area 1 suggested the upper sediments were heavily disturbed and overlaid intact silts to great depth overlying sand and gravel sediments. The disturbed upper sediments produced modern garbage likely associated with levelling during construction of the subdivision to the east. Target Area 2 was immediately adjacent to an existing gravel road. The upper levels exhibited evidence of disturbance with massive, undifferentiated silts to a great depth. Target Area 3 also exhibited disturbance in the upper levels with undifferentiated silts overlying gleysols and groundwater. All of the backhoe tests failed to encounter cultural materials and palaeosols.

Given the results of the HRIA, **it is recommended that the Town of Drumheller, Drumheller Resiliency and Flood Mitigation Program – Midland & Newcastle be granted *Historical Resources Act* Approval as per the plans in Appendix A and in fulfillment of the *Historical Resources Act* Requirements (4956-20-0069-002).** These recommendations are subject to the approval of Alberta Culture and Status of Women.

## REFERENCES CITED

- Adams, B.W., L. Poulin-Klein, D. Moisey, and R.L. McNeil  
2005 *Rangeland Plant Communities and Range Health Assessment Guidelines for the Dry Mixedgrass Natural Subregion of Alberta*. Rangeland Management Branch, Public Lands Division, Alberta Sustainable Resource Development, Lethbridge. Pub. No. T/040.
- Antevs, Ernst  
1955 Geologic-Climatic dating in the West. *American Antiquity* 20(4):317-335.
- Borden, C.E.  
1952 A Uniform Site Designation Scheme for Canada. *Anthropology in British Columbia* 3:44-48.
- Brink, J.  
2008 *Imagining Head-Smashed-In: Aboriginal Bison Hunting on the Northern Plains*. Athabasca University Press, Calgary.
- Brumley, J.H., and B.J. Dau  
1988 Historical Resource Investigations within the Forty Mile Coulee Reservoir. In *Archaeological Survey of Alberta Manuscript Series No. 13*. Archaeological Survey of Alberta, Edmonton.
- Bryan, Alan  
2000 The Lindoe Site, Southeastern Alberta. Non-permit Report. Archaeological Survey of Alberta, Edmonton.
- Byrne, William J.  
1973 *The Archaeology and Prehistory of Southern Alberta as Reflected by Ceramics*. National Museum of Man Mercury Series, Archaeological Survey of Canada Paper No. 14, Ottawa.
- Calder, James M.  
1977 *The Majorville Cairn and Medicine Wheel site, Alberta*. National Museum of Man Mercury Series, Archaeological Survey of Canada Paper No. 62, Ottawa.
- Catto, N., and C.A. Mandryk  
1990 Geology of the Postulated Ice-Free Corridor. In *Megafauna and Man: Discovery of America's Heartland*, edited by Larry D. Agenbroad, J.I. Mead and L.W. Nelson, pp. 81-85. The Mammoth Site of Hot Springs, South Dakota. Scientific Papers, Vol. 1. Hot Springs, South Dakota.

Churcher, C.S., and M. Wilson

1979 Quaternary Mammals from the Eastern Peace River District, Alberta. *Journal of Paleontology* 53(1):71-76.

Deevey, Edward S., and Richard Foster Flint

1957 Postglacial Hypsithermal Interval. *Science* 125(3240):182-184.

de Guzman, Margarita

2010 Historic resources impact mitigations Taylor NGL Limited Partnership Harmattan to Cochrane pipeline mitigation at sites EiPo-55, EiPp-16 and EiPp-20: final report (ASA permit 09-260), unpublished consultant's report on file with the Archaeological Survey of Alberta, Edmonton.

Dyck, Ian

1983 The Prehistory of Southern Saskatchewan. In *Tracking Ancient Hunters: Prehistoric Archaeology in Saskatchewan*, edited by Henry T. Epp and Ian Dyck, pp. 63-139. Saskatchewan Archaeological Society, Regina.

Dyke, Arthur

2004 An Outline of North American Deglaciation with Emphasis on Central and Northern Canada. In *Quaternary Glaciations-Extent and Chronology, Part II: North America*, edited by Jürgen Ehlers and P.L. Gibbard, Quaternary Science Vol. 2(6):373-424. Elsevier, Amsterdam.

Fedje, Daryl

1988 *The Norquay and Eclipse Sites: Trans-Canada Highway Twinning Mitigation in Banff National Park*. Parks Canada Microfiche Report Series No. 395. Ottawa.

Fenton, M.M., E.J. Waters, S.M. Pawley, N. Atkinson, D.J. Utting, and K. McKay

2013 *Surficial Geology of Alberta*. Alberta Geological Survey Map 601. Alberta Energy Regulator/Alberta Geological Survey, Edmonton.

Forbis, Richard G.

1960 Some Late Sites in the Oldman River Region, Alberta. In *Contributions to Anthropology* 1957:119-164. National Museum of Canada Bulletin 162. Ottawa.

1962 The Old Women's Buffalo Jump, Alberta. In *Contributions to Anthropology* 1960(1):57-123. National Museum of Canada Bulletin 180. Ottawa.

1968 Fletcher: A Paleo-Indian Site in Alberta. *American Antiquity* 33(1):1-10.

1977 *Cluny, an Ancient Fortified Village in Alberta*. The University of Calgary Department of Archaeology Occasional Papers No. 4, Calgary.

Frison, G.C.

1991 *Prehistoric Hunters of the High Plains*. 2nd ed. Academic Press, New York.

Frison, G.C., and R. Bonnichsen

1996 The Pleistocene-Holocene Transition on the Plains and Rocky Mounts of North America. In *Humans at the End of the Ice Age: The Archaeology of the Pleistocene-Holocene Transition*, edited by L.G. Straus, B.V. Eriksen, J.M. Erlandson, and D.R. Yesner, pp. 303-318. Plenum Press, New York.

Heritage Community Foundation

2005a Alberta: How the West was Young. AlbertaSource.ca, the Alberta Online Encyclopedia.

2005b Alberta: Home, Home on the Plains. AlbertaSource.ca, the Alberta Online Encyclopedia.

Historic Resources Management Branch

2022 Listing of Historic Resources (March 2022 edition). Alberta Culture and Status of Women, Edmonton.

Hudecek-Cuffe, Caroline

1992 Aspects of Culture Change in the Late Prehistoric Period on the Northwestern Plains. *North American Archaeologist* 13(4):317–332.

Jankuta, Kimberly, and Kristin McKay

2017 Historical resources impact assessment Foothills Forest Products 2016-2017 annual operating plan: final report (ASA Permit 16-010), unpublished consultant's report on file with the Archaeological Survey of Alberta, Edmonton.

Krahulic, Tobi

2020 Historical resources impact mitigation Grande Prairie Mainline Loop No. 2 - Wapiti section, mitigation of site GfQu-30: final report (ASA 19-080), unpublished consultant's report on file with the Archaeological Survey of Alberta, Edmonton.

Meyer, Dan, Lindsay Amundsen-Meyer, Kendra Kolomyja, and Erik Johannesson

2016 Flood Impact Assessment Program 2015 Historical Resources Impact Mitigation at EePj-103 (Margaret's Site) on the Bow River Final Report (ASA Permit 15-167), unpublished consultant's report on file with the Archaeological Survey of Alberta, Edmonton.

Milne Brumley, Laurie

1978 *The Saamis Site: A Late Prehistoric-Protohistoric Campsite in Medicine Hat, Alberta*. National Museum of Man Mercury Series, Archaeological Survey of Canada Paper No. 79, Ottawa.

Natural Regions Committee

2006 *Natural Regions and Subregions of Alberta*. Compiled by D.J. Downing and W.W. Pettapiece. Government of Alberta. Pub. No. T/852.

Peck, Trevor R.

2011 *Light from Ancient Campfires: Archaeological Evidence for Native Lifeways on the Northern Plains*. Athabasca University Press, Edmonton.

Peck, Trevor R., and Caroline Hudecek-Cuffe

2016 A Clovis Point Surface Find (EaOp-59) near Veinerville, Southeastern Alberta. *Alberta Archaeological Review* 62 & 63:12-13.

Quigg, Michael J.

1974 *The Belly River: Prehistoric Population Dynamics in a Northwestern Plains Transitional Zone*. National Museum of Man Mercury Series, Archaeological Survey of Canada Paper No. 23, Ottawa.

Reeves, B.O.K.

1969 The Southern Alberta Paleo-cultural Paleo-Environmental Sequence. In *Post-Pleistocene Man and His Environments on the Northern Plains*, edited by Richard Forbis, Leslie B. Davis, Ole Christensen, and Gloria Fedirchuk, pp 6-46. University of Calgary, Archaeological Association, Calgary.

1973 The Concept of an Altithermal Cultural Hiatus in Northern Plains Prehistory. *American Anthropologist* 75(5): 1221-1253.

1975 Archaeological Salvage Investigations Alberta Highways and Transport Construction Project Secondary Highway SR 901, Bow River Crossing. Consultant's Report (ASA Permit 74-028), unpublished consultant's report on file with the Archaeological Survey of Alberta, Edmonton.

1977 *Historical Site Report, Dome Petroleum Limited, Empress-Red Deer Ethane Pipeline*. Archaeological Survey of Alberta. Permit No. 1976-065. Copies available from Archaeological Survey of Alberta, Edmonton.

1978 Head-Smashed-In: 5,500 Years of Bison Jumping in the Alberta Plains. *Plains Anthropologist* 23(82):151-174.

1990 Communal Bison Hunters of the Northern Plains. In *Hunters of the Recent Past*, edited by Leslie B. Davis and Brian O.K. Reeves, pp 168-194. Unwin & Hyman, London.

Shetsen, I.

1990 *Quaternary Geology, Central Alberta*. Alberta Forestry, Lands and Wildlife, Edmonton, AB.

Stanford, D.J.

1999 Paleoindian archaeology and late Pleistocene environments in the Plains and southwestern United States. In *Ice Age People of North America: Environments, Origins, and Adaptations*, edited by R. Bonnicksen and K.L. Turnmire, pp. 281-339. Center for the Study of the First Americans, Corvallis, Oregon.

Strong, W.L., and K.R. Leggat

1992 *Ecoregions of Alberta*. Alberta Forestry, Lands and Wildlife, Edmonton, AB. Pub. No. T/245. Map at 1:1,000,000.

Van Dyke, Stanley

1994 Oldman River Dam Prehistoric Archaeology Mitigation Program: Technical Series No. 1: Campsites Study, 1988-1991 (ASA Permits 88-039, 89-025, 90-025, 92-050). Archaeological Survey of Alberta, CRM 100. Copies available from the Archaeological Survey of Alberta.

Van Dyke, Stanley, Sharon Hanna, Wendy Unfreed, and Barb Neal

1990 1989 Oldman River Dam Prehistoric Mitigation Program Campsites Component: final report (ASA Permit 89-025), unpublished consultant's report on file with the Archaeological Survey of Alberta, Edmonton.

Vickers, J. Roderick

1986 Alberta Plains Prehistory: A Review. In *Archaeological Survey of Alberta Occasional Paper No. 27*. Archaeological Survey of Alberta, Edmonton.

Walker, Ernest G.

1992 *The Gowen Sites: Cultural Responses to Climatic Warming on the Northern Plains (7500-5000 B.P.)*. Canadian Museum of Civilization Mercury Series, Archaeological Survey of Canada Paper No. 145, Hull.

Wedel, Waldo R.

1953 Some Aspects of Human Ecology in the Central Plains. *American Anthropologist* 55(4):499-514.

Wendland, Wayne M.

1978 Holocene Man in North America: The Ecological Setting and Climatic Background. *Plains Anthropologist* 23(82):273-287.

Wendland, Wayne M., and Reid A. Bryson

1970 Atmospheric Dustiness: Man and Climatic Change. *Biological Conservation* 2(2):125-128.

Wettlaufer, Boyd N., and William J. Mayer-Oakes

1960 *The Long Creek Site*. Anthropological Series No. 2, Department of Natural Resources, Saskatchewan Museum of Natural History, Regina.

Wormington, H.M., and Richard G. Forbis

1965 *An Introduction to the Archaeology of Alberta, Canada*. Proceedings No. 11, Denver Museum of Natural History.

**APPENDIX A:**  
**DEVELOPMENT PLAN**

Drumheller Resiliency and Flood Mitigation Program  
Midland and Newcastle



**NOTES:**

1. 2019 AERIAL IMAGE (PROVIDED BY DRUMHELLER RESILIENCY AND FLOOD MITIGATION OFFICE).
2. RIVER  $\epsilon$  PER NHC (APRIL 2020).
3. PROJECT COORDINATE SYSTEM CANA83-3TM114.
4. SCALE NOTATIONS INDICATED ARE BASED ON AN ANSI B DRAWING FORMAT.

**LEGEND:**

DIKE FOOTPRINT



**PLAN**  
SCALE = 1:1250



Project Number:  
Date: MARCH, 2022

DRUMHELLER RESILIENCY AND FLOOD MITIGATION PROGRAM  
PRELIMINARY DESIGN

**DRAFT**

NOT FOR CONSTRUCTION

FOR DISCUSSION ONLY





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**LEGEND:**

DIKE FOOTPRINT



**PLAN**  
SCALE = 1:1250



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DRUMHELLER RESILIENCY AND FLOOD MITIGATION PROGRAM  
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**DRAFT**

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**LEGEND:**

DIKE FOOTPRINT



**PLAN**  
SCALE = 1:1250



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Date: MARCH, 2022

DRUMHELLER RESILIENCY AND FLOOD MITIGATION PROGRAM  
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4. SCALE NOTATIONS INDICATED ARE BASED ON AN ANSI B DRAWING FORMAT.

**LEGEND:**

DIKE FOOTPRINT



**PLAN**  
SCALE = 1:1250



Project Number:  
Date: MARCH, 2022

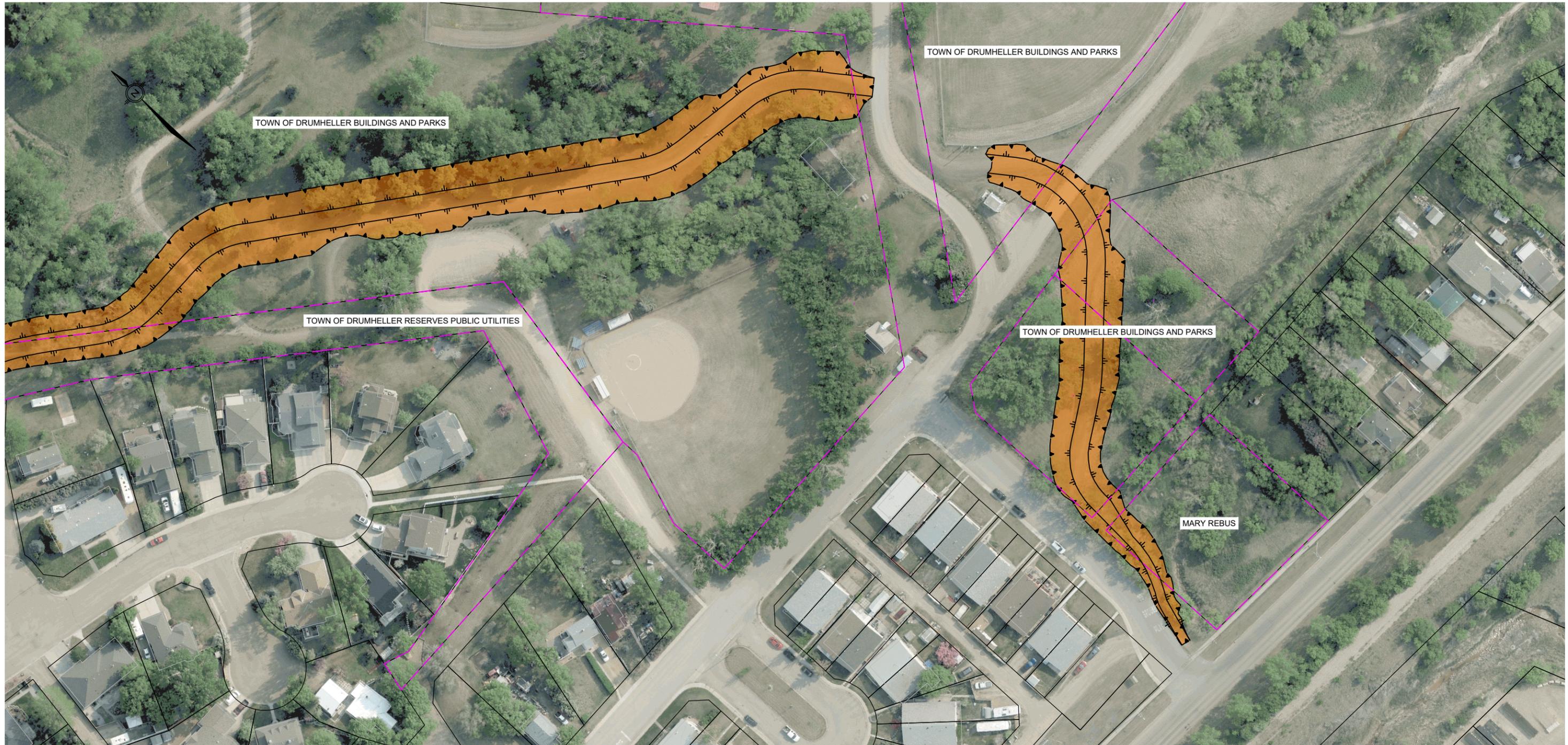
DRUMHELLER RESILIENCY AND FLOOD MITIGATION PROGRAM  
PRELIMINARY DESIGN

**DRAFT**

NOT FOR CONSTRUCTION

FOR DISCUSSION ONLY





**NOTES:**

1. 2019 AERIAL IMAGE (PROVIDED BY DRUMHELLER RESILIENCY AND FLOOD MITIGATION OFFICE).
2. RIVER  $\epsilon$  PER NHC (APRIL 2020).
3. PROJECT COORDINATE SYSTEM CANA83-3TM114.
4. SCALE NOTATIONS INDICATED ARE BASED ON AN ANSI B DRAWING FORMAT.

**LEGEND:**

DIKE FOOTPRINT



**PLAN**  
SCALE = 1:1250



Project Number:  
Date: MARCH, 2022

DRUMHELLER RESILIENCY AND FLOOD MITIGATION PROGRAM  
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**APPENDIX B:**  
***HISTORICAL RESOURCES ACT REQUIREMENTS***

HRA Number: 4956-20-0069-002

## Historical Resources Act Approval with Conditions

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Proponent: Drumheller Resiliency and Flood Mitigation Office  
224 Centre Street, Drumheller, AB T0J 0Y4

Contact: Darryl Drohomerski

Agent: Circle CRM Group Inc.

Contact: Trevor Peck

**Project Name:** Drumheller Resiliency and Flood Mitigation - Dike D

Project Components: Flood Mitigation / Remediation

Application Purpose: Requesting HRA Approval / Requirements

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*Historical Resources Act* approval is granted for the activities described in this application and its attached plan(s)/sketch(es) subject to the following conditions.



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Matthew Wangler  
Acting Assistant Deputy Minister  
Heritage Division  
Alberta Culture and Status of  
Women

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### SCHEDULE OF CONDITIONS

#### ARCHAEOLOGICAL RESOURCES

*Historical Resources Act* approval is granted in relation to archaeological resources, subject to the conditions outlined below.

1. The following *Historical Resources Act* conditions are based on the results of Historic Resources Impact Assessment studies carried out by Circle CRM Group Inc. under Archaeological Research Permit No. 21-112.
2. *Historical Resources Act* approval is issued for the Drumheller Resiliency and Flood Mitigation - Dike D Project, as illustrated in the development plan included in Appendix A of the Final Report for Archaeological Research Permit No. 21-112. Development can proceed in the Dike D development footprint without any further concerns for archaeological resources.
3. Relative to the remaining areas and components of the overall Drumheller Resiliency and Flood Mitigation Project, outstanding *Historical Resources Act* requirements for the completion of a Historic Resources Impact Assessment for archaeological resources, as outlined in *Historical Resources Act* Requirements (4956-20-0069-001; Oct 30/2020) remain in effect and are reiterated below.

**SCHEDULE OF CONDITIONS (continued)**

4. The Historic Resources Impact Assessment of all remaining areas and components of the Drumheller Resiliency and Flood Mitigation Project must address all areas of high archaeological potential within the project area including, but not limited to, undisturbed terrain in areas that have not been assessed systematically under previous Historic Resources Impact Assessment studies, and areas in proximity to previously recorded archaeological and historic sites. The permit application is to be accompanied by a detailed selection of areas for assessment.
5. Any further Historic Resources Impact Assessment for archaeological resources undertaken for this project is to be carried out prior to the initiation of any land surface disturbance activities under snow-free, unfrozen ground conditions. Should the project require field studies under winter conditions, directions in the [Archaeological Survey Information Bulletin: Winter Conditions](#) must be followed.
6. Any further Historic Resources Impact Assessment for archaeological resources undertaken for this project must be conducted on behalf of the proponent by an archaeologist qualified to hold an archaeological research permit within the Province of Alberta. A permit must be issued by Alberta Culture and Status of Women prior to the initiation of any archaeological field investigations. Please allow ten working days for the permit application to be processed. To obtain contact information for consultants qualified to undertake this work, please consult the list of [Alberta Historic Resource Consultants](#).
7. A deep testing program is required in areas of significant sedimentation.
8. During the conduct of any further Historic Resources Impact Assessment for archaeological resources the proponent's consulting archaeologist is to confirm the relationship between the footprint of the proposed project and the following previously recorded archaeological sites: EiPd-1 and EiPd-3.
9. Results of any further Historic Resources Impact Assessment investigations must be reported to Alberta Culture and Status of Women and subsequent *Historical Resources Act* approval must be granted before development proceeds in the remaining areas and components of the Drumheller Resiliency and Flood Mitigation Project.
10. Site-specific conditions are itemized below.

<b>SITE</b>	<b>HRV</b>	<b>SITE DESCRIPTION</b>	<b>CONDITIONS/APPROVAL</b>
EiPd-1	4	campsite, killsite	The proponent's consulting archaeologist is to confirm the relationship between this site and the footprint of the proposed project.
EiPd-3	4	campsite	The proponent's consulting archaeologist is to confirm the relationship between this site and the footprint of the proposed project.

**PALAEONTOLOGICAL RESOURCES**

There are no *Historical Resources Act* requirements associated with palaeontological resources; however, the proponent must comply with [Standard Requirements under the \*Historical Resources Act\*: Reporting the Discovery of Historic Resources](#), which are applicable to all land surface disturbance activities in the Province.

**ABORIGINAL TRADITIONAL USE SITES**

There are no *Historical Resources Act* requirements associated with Aboriginal traditional use sites of a historic resource nature; however, the proponent must comply with [Standard Requirements under the](#)

**SCHEDULE OF CONDITIONS (continued)**

[Historical Resources Act: Reporting the Discovery of Historic Resources](#), which are applicable to all land surface disturbance activities in the Province.

**HISTORIC STRUCTURES**

There are no *Historical Resources Act* requirements associated with historic structures; however, the proponent must comply with [Standard Requirements under the Historical Resources Act: Reporting the Discovery of Historic Resources](#), which are applicable to all land surface disturbance activities in the Province.

**PROVINCIALY DESIGNATED HISTORIC RESOURCES**

There are no *Historical Resources Act* requirements associated with Provincially Designated Historic Resources; however, the proponent must comply with [Standard Requirements under the Historical Resources Act: Reporting the Discovery of Historic Resources](#), which are applicable to all land surface disturbance activities in the Province.

**ADDITIONAL COMMENTS**

1. In addition to any specific conditions detailed above, the proponent must abide by all [Standard Conditions under the Historical Resources Act](#).

Lands Affected: All New Lands

Proposed Development Area:

MER	RGE	TWP	SEC	LSD List
4	20	29	12	4-5
4	20	29	11	8-10

Documents Attached:

Document Name	Document Type
Overview map	Miscellaneous

**APPENDIX C:**  
**BACKHOE TESTS**

Backhoe Test #01 to #09

## Backhoe Test #1 Maximum Depth 340 cmbs

0-2 cmbs: Vegetation/rootmat with occasional brick inclusions

2-50 cmbs: Light grey-brown undifferentiated silt, occasional brick inclusions

50-190 cmbs: Light grey-brown undifferentiated silt

190-340 cmbs: Mixed medium brown gravel (20%), sand (10%) and silt (70%) (intact); stopped at extent of backhoe arm

Note: Backhoe operator had heard this area had been disturbed in the 1960s for housing development; this would explain the surface levelling.



## Backhoe Test #2 Maximum Depth 370 cmbs

0-2 cmbs: Grass/rootmat lacking an Ah horizon

2-160 cmbs: Light grey-brown undifferentiated silt with moisture line at 50 cmbs

160-300 cmbs: Medium brown sandy silt

300-370 cmbs: Medium brown sand with gravel (20%); stopped at extent of backhoe arm



### Backhoe Test #3 Maximum Depth 380 cmbs

- 0-2 cmbs: Grass/rootmat with no Ah horizon
- 2-20 cmbs: Light to medium grey-brown silt
- 20-50 cmbs: Black coal/slag disturbance
- 50-52 cmbs Red shale disturbance
- 52-100 cmbs Light to medium grey-brown undifferentiated silt with frequent roots
- 100-270 cmbs Light grey-brown silt
- 270-380 cmbs: Medium brown sand; stopped at extent of backhoe arm



## Backhoe Test #4 Maximum Depth 330 cmbs

- 0-2 cmbs: Grass/rootmat with no Ah horizon
- 2-70 cmbs: Medium brown undifferentiated silty clay, with culvert fragment, other modern detritus
- 70-100 cmbs: Red and black layer with modern brick, ceramic, and glass inclusions
- 100-200 cmbs: Grey-brown clay
- 200-220 cmbs: Yellowish-brown clay
- 220-290 cmbs: Mottled yellowish-brown clay; stopped due to significant clay layers considered basal



## Backhoe Test #5 Maximum Depth 350 cmbs

- 0-2 cmbs: Grass/rootmat with no Ah horizon
- 2-60 cmbs: Medium rusty-brown silt, disturbed with occasional modern detritus
- 60-120 cmbs: Medium brown undifferentiated silt
- 120-121 cmbs: Dark brown organic lens. Note: a bison distal tibia and *os coxae* fragment recovered from the spoil are inferred to be from this layer; however, shaving of the walls found no cultural material
- 121-350 cmbs: Medium brown undifferentiated silt; excavated to the extent of backhoe arm



## Backhoe Test #6 Maximum Depth 400 cmbs

- 0-2 cmbs: Grass/rootmat with no Ah horizon
- 2-70 cmbs: Red shale with dark brown silt with modern detritus, including porcelain, brick, and wood.
- 70-140 cmbs: Medium brown silt mixed with red shale
- 140-290 cmbs: Medium brown undifferentiated silty clay
- 290-400 cmbs: Medium brown clay, considered basal



## Backhoe Test #7 Maximum Depth 280 cmbs

0-60 cmbs: Ah horizon, dark brown silt with organics

60-100 cmbs: Light brown undifferentiated silts

100-210 cmbs: Medium brown clay

210-260 cmbs: Grey-brown mottled clay

260-280 cmbs: Medium brown sand with groundwater, stopped test due to collapsing walls.



## Backhoe Test #8 Maximum Depth 260 cmbs

0-5 cmbs: Grass/rootmat with organics (not Ah horizon)

5-70 cmbs: Light brown undifferentiated silts

70-200 cmbs: Medium brown clay

200-260 cmbs: Blue-grey mottled clay, stopped test due to significant clay suggesting basal.



## Backhoe Test #9 Maximum Depth 260 cmbs

- 0-5 cmbs: Grass/rootmat with organics (not Ah horizon)
- 5-160 cmbs: Light brown undifferentiated silts, irrigation line at about 15 cmbs
- 160-270 cmbs: Light, medium brown sandy silt
- 270-310 cmbs: Gleysol with blue-grey mottles and groundwater, stopped due to gleysol indicating basal, as well as groundwater.



**APPENDIX D:  
SCHEMATIC PROFILES**

Backhoe Test #01 to #09

### BHT 1

0-2 cmbs: vegetation & rootmat
2-190 cmbs: light grey-brown silt, possibly fill, some brick in upper portion
190-340 cmbs: mixed medium brown gravel (20%), sand (10%) and silt (70%)

### BHT 2

0-2 cmbs: grass & rootmat
2-160 cmbs: light grey-brown silt, moisture line at 50 cmbs
160-300 cmbs: medium brown sandy silt
300-370 cmbs: medium brown gravel (20%) and sand (80%)

### BHT 3

0-2 cmbs: grass & rootmat
2-20 cmbs: light to medium grey-brown silt
20-50 cmbs: black coal/slag (disturbance)
50-52 cmbs: red shale (disturbance)
52-100 cmbs: light to medium grey-brown silt with lots of roots
100-270 cmbs: light grey-brown silt
270-380 cmbs: medium brown sand

### BHT 4

0-2 cmbs: grass & rootmat
2-70 cmbs: medium brown silty clay, culvert fragment
70-100 cmbs: red and black layer with modern brick, ceramic, and glass
100-200 cmbs: grey-brown clay
200-220 cmbs: yellowish-brown clay
220-290 cmbs: mottled yellowish-brown clay

### BHT 5

0-2 cmbs: grass & rootmat
2-60 cmbs: medium rusty-brown silt, disturbed with garbage
60-120 cmbs: medium brown silt
120-121 cmbs: dark brown organic lens
121-350 cmbs: medium brown silt

### BHT 6

0-2 cmbs: grass & rootmat
2-70 cmbs: red shale with dark brown silt containing garbage (porcelain, brick, wood)
70-140 cmbs: medium brown silt mixed with red shale
140-290 cmbs: medium brown silty clay
290-400 cmbs: medium brown clay, piece of sawn bark, disturbed

### BHT 7

0-60 cmbs: Ah dark brown silt & organics
60-100 cmbs: light brown silt
100-210 cmbs: medium brown clay
210-260 cmbs: grey-brown mottled clay
260-280 cmbs: medium brown sand with groundwater

### BHT 8

0-5 cmbs: grass & rootmat
5-70 cmbs: light brown silt
70-200 cmbs: medium brown clay
200-260 cmbs: blue-grey mottled clay

### BHT 9

0-5 cmbs: grass & rootmat
5-160 cmbs: light brown silt, irrigation line at 15 cmbs
160-270 cmbs: light medium brown sandy silt
270-310 cmbs: gleysol with blue-grey mottles and groundwater