DEPARTMENT OF GAME, FISH AND PARKS
Division of Wildlife – Regional Office
4130 Adventure Trail
Rapid City, South Dakota 57702-0303

October 3, 2022

SD/DENR Minerals and Mining Program
Attn. Roberta Hudson
Joe Foss Building
523 East Capitol Avenue
Pierre, SD 57501-3181

Subject: Wharf Mine Boston Expansion Aquatic, Wildlife and Vegetation Survey Contractors

Dear Roberta,

Pursuant to SDCL 45-6B-7(4), this letter represents South Dakota Department of Game, Fish and Parks approval of the following contractors to conduct preliminary wildlife surveys at the Wharf Mi9ne Boston Expansion Project:

- GEI Consultants, Inc
- ICF International
- BKS Environmental.

Should you have any questions regarding this letter please contact me by any of the numbers listed below.

Sincerely,

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Crystal Hocking, RESPEC
Matt Zietlow, WRI

"Serving People, Managing Wildlife"

The Division of Wildlife will manage South Dakota's wildlife and fisheries resources and their associated habitats for their sustained and equitable use, and for the benefit, welfare, and enjoyment of the citizens of this state and its visitors.

COEUR WHARF
BOSTON EXPANSION
BASELINE WILDLIFE REPORT: NOVEMBER 2021

PREPARED FOR:

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ICF. 2021. Coeur Wharf Boston Expansion Wildlife Survey: November 2021. (ICF 00047.21) Gillette, WY. Prepared for Coeur Wharf Resources (USA), Inc, Lead, SD.

Contents

Acronyms and Abbreviations

BWH	Broad-winged Hawk
E	East
GPS	Global Positioning System
IPaC	Information Planning and Conservation tool
N	North
NLEB	Northern long-eared bat
R	Range
SDCL	South Dakota Codified Law
SD DANR	South Dakota Department of Agriculture and Natural Resources
SDGFP	South Dakota Department of Game, Fish, and Parks
SDNHP	South Dakota Natural Heritage Program
T	Township
T&E	Threatened and Endangered
USFWS	U.S. Fish and Wildlife Service
UTM	Universal Transverse Mercator unit
Wharf	Coeur Wharf Resources, Inc., Wharf Mine
WGRE	Wharf Golden Reward Expansion

1.0 Introduction

Coeur Wharf Resources, Inc., Wharf Mine (Wharf) has proposed to expand existing gold mine operations in the area known as the Boston Expansion. This area is approximately 3 miles west of Lead, in Lawrence County, South Dakota. The 2021 Boston Expansion consists of approximately 50 acres of private land located in Sections 2 and 3, T4N, R2E. The 2021 proposed Boston Expansion is located along the southern edge of the existing Wharf Mine permit boundary along the Portland Ridgeline (Figure 1).

As part of the South Dakota Department of Agriculture and Natural Resources (SD DANR) Large-Scale Mine Permit Application process, a baseline wildlife study was required for the proposed Boston Expansion project. Wharf contracted ICF in the spring of 2021 to complete the baseline wildlife studies. The purpose of this document is to summarize the baseline survey results for wildlife within the Boston Expansion. The baseline data gathered during field sampling will be used to address critical resources potentially affected by the proposed mine expansion, as specified in South Dakota Codified Law (SDCL) 45-6B-92.

The Boston Expansion is in an in area that has been surveyed previously for wildlife at the Wharf Mine as part of both annual monitoring and expansion projects (Figure 1). In 2010, a baseline wildlife study was conducted by ICF for the Wharf and Golden Reward Expansion (WGRE) project, which covered 573 acres. The Boston Expansion is adjacent to the Wharf permit area on the south side and is entirely within the larger WGRE survey area (Figure 1). The 2010 surveys identified bat habitat and detected three bat species listen in the South Dakota Natural Heritage Program (SDNHP) (ICF 2010); these observations were in the vicinity of, but not within, the Boston Expansion. No evidence of collective roosting was observed in 2010, and mitigation activities of potential habitat were conducted to allow bats to escape before the underground habitat (i.e., shafts and adits) was backfilled.

Additionally, raptor surveys are conducted annually within the Wharf Mine permit area and an approximately 0.2- to 0.6-mile buffer. The Boston Expansion is included entirely within this annual monitoring area; as such, a long-term dataset of nesting raptors is available for the proposed Boston Expansion. Several current and historical raptor nests are present around the mine, including one historical Broad-winged Hawk (*Buteo platypterus*) territory with no intact nests on Foley Mountain, south of and adjacent to the Boston Expansion (Figure 2). However, nesting activity in the area has not changed significantly over the past decade, and no active nests are located within the Boston Expansion (Table 1).

Due to the inclusion of the proposed Boston Expansion within both the 2010 WGRE survey and the annual raptor monitoring areas, the South Dakota Game, Fish, and Parks (SDGFP) determined that the only specific wildlife surveys required for the project would be those for bat habitat and nesting raptors (pers. comm., January 28, 2021, Amy Allen [Wharf] and Stan Michals [SDGFP]). Information on other animal groups (species of special interest, big game, non-raptor avian species, other mammals not previously listed, invertebrates, and herptiles) was obtained primarily through opportunistic observation in and near the proposed Boston Expansion. ICF conducted these baseline surveys in the spring of 2021 with follow-up bat surveys in late-summer and fall 2021. Surveys were conducted in accordance with applicable SDGFP guidelines.

2.0 Baseline Study Area

The baseline wildlife study area for the Boston Expansion consists of the proposed approximately 50-acre expansion permit area surveyed for all wildlife (hereafter Boston Expansion) and a 0.5-mile perimeter for raptor nest surveys (hereafter raptor survey area) (Figure 1). The area is within both the Wharf Mine annual wildlife survey area and the 2010 WGRE baseline survey area, as noted above (Figure 1).

Elevation in the Boston Expansion is approximately 6,600 feet, and the area receives an average annual precipitation of 16 to 37 inches (USDA 2006). Soils within the Boston Expansion consist of three types, discussed in detail in the 2021 baseline soil assessment report (BKS Environmental Associates, Inc. 2021).

The survey area consists of forest vegetation comprised of ponderosa pine (*Pinus ponderosa*), quaking aspen (*Populus tremuloides*), paper birch (*Betula papyrifera*), white spruce (*Picea glauca*), and oak (*Quercus* sp.). The forest understory is comprised of grasses, forbs, and shrubs (USDA 2006). The habitats in the Black Hills support bird species from both the west and east coast, allowing the region to have a high avian species richness. Exposed rock faces and outcrops interspersed with the forest also provide diverse habitats that support birds and mammals, including bat species.

The Boston Expansion is composed entirely of private lands owned by Wharf, while the survey area is comprised of lands owned by Wharf or other private landholders. Land uses in the survey area include active mining (Wharf Mine) immediately to the north and a residential area (Terry Peak subdivision and Barefoot Resort) to the south. A portion of the Terry Peak Ski Area overlaps the southeastern corner of the survey area. Several roads (including a paved county road, and several dirt two-track, neighborhood, and mine roads) pass through the permit or survey areas. Human activities associated with these land uses include frequent vehicular and pedestrian traffic year-round.

3.0 Habitat Description

3.1 Ponderosa pine-common snowberry

The ponderosa pine-common snowberry vegetation community is the dominant vegetation community within the Boston Expansion. The topography ranged from gently rolling to very steep and rocky. The overstory was dominated by ponderosa pine. White spruce and quaking aspen were present in the overstory but were not dominant. The dominant shrubs in the understory included: common snowberry (*Symphoricarpos albus*), kinnikinnick (*Arctostaphylos uva-ursi*), creeping juniper (*Juniperus horizontalis*), and Saskatoon serviceberry (*Amelanchier alnifolia*). Common grasses and grass-like species included Sandberg bluegrass (*Poa secunda*), prairie sandreed (*Calamovilfa longifolia*), smooth brome (*Bromus inermis*), rough-leaved ricegrass (*Oryzopsis asperifolia*), and Ross sedge (*Carex rossii*). Common forbs that were present included western yarrow (*Achillea millefolium*), Virginia strawberry (*Fragaria virginiana*), and Mountain blue violet (*Viola adunca*).

All ponderosa pine habitats, especially those with higher understory cover, support a relatively high diversity of wildlife species. These habitats generally host several levels of open canopy cover that can provide for an array of different species while also allowing for easy movement between canopy levels for greater utilization of the overall habitat. Mammalian species such as white-tailed deer, squirrels, and chipmunks are common. Avian species such as nuthatches, chickadees, warblers, and woodpeckers are abundant in this habitat as well. Ponderosa pine is the preferred nesting habitat for broad-winged hawks.

3.2 Quaking Aspen

The quaking aspen (*Populus tremuloides*) vegetation community was in scattered and isolated pockets throughout the Boston Expansion. The topography ranged from gently rolling to very steep and rocky. The overstory was dominated by quaking aspen. White spruce and ponderosa pine were present in the overstory but were not dominant. The dominant shrubs in the understory included woods rose (*Rosa woodsii*), Saskatoon serviceberry, and wild raspberry (*Rubus idaeus*). Common grasses included prairie sandreed, rough-leaved ricegrass, smooth brome, green needlegrass (*Nassella viridula*), and western wheatgrass (*Elymus smithii*). Forb species that were most abundant included false Solomon's seal (*Smilacina stellata*), dogwood (*Dyssodia papposa*), fetid marigold (*Dyssodia papposa*), and wild lily-of-the-valley (*Maianthemum canadense*).

Aspen habitats tend to be more open and less complex than pine habitats. Therefore, wildlife species that utilize them may be less diverse or spend less time in them, as they tend to offer less cover for refuge. However, certain components of this habitat, such as aspen buds and/or the greater diversity of understory species that result from additional sunlight exposure, can be attractive to certain wildlife species. Because aspen habitats in the Boston Expansion survey area tend to occur in small patches within larger areas of ponderosa or spruce, many of the species common to those habitats are also found in aspen habitat.

3.3 White Spruce

The white spruce vegetation community was small and present only in the northwestern extent of the Boston Expansion. The topography was moderately steep to very steep. The overstory was dominated by white spruce. Ponderosa pine was present in the overstory but was not dominant. Dominant shrubs that were present in the understory included common snowberry, Saskatoon serviceberry, grouse whortleberry (*Vaccinium scoparium*), and chokecherry (*Prunus virginiana*). Green needlegrass and smooth brome were the common grass species present, along with common forbs such as heartleaf arnica (*Arnica cordifolia*) and bluebell bellflower (*Campanula rotundifolia*).

Spruce habitats generally host relatively dense canopy cover that provides adequate refuge for many species. However, dense overstory may also limit the accessibility for many animals and restrict sunlight exposure to the understory, which can limit plant diversity and overall wildlife use for activities such as foraging. Nevertheless, small mammals such as squirrels and weasels tend to be more common in spruce habitat than in other communities. Avian species found within spruce habitat can include several species of woodpeckers, Brown Creepers (*Certhia americana*), and kinglets (*Regulus* sp.). Ruffed Grouse (*Bonasa umbellus*) are also frequently found in mature spruce forests that include an understory of deciduous trees.

3.4 Other Minor Habitats

Riparian habitats associated with portions of Annie Creek and Nevada Gulch and small patches of meadow habitat interspersed throughout the Boston Expansion project area are limited in their extent and are generally similar to the ponderosa pine and white spruce habitats (described above) that neighbor them. Although generally temporary, the availability of water resources associated with riparian habitats can attract many wildlife species from the neighboring areas and often concentrate an abundance of animals in this habitat. However, given the limited extent of riparian and meadow habitat, the species diversity tends to be similar to that of the surrounding habitats with little opportunity to fully support more specialized grassland, riparian, or wetland species.

Disturbed habitats are characterized by nearly a complete absence of vegetation and are, therefore, less valuable to wildlife species. Diversity and abundance of wildlife species are extremely low, if not absent in these habitats.

Reclaimed grassland vegetation communities are located adjacent to current or former mining activities in the north-central and eastern portions of the Boston Expansion. This habitat type was dominated by grasses and forbs with minimal tree and shrub cover. Common grass species within this vegetation community included prairie sandreed, western wheatgrass, sheep fescue (*Festuca ovina*), green needlegrass, and Kentucky bluegrass (*Poa pratensis*). Common forbs that were present included northern bedstraw, alfalfa medic (*Medicago sativa*), and red clover (*Trifolium pratense*). Wood's rose was the dominant shrub species within this vegetation community.

Reclaimed grassland tends to support a lower diversity and abundance of wildlife species because it is less complex than other habitats and often comprised of non-native plant species or less overall vegetative diversity. Reclamation practices and maturation of this habitat are key factors in determining their current value to wildlife species. Nevertheless, proper attention to reclamation techniques, timing, and seeding composition can produce grassland habitats that support both grassland specialist species and generalist species for a variety of activities (e.g., nesting, foraging, and refuge). Small mammals such as mice and voles, as well as their predators (e.g., coyotes, foxes,

hawks, and harriers) are common in grassland habitats. Other mammals such as deer and marmots can be found foraging or resting in this habitat. Other avian species that utilize reclaimed grasslands include several species of sparrows, larks, and shrikes. Several species of snakes and other reptiles are also typically found in grassland habitats.

4.0 Methods

Baseline wildlife surveys were conducted by ICF in May and June 2021. Targeted wildlife surveys included those for bat habitat, bat presence/absence, and raptor nests. Surveys were conducted as focused surveys within the Boston Expansion or in conjunction with annual raptor surveys. The Boston Expansion was revisited in late August to confirm potential bat roost and hibernaculum locations followed by presence absence and roost surveys in September and hibernaculum surveys in October.

SDGFP did not request surveys for other species (big game, lagomorphs, breeding birds, waterfowl, small mammals, mammalian predators, furbearers, reptiles, or amphibians). This aligns with surveys previously conducted in the area as part of the 2010 WGRE baseline studies, for which no quantitative surveys were required for those species. Additionally, because of unsuitable habitat and the unlikely occurrence of threatened and endangered (T&E) wildlife species in the Boston Expansion, specific surveys for vertebrate T&E species were not conducted. However, due to the Boston Expansion's location within areas previously surveyed for baseline and annual monitoring programs, several years of existing wildlife data (including 2021) is available for the area. That historic data was reviewed, summarized, and incorporated into this document. Regardless, all incidental wildlife encountered during surveys, including T&E and other special status species, were recorded. Data recorded included the species and number of animals seen, location in Universal Transverse Mercator (UTM) coordinates using a using a Global Positioning System (GPS) unit, behavior, and habitat association.

4.1 Bat Surveys

4.1.1 Habitat Assessment and Presence/Absence Surveys

Surveys at Wharf Mine for bat habitat and presences/absence have been conducted in previous years as part of baseline surveys for WGRE and other areas. Prior to 2021, the most recent surveys were conducted in 2010 as part of the WGRE baseline surveys. This information was consulted and taken into consideration prior to completing 2021 bat surveys. Results from the WGRE surveys indicate that both federally listed and state sensitive species are present in the area (ICF 2010).

The survey protocols developed for this project were based on those previously utilized by the 2010 WGRE baseline surveys and/or those recommended by state and federal agencies (pers. comm., August 31, 2021, ICF/SDGFP/Wharf Meeting), the U.S. Fish and Wildlife Service's (USFWS) *Range-wise Indiana Bat Survey Guidelines* (hereafter, USFWS *Guidelines*; 2020), the USFWS *Northern Long-eared Bat Interim Conference and Planning Guidance* (hereafter, USFWS *Interim Guidance*; 2014), or the USFWS's *Indiana Bat* (Myotis sodalis) *Survey Protocol for Assessing Use of Potential Hibernacula* (2019). A study plan was written and approved by the SDGFP prior to surveys (ICF 2021; pers. com., September 3, 2021, Amy Allen [Wharf] and Stan Michaels [SDGFP]).

Preliminary habitat assessments for maternity roost and winter hibernacula sites occurred in June and August 2021. Biologists conducted pedestrian ground searches and assessments for potential roost and hibernacula sites (i.e., rock cavities, crevices located in rock outcrops, or trees with loose bark or cavities) that could host wintering or breeding bat species within the Boston Expansion per

correspondence with SDGFP (pers. comm., January 28, 2021, Amy Allen [Wharf] and Stan Michaels [SDGFP]). Biologists also assessed locations provided by Wharf on previous and historical mining activities in or near the Boston Expansion; these included sites identified as potential bat habitat during the 2010 WGRE baseline surveys. Locations were recorded in UTM NAD83 (North American Datum 83, Zone 13N) coordinates using a GPS unit. Qualitative descriptions including substrate and distances from the nearest disturbance were recorded, and photographs of the sites were taken.

Standard precautions and all recommended guidelines detailed in the South Dakota Bat Management Plan (Dowd-Stukel 2001) were followed to prevent undue disturbance to any hibernating or breeding/nursing bats encountered. Areas suitable for hibernacula or maternity roosts were searched for sign and/or bat presence/absence only during dry conditions with temperatures above 50 that did not jeopardize the survival of breeding bats. Biologists also watched for and recorded any activity of bats hunting over tree stands or open areas of the forest within the proposed expansion area during all baseline monitoring site visits.

Passive acoustic surveys were conducted for summer bat presence/absence near identified potential roost sites. Wildlife Acoustics SM4BAT full-spectrum bat echolocation detectors equipped with single omni-directional ultrasonic microphones (*Wildlife Acoustics*, MA) were placed throughout the bat survey area near potential bat roost locations, including near tree snags, rock outcrops, and surface mine features.

Detector units were mounted to t-posts and microphones were positioned three meters above ground level. Specific detector locations were chosen in accordance with recommendations made in the USFWS *Guidelines.*

Detectors were deployed for 7 consecutive nights, which aligned with survey protocols recommended by the SDGFP (pers. comm., August 31, 2021, ICF/SDGFP/Wharf Meeting) and the SDGFP approved survey plan (ICF 2021). This exceeded the USFWS *Interim Guidance* minimum of 2 nights total per site and helped to compensate for potential poor weather (e.g., prolonged precipitation, low temperatures, and sustained winds) while detectors were deployed. Extended weather forecasts were consulted prior to deployment in an attempt to reduce the chance of poor weather during surveys. Weather conditions were reviewed the morning after each survey night using a thermometer and rain gauge and recorded on datasheets. Recording periods began 30 minutes before sunset and concluded the following morning at sunrise. Calls were recorded directly to media cards located within the detector unit.

4.1.2 October Hibernaculum Surveys

Results from the summer habitat assessments indicated that the shaft collapses and rock outcrops within the Boston Expansion have some characteristics of suitable bat hibernacula habitat. Therefore, per the study plan, ICF conducted potential hibernacula surveys at these sites in October 2021 (ICF 2021). A combination of passive acoustic surveys and active count monitoring were utilized, per USFWS *Indiana Bat* (Myotis sodalis) *Survey Protocol for Assessing Use of Potential Hibernacula*. Studies by Lemen et al. (2016a and 2016b) indicate that passive acoustic detection is a reliable method of detecting northern long-eared bats (NLEB) emerging from hibernaculum. Three Wildlife Acoustics SM4BAT full-spectrum bat echolocation detector equipped with single omni-directional ultrasonic microphones (*Wildlife Acoustics*, MA) were placed according to the USFWS *Guidelines* near potential roost/hibernacula entrances. Detector units were mounted to t-posts with microphones positioned 3 meters above ground level. Detectors were deployed for 7 consecutive nights, which exceeds the USFWS *Interim Guidance* minimum of 2 nights total per site. Recording periods began 30

minutes before sunset and concluded the following morning at sunrise. Calls were recorded directly to media cards located within the detector unit.

During 2 nights of the passive acoustic surveys, wildlife biologists monitored the potential hibernaculum entrances for emerging bats. To aid with active bat detection after sundown, an Elekon Heterodyne BatScanner (*Elekon*, Switzerland) and infrared-capable videorecorder were used. One biologist was stationed within sight of each opening thought to be interconnected to reduce the possibility of bats leaving through an unmonitored entrance. Openings that were within line of sight of each other were monitored by at least one biologist. The monitoring period began 30 minutes before sunset and lasted until either 60 consecutive minutes of no monitored bat activity was recorded after 2200 or until 5 hours after sunset, whichever occurred sooner (ICF 2010, USFWS 2019). Survey methods followed those in the approved study plan (ICF 2021).

The biologists followed protocols established by USFWS *Indiana Bat* (Myotis sodalis) *Survey Protocol for Assessing Use of Potential Hibernacula*. The biologists remained in a position such that they did not interfere with the passive acoustic detector. Data reported with the aid of the Elekon Heterodyne BatScanners included the number of bat passes per hour during the period, the frequency peak of each pass, and notes describing the bat activity throughout the period.

4.1.3 Data Analysis

All bat calls that were recorded during the September presence/absence survey and October hibernaculum survey were identified using a USFWS-approved Automated Acoustic Bat Identification Software Program, Sonobat 4.4.5 North America. When performing batch analysis of the data sets, Region Pack: DK(c20200109) and Black Hills were used for the regional and subregion classifiers. Noise scrubbing filters and minimum 4 pulses per call sequence parameters were utilized to reduce the amount of noise files and fragmented calls recorded during the surveys. If the automated bat identification program identified calls from NLEB with a high degree of probability ($p < 0.05$) and adequate number of pulses per call sequence, then manual analysis and call reference comparison were conducted to determine if NLEB calls were recorded at the site. If probable NLEB call sequences identified by Sonobat were not characteristic of NLEB, contained distinct calls produced by species other than NLEB, or were of insufficient quality, they were reclassified. All high frequency and low frequency calls that were recorded during both the passive and potential hibernacula surveys were manually vetted to account for all bat species passes. Call analysis was conducted by a biologist experienced with acoustic identification of potential species occurring within the Boston Expansion.

4.2 Raptors

ICF biologists documented all raptor sightings within 0.5 mile of the proposed Boston Expansion. Raptor use of the survey area were determined by reviewing existing data, and compiling results from specific surveys and incidental observations.

Searches for nesting diurnal raptors were conducted within the proposed Boston Expansion and the survey area in May and June 2021. Nest searches involved walking and/or driving throughout the wildlife study area during the breeding season while looking for diurnal raptors and their nests. Tape-recorded raptor calls (Cooper's Hawk [*Accipiter cooperi*] and Broad-winged Hawk) were used to elicit defensive responses, especially in heavily wooded areas where visibility was limited. During and after calling, biologists watched and listened for raptors for several minutes to hear a response.

Areas where diurnal raptors were observed and/or raptors responded to calls were thoroughly searched on foot. Surveys were conducted in June once migratory raptors returned to their breeding areas. All previously documented nests were monitored to determine their nesting status (active/inactive) and condition for the year.

Any new nests discovered were mapped in the field using hand-held GPS receivers; those efforts were timed to prevent disruption of active nest sites. If a new nest was found, the tree was to be flagged with either pink-and-black striped or solid pink survey tape and marked "WILDLIFE TREE--DO NOT CUT." Nest surveys during all periods were brief and conducted from a distance to avoid flushing incubating raptors from their nests (Rosenfield et al. 2007). All nest observations included species, substrate, and location in UTMs.

4.3 Species List

A comprehensive species list for the study area was maintained during all visits with notes on species observations or sign. Biologists were especially vigilant for federally or state-listed species (including endangered, threatened, petitioned, and candidate species) or other species of special concern included under the SDNHP. Biologists watched for any habitats within the study area that could support these species. Prior to initiating field studies, a potential vertebrate species list for the study area was developed from the *2020 Wharf Wildlife Monitoring Report* (ICF 2020). Information on species' range and occurrence were obtained from previous baseline and annual monitoring reports for the mine and available published literature and results from similar surveys conducted in the same general vicinity. Such sources included standard field guides, regional faunal texts and checklists, and any available state and federal agency data. All wildlife observations are provided in a table appended to the report (Appendix A).

5.0 Results

5.1 Bat Surveys

5.1.1 Habitat Assessment and Presence/Absence

Habitat Assessment

Habitat assessments for all bat species occurred throughout all baseline surveys, with targeted searches for roost and hibernacula occurring on June 3 and August 8, 2021. No bats were observed in the Boston Expansion during surveys. Of the 25 sites identified during the 2010 WGRE baseline surveys, 11 occurred within 0.5 mile of the Boston Expansion. Of those 11 sites, only 2 were within proximity (i.e., 0.1 mile) of the area. One site, identified by Wharf personnel in 2009 as a covered prospect pit, had no suitable habitat in 2009 as there were no shaft openings at the site. As such, the site was not surveyed further for bats in 2010 or 2021. The other site (T1) was surveyed in 2021 and is discussed in detail below.

During the 2021 surveys, biologists assessed five historical surface mine features identified by Wharf as potential underground habitats that could support bats. Of these, four (C1, C2, C3, and T1) had marginal but potentially adequate bat roost or hibernacula habitat. The final site (M1, Figure 3, Photo 1) did not have bat habitat present due to a lack shafts, adits, or tunnels. A nearby granite rock outcrop was also assessed and was determined to lack suitable habitat to host a bat roost or hibernaculum. The rock outcrop was exposed with no crevices to protect bats from inclement weather or cool temperatures.

In addition to these sites, ICF identified three sites (R1, R2, and T2) with marginal roost and/or hibernacula habitat characteristics. All of the identified sites except for one (T2) occur in the eastern part of the Boston Expansion (Figure 3). Each site is described in detail below.

Sites C1, C2, and C3 are three collapses with vertical shafts in close proximity (within approximately 50 feet) to each other (Figure 3, Photos 2-4) and could provide suitable roosting or hibernacula habitat. Field assessments of the sites also indicated that the shaft collapses could be interconnected due to their proximity to one another. The opening of the C1 pit was approximately 50 feet in diameter. A safety fence installed around the C1 pit prevented a closer view of the pit and an estimation of depth (Photo 2). The C2 and C3 sites had openings of approximately 10 feet and 5 feet, respectively, and shaft depths of approximately 30 feet (Photos 3 and 4). The openings to the C2 and C3 sites were within 15 feet of each other and located in the same narrow drainage, with C3 located upstream of C2. The C2 and C3 sites were in pine and aspen habitat, while the nearby C1 was in an open area disturbed by historic mining activities.

Site T1 was originally identified as an old, excavated pit, and was assessed during the 2010 WGRE baseline surveys. No potential hibernacula or maternity roost habitats were identified at the site during that visit. T1 was revisited in 2021 as it was identified by Wharf as an adit. While no openings to underground shafts were found, two snags in the pit that could provide bat roosting habitat were found (Photo 5). Loose bark on the snags could host individual roosting bats, but the diameter of the snags limits the suitability of the trees to host colonial maternity roosts.

Granite rock outcrops provide the potential bat habitat associated with sites R1 and R2. The sites are marginally suitable for individual roosting or wintering bats (Photo 6 and 7) as they have some narrow crevices less than 6 inches wide where roosting could occur. However, the depth of the crevices is likely not enough to protect bats from inclement weather or external cool temperatures. Therefore, the habitat at these locations is not of high quality for hosting bat maternity roosts or hibernacula. Results from the WGRE surveys (ICF 2010) indicate that small-footed myotis (*Myotis leibii*), little brown bat (*Myotis lucifugus*), silver-haired bat (*Lasionycteris noctivagans*), and Townsend's big-eared bat (*Corynorhinus townsendii*) do occur in the general area. These species are known to roost in crevices and caves (Bat Conservation International 2021). However, no bats or signs of their presence were observed at any of these locations during the 2021 surveys.

A tree snag with loose bark and small crevices occurs at site T2 (Photo 8). The short height of the tree snag is a limiting factor for roosting bats, as most bat species prefer taller locations for roosts. Results from the WGRE surveys (ICF 2010) indicate that NLEB, big brown bat (*Eptesicus fuscus*), little brown bat, and silver-haired occupy the area. These species are known to roost in trees and under loose bark (Bat Conservation International 2021). However, no bats or signs of their presence were observed at any of these locations during the 2021 surveys.

At least one source of anthropogenic disturbance (roads, buildings, or mine activates) occurs within 0.1 mile of each of the identified potential bat habitat sites (Table 2). Mining activities occur north of each site, while residential and recreational development occurs to the south and east of the sites.

Presence/Absence Surveys

Targeted passive acoustic surveys for late-summer bat presence/absence were conducted near identified potential roost sites from September 7 through 14, 2021. Four Wildlife Acoustics SM4BAT full-spectrum bat echolocation detectors equipped with single omni-directional ultrasonic microphones (Wildlife Acoustics, MA) were placed along the Boston Expansion. The four locations included:

- One (Monitor A) in proximity to three shaft collapses (C1, C2, C3) near each other (i.e., within 60 feet) in SE ¼ NE ¼ Section 2 T4N, R2E (Photos 2, 3, and 4).
- Two (Monitors B and C) near rock outcrops (R1, R2) in SE ¼ NE ¼ Section 2 T4N, R2E (Photos 6 and 7).
- One (Monitor D) near tree snags and forested habitat (T2) in NW ¼ SW ¼ Section 2 T4N. R2E (Photo 8).

Overall, weather during the presence/absence surveys was within parameters stated in the study plan (Table 3). A thermometer installed in the field near the C1, C2, and C3 sites during the survey period did not properly record daily high and low temperatures for the survey area. As such, data for temperature, wind speed, and precipitation were downloaded from the nearest weather station (Lead, South Dakota) from either National Oceanic and Atmospheric Administration (NOAA) or from The Weather Underground. Low temperatures during the first 5 hours of each night ranged from 57 degrees Fahrenheit (*F) to 74*F (Table 3). Wind speeds varied from 0–15 mph and were near or below 9 mph for 4 of the nights (Table 3). No precipitation was recorded over the 7 survey nights.

A total of eleven species were identified by the Sonobat auto-ID software during the late-summer presences/absence surveys: Townsend's big-eared bat, eastern red bat (*Lasiurus borealis*), big brown bat (*Eptesicus fuscus*), hoary bat (*Lasiurus cinereus*), silver-haired bat, western small-footed bat (*Myotis ciliolabrum*), long-eared myotis (*Myotis evotis*), long-legged

myotis (*Myotis volans*), fringe-tailed bat (*Myotis thysanodes*), little brown bat, and northern long-eared bat (NLEB) (*Myotis septentrionalis*). Of these species, 5 are listed by the SDNHP as species of concern: Townsend's big-eared bat, silver-haired bat, long-eared myotis, fringe-tailed myotis, and NLEB. The NLEB is considered a listed threatened species by the USFWS (USFWS 2016). Descriptions of the general habitat and current state and/or federal status of each species can be found in Table 4.

The number of echolocation calls recorded cannot be used to correlate the number of bats of that species in the area or the recordings. Each time a call is emitted within range of the detector, a recording is created. Therefore, it is possible for a single bat can be recorded multiple times if it is foraging for an extended period within range of the detector. If the detectors are deployed directly facing hard objects or high amounts of clutter, this could cause echoes within calls resulting in low quality or fragmented recordings. It cannot be determined if the species recorded from the acoustic detectors are roosting within the adjacent habitat. The recordings reflect the bat species passes near the acoustic detector microphones. If acoustic detectors are deployed directly adjacent to high clutter, hard surfaces, or open water, the potential for echoes and fragmented calls is higher. Additionally, bats will alter their echolocation calls when foraging through cluttered environments as opposed to emitting open search phase calls, which are typically preferable for species identification.

A total of 1,869 calls were identified by the Sonobat auto-ID software during the passive acoustic surveys in September at the Wharf Mine Boston Expansion; 266 of those calls were emitted from myotis spp. The long-eared myotis, fringe-tailed myotis, and NLEB were the only species not recorded at every site during the passive acoustic survey. Myotis species with ranges which occur within the Boston Expansion emit echolocation calls generally within the same frequency range and contain similar call characteristics. In some cases, a species identification could not definitively be made due to the poor quality of the call sequence recording. In this instance, the calls were either characterized as high frequency (HiF) or low frequency (LoF) calls. Unidentifiable low frequency calls are not represented in the results. At most locations, high frequency calls were recorded; however, due to the poor quality of the recording, species could not be identified and are represented in this report as Unknown myotis (HiF). All species recorded, the number of species passes during the September passive acoustic survey, and their locations are represented in Table 5.

Monitor A – The acoustic detector at site C1, C2, and C3 was placed at the openings of the three mine shaft collapses located within the Boston Expansion area. The auto-ID software identified a total of 161 calls (excluding the unknown Myotis) originating from 8 species, and the manual analysis identified 265 calls originating from 9 species (all species listed excluding long-eared myotis and fringe-tailed myotis). A total of 41 myotis spp. calls were identified through manual call analysis. The most common myotis species recorded was the little brown bat (16 calls), followed by the western small-footed and long-legged myotis (both with 11 calls). Three NLEB calls were identified through manual analysis. The recordings exhibited the typical call characteristics of NLEB calls (High frequency up to 100 kHz of bandwidth, characteristic frequency (Fc) range around 40 kHz, steep FM sweep nearly linear, long down-droops at end of call, consistent calls). All NLEB calls were carefully analyzed and compared with reference calls provided by multiple automated identification programs (Sonobat and Kaleidoscope Pro). Given the Fc range and FM sweep of some high frequency recordings, paired with the poor quality of the calls, 23 calls were identified as unknown myotis species. The majority of the low frequency

calls originated from the silver-haired bat (130 calls) followed by the Townsend's big-eared bat (36 calls) and the big brown bat (24 calls).

Monitor B – The acoustic detector at site R1 was deployed facing a rocky outcrop identified during the preliminary habitat assessment. The auto-ID software identified 195 calls, and manual analysis identified 303 calls, both consisting of 10 different species (all species listed excluding NLEB). A total of 83 myotis spp. calls were identified through the manual call analysis process. The most common myotis species recorded was the little brown bat (31 calls), followed by the western small-footed bat (24 calls) and long-legged myotis (23 calls). Additionally, eight unknown myotis species calls were determined due to the poor quality of recordings. The majority of the low frequency calls identified were from the silver-haired bat (163 calls) and big brown bat (33 calls).

Monitor C - The acoustic detector at site R2 was deployed facing another rocky outcrop identified during the preliminary habitat assessment surveys. This site contained the least number of recorded calls during the passive acoustic surveys. A total of 77 calls were identified by the auto-ID software, and the manual analysis identified 122 calls, both consisting of eight species (all species listed excluding the long-eared myotis, fringe-tailed myotis, and the NLEB). The most common myotis species recorded was the little brown bat (10 calls) followed by the western small-footed and long-legged myotis (both with 5 calls each). There were only five unknown myotis calls identified through the manual analysis process at site R2. The majority of the low frequency calls identified were from the silver-haired bat (69 calls) followed by the hoary bat (15 calls) and the eastern red bat (13 calls).

Monitor D – The acoustic detector at site T2 was deployed near a few tree snags located within a forested section of the Boston Expansion. A total of 222 calls were identified by the auto-ID software, and the manual analysis identified 382 calls, both originating from 9 species (all species listed with the excluding the fringe-tailed myotis and the NLEB). A total of 122 myotis calls recorded at site T2. The most common myotis species recorded was the little brown bat (59 calls), followed by the long-legged myotis (44 calls) and western small-footed bat (11 calls). A total of 58 calls exhibited characteristics typical of myotis species, but due to the poor quality of the calls they were classified as unknown myotis. The majority of low frequency calls identified were produced by the silver-haired bat (168 calls) followed by the eastern red bat (52 calls) and the big brown bat (25 calls).

A total of 1,072 calls were identified through manual analysis during the passive acoustic surveys in September 2021 at the Wharf Mine Boston Expansion. The automated identification software recognized a total of 655 calls throughout the four sites during the passive acoustic surveys. Manual analysis of all calls recorded identified 1,072 calls originating from 11 different species, which are all represented in Table 5. A total of 266 myotis species calls were identified through the manual analysis process. The most common species recorded throughout the four sites was the silver-haired bat with a total of 530 calls identified, followed by the little brown bat with 116 calls identified.

5.1.2 October Hibernaculum Surveys

Five areas within the Boston Expansion were identified as potential bat hibernaculum habitat, three shaft collapses (C1, C2, C3) near each other (i.e., within 60 feet) and two rock outcrops (R1, R2) (Figure 3, Photos 2-4, 6 and 7). Entrances of the collapses met parameters outlined in the USFWS's *Indiana Bat* (Myotis sodalis) *Survey Protocol for Assessing Use of Potential Hibernacula* (2019). As the

underground structure of the shafts was unknown (i.e., if they interconnected), it was determined the sites should be surveyed. SDGFP recommended surveying the outcrops because some individual roosting bats could use the sites in winter months (pers. comm., August 31, 2021, ICF/SDGFP/Wharf Meeting).

One round of passive acoustic monitoring surveys was conducted from October 6 through 18, 2021. Emergence surveys were conducted the at C1, C2 and C3 concurrently with the acoustic monitoring surveys on October 6 and 7, 2021. Elekon Heterodyne BatScanners and infrared-capable videorecorders were used during emergence surveys to aid with bat detection. To help with species identification, three Wildlife Acoustics SM4BAT full-spectrum bat echolocation detectors equipped with single omni-directional ultrasonic microphones (*Wildlife Acoustics*, MA) were deployed for 12 nights. Locations included:

- One (Monitor A) in proximity to three shaft collapses (C1, C2, C3) near each other (i.e., within 60 feet) in SE ¼ NE ¼ Section 2 T4N, R2E.
- One (Monitor B) near rock outcrop R1 in SE ¼ NE ¼ Section 2 T4N, R2E.
- One (Monitor C) rock outcrop R1 in SE ¼ NE ¼ Section 2 T4N, R2E.

Results of these surveys are presented in Table 6 and discussed below.

No bats were visually observed emerging from C1, C2 or C3 during the surveys conducted by field biologists on October 6 and 7, 2021. Additionally, no bats were detected while reviewing the 16 hours of infrared video footage taken over the two nights. Multiple bat echolocations were detected by the BatScanner during both nights of emergence surveys. Site C1 registered peak number of bat passes during survey hour 4 on night one (October 6) and peak number of bat passes during survey hour 2 during night two (October 7). Sites C2 and C3, which were surveyed concurrently as one site, registered peak number of bat passes during survey hour 3 during night one and survey hour 2 during night two (Figure 4). Bat echolocation frequencies ranged from 24 kHz to 67 kHz at C1 across each survey night while frequencies recorded at C2/C3 ranged from 21 kHz to 33 kHz across both nights (Table 7).

Weather during the emergence surveys were within parameters set by the USFWS's *Indiana Bat* (Myotis sodalis) *Survey Protocol for Assessing Use of Potential Hibernacula* (2019). Weather data (temperature and wind) were recorded onsite during surveys (Table 8). Temperatures during the survey nights ranged from 48°F–73°F, with cooler temperatures recorded on the second night (Table 8). Wind speeds on the first night averaged 9 mph on October 6, and 5 mph October 7 (Table 8). No precipitation was recorded during the surveys.

The number of passive acoustic survey nights exceeding the number required by the study plan. This was due to a cold front and snowstorm occurring at the site near the end of the survey period (Table 9), which resulted in approximately20 inches of snow accumulation at the site. As a result of the poor weather conditions, the monitors were left onsite for an additional 5 nights. Data for all 12 nights was analyzed.

Weather information for the first two nights of October surveys is summarized in Table 8, as biologists were onsite for the emergence surveys. Information for the remaining nights (October 8–18) in the hibernaculum survey period are summarized in Table 9. Daily low temperatures for the entire weather-extended survey period were recorded onsite. The remaining data were downloaded from the NOAA or The Weather Underground weather stations in Lead, SD. Weather parameters, as set by the USFWS's *Indiana Bat* (Myotis sodalis) *Survey Protocol for Assessing Use of Potential Hibernacula* (2019) were met on 8 nights (Tables 8 and 9). Low

temperatures during the first 2 hours of each night ranged from 47°F to 61°F (Tables 8 and 9). Wind speeds varied from 0–16 mph, and below 9 mph for 6 of nights (Tables 8 and 9). As stated, overnight snow was recorded on at least 1 night (October 13).

The data collected from all three sites during the survey included multiple noise files, which were most likely produced by inclement weather, other animals passing nearby, or heavy mining machinery. All noise files were inspected to ensure no bat passes were present within the call files. The same methods and parameters from the September passive surveys were utilized in the data analysis of the potential hibernacula acoustic surveys. All auto-ID and manual analysis results are represented in Table 6.

Monitor A – The acoustic detector at site C1, C2, and C3 was placed at the openings of the three mine shaft collapses located within the Boston Expansion and was at the same location as the presence/absence survey in September. The auto-ID software identified a total of 27 calls produced by 6 species (Townsend's big-eared bat, eastern red bat, big brown bat, hoary bat, silver-haired bat, and the long-eared myotis), and the manual analysis identified 15 calls produced by four species. All calls identified through the manual analysis process were produced by low frequency bats (Townsend's big-eared bat, big brown bat, hoary bat, and silver-haired bat). There were multiple noise files that the auto-ID identified as potential high and low frequency calls, but inspection of those files revealed that the calls originated from noise caused by the mine (heavy mining machinery or rocks tumbling) or precipitation.

Monitor B – The acoustic detector at site R1 was deployed facing a rocky outcropping located on the southern section of the Boston Expansion and was at the same location as the presence/absence survey in September. The auto-ID software identified a total of 38 calls produced by four species (Townsend's big-eared bat, big brown bat, hoary bat, and silver-haired bat), and the manual analysis identified 19 calls produced by the same four species. All calls identified through the manual analysis process were produced by low frequency bats. Multiple noise files were recorded during the survey.

Monitor C - The acoustic detector at site R2 was deployed facing an alternate rocky outcropping located on the northern section of the Boston Expansion site and was at the same location as the presence/absence survey in September. The auto-ID software identified a total of 20 calls produced by four species (big brown bat, hoary bat, silver-haired bat, and western small-footed bat), and the manual analysis identified 21 calls produced by the same four species. This was the only site that recorded a high frequency producing species (western small-footed bat) during the October hibernacula surveys. Multiple noise files were recorded during the survey.

A total of 55 calls were identified through manual analysis during the potential hibernacula/roost site acoustic surveys in October 2021, at the Boston Expansion. The majority of the calls identified were produced by low frequency bats, with the exception of two calls produced by a western small-footed bat. Eastern and western small-footed bats have been known to roost in the cracks of rock faces and tallus slopes, although it cannot be fully determined if these calls were produced from a bat roosting at site R2. All species identified and associated species call numbers recorded are represented in Table 6.

5.2 Raptor Survey

Surveys for raptor nests in the Boston Expansion were conducted on June 3, 2021. During the survey, an ICF biologist recorded a Broad-winged Hawk in the western portion of the Boston Expansion (Table 2; Figure 2) in a ponderosa forest. The area was searched for a nest, but none was found, and the hawk was not displaying any territorial behaviors. A SDNHP Rare Animal form was submitted on June 15, 2021, through the South Dakota online submittal process.

One former Broad-winged Hawk territory (BWH2), comprised of seven nest sites, occurs within the Boston Expansion raptor survey area (Table 1; Figure 2). However, the last nest in the territory was recorded destroyed by natural causes in 2018. The territory was last active in 2003 when one young fledged from the BWH2g nest. Residential and recreational development, including roads and houses, has been documented within the BWH2 territory for several years, with some development as close as 120 feet to a nest site.

5.3 Species List

Appendix A lists all potential and observed species that have the potential to or do occur in the Boston Expansion. Of the seven species that were not bats observed, only the forementioned Broad-winged hawk was listed as a SDNHP Rare Animal. Of the 11 species of bats identified through calls, five are SDNHP Rare Animals (Townsend's big-eared bat, silver-haired bat, long-eared myotis, fringe-tailed myotis, and northern long-eared bat). The NLEB is also considered a listed threatened species by the United States Fish and Wildlife Service (USFWS).

6.0 Conclusion

The Boston Expansion encompasses approximately 50 acres and has been monitored as part of other baseline or annual monitoring efforts at Wharf Mine since 2010. Because the area is small and has existing disturbance, topsoil stripping and other habitat impacts are reduced to relatively small areas needed for the mine expansion, access roads, and other supporting infrastructure. While the relatively limited surface disturbance associated with this project could have direct and indirect impacts on local wildlife populations, any potential effects are not expected to be substantial. This is due to the limited habitat disturbance associated with the proposed disturbance area and abundant existing activities (residential development and active mining) immediately adjacent to the Boston Expansion.

Bat species, including the federally threatened NLEB and SDNHP species of concern (Townsend's big-eared bat, silver-haired bat, long-eared myotis, and fringe-tailed myotis,), detected during surveys may be displaced to other habitats during mine expansion. However, several existing sources of anthropogenic disturbance occur near and adjacent to the Boston Expansion, including residential neighborhoods and active mining. Research shows that traffic noise and areas with consistent loud noises reduces bat foraging times and can deter bats from roosting in or near the noisy area (Jones 2008; CDOT 2016). Other studies indicate that light pollution associated with residential areas reduces bat activity (Stone et al., 2009). The presence of existing disturbances (both mine and non-mine related) near the Boston Expansion has likely reduced the quality of bat roost and hibernacula habitat in the Boston Expansion. While survey results indicate that bats use the Boston Expansion, it is most likely for foraging given the lack of bats observed emerging from the collapses.

Several potential summer roost and winter hibernacula locations were identified during surveys. These included tree snags, rock outcrops, and surface mine features throughout the Boston Expansion. No evidence of roosting or hibernacula were detected at any of the sites based upon both observation and recording of echolocation calls. Nevertheless, the possibility of such sites as transitional roost sites cannot be eliminated. Expansion of the mine could directly impact bats and these roosting habitats. However, additional suitable habitat for summer and maternity roosts and hibernacula are present beyond the Boston Expansion, providing undisturbed alternate habitat for localized bat populations and any displaced individuals. Habitats found in the Boston Expansion are marginal for roosts and hibernacula, and higher quality habitat (e.g., caves, old mine shafts, and larger trees farther from disturbance) is found elsewhere in the local area and Black Hills region. Mitigation measures that can be taken to avoid roost and hibernacula disturbance include tree removal and placement of temporary closures over collapse entrances outside of the bat maternity season.

Northern longed-eared bats (NLEB), a federal threatened and state sensitive species, were detected during 2021 in the Boston Expansion. Their confirmed presence will require consultation with the USFWS to determine avoidance and minimization measures that will be put into place moving forward. Three NLEB calls were identified at site Monitor A (placed near sites C1, C2, C3) during the September presence/absence survey. This species is known to occur in Lawrence County, SD (USFWS 2017 and SDGFP 2016) and was recorded during surveys for the WGRE project in 2010 (ICF 2010). Hibernacula with confirmed White-nose Syndrome (WNS)/ *Pseudogymnoascus destructans* (Pd) have been detected in nearby Custer County (USFWS 2021). As such, the Boston

Expansion falls within the WNS Zone per the Final 4(d) Rule of the ESA (USFWS 2016). This ruling protects the NLEB and provides guidance on regulatory requirements for development activities. In addition to the NLEB, five additional bat species are listed by the SDGFP as Rare Animals (SDNHP 2018).

Resource recovery in the Boston Expansion would not result in impacts on regional raptor populations, though individual birds or pairs may be affected. Mining activity could cause raptors to abandon nest sites near disturbance, particularly if activities encroach on active nests during a given breeding season. Other potential direct impacts would be injury or mortality due to collisions with mine-related vehicular traffic. Construction activities that occur within or near active raptor territories could also cause indirect impacts such as reduction or avoidance of foraging habitats for nesting birds. However, the low density of nesting raptors relative to the apparent availability of suitable habitat (demonstrated by the lack of known active nests in the area since 2003) suggests that alternate nesting habitat is available for all known nesting raptor species in the Boston Expansion.

The most notable SDNHP species of interest were the five species of bat recorded during targeted acoustic surveys. One additional SDNHP sensitive species, the Broad-winged Hawk, was documented in the Boston Expansion during baseline surveys. However, avian observations consisted of limited observations of birds perched in or flying over the permit area, or sightings made in the surrounding survey perimeter. Bat species were recorded near identified potential roost and hibernacula sites. While an exact number of individuals cannot be derived from the passive acoustic surveys, results indicate that at least 11 species of bats utilize habitats in the Boston Expansion area during at least a portion of the year.

Other wildlife species of concern, such as the Broad-winged Hawk and other nesting avian species, that occur in the area may also experience direct and/or indirect impacts from increased travel and noise in the area during project construction and operation. The presence of alternate nesting and foraging habitat in the immediate vicinity, the mobility of those species, and the location of most relative to planned and existing disturbance combine to reduce impacts on most nesting SDNHP birds as well as other species of interest.

As indicated, suitable nesting and roosting habitat (trees and rock crevices) for some SDNHP species is present in the Boston Expansion. However, the abundance of suitable alternate nesting and roosting habitats throughout areas adjacent to the Boston Expansion minimizes the potential for both direct and indirect impacts for species of concern, and others that require similar habitats.

6.1 Recommended Avoidance and Mitigation Measures – Bat Species

To avoid potential impacts to tree roosting bats within the Boston Expansion Site, tree clearing activities should be performed outside of bat maternity season (May 15 – August 15). If the existing collapsed mine sites are to be impacted by the expansion activities, a qualified biologist will perform a one-night emergence survey during acceptable weather conditions (no rain or high winds, night temperatures above 50° F). After the emergence survey is completed, temporary physical exclusion barriers will be installed to prevent bats from re-entering the roost (tarps can be used for this purpose). The possibility of bats utilizing the collapsed mines

as transitional or winter roost sites cannot be predicted, therefore, any closure or excavation of these locations should be conducted during the bats active season (May 15 – August 15). Proper tarp placement and closure of these sites should prevent bats from flying into the underground portion of the mine. Escape of any bats closed in through this method of temporary closure can be achieved by crawling out from around the edges of the tarp. There should be no openings large enough to permit a flying bat to enter or exit the mine. This temporary closure should be done at least 4-5 nights (during good weather) before permanent closure or excavation of these locations. Implementing the mine opening closure and tree clearing recommendations outlined above will assist in reducing potential inadvertent impacts or incidental loss of bats.

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7.1 Personal Communication

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8.0 Qualifications

Pete Datema is a project manager and wildlife biologist with ICF and has worked in the Gillette office since 2018. He earned an M.S. degree in Fisheries and Wildlife from Clemson University (2012) and a B.S. degree in Fisheries and Wildlife from Michigan State University (2009). Pete has worked with energy companies in Montana, California and Wyoming conducting wildlife surveys, specializing in eagles and raptors. He has worked extensively with eagles; trapping, banding and collecting blood samples in Michigan, California and Virginia with federal agencies and Universities. Pete has organized and managed field crews and conducted aerial and ground based surveys for numerous species. Pete has conducted surveys for greater sage-grouse and completed avian point counts, habitat assessments, and wildlife habitat restoration.

Jeff Abplanalp is a wildlife biologist with ICF and joined the Gillette office in 2019. He earned a B.S. in Wildlife and Fisheries Management and Biology from the University of Wyoming (2009). Jeff has worked closely with energy and agricultural industries throughout Wyoming and has 9 years of experience conducting terrestrial and aquatic wildlife surveys and research within the state. He has extensive experience in the surveying of Greater Sage Grouse, raptors, and sagebrush-grassland habitat across many of Wyoming's energy rich regions such as the Powder River Basin, Wind River Basin, and Big Horn Basin. Jeff has extensive experience in big game population, depredation, and disease management. Jeff has also conducted bat monitoring and bat habitat surveys in the Black Hills of South Dakota.

Drew Powell is a wildlife biologist with ICF and has 10 years of experience working with bats, primarily in the eastern and midwestern United States. Drew will provide manual identification of the acoustic data collected from the recorders deployed at the Wharf Mine survey sites. He is based out of the Louisville KY office Drew has managed multiple acoustic projects requiring manual vetting of recorded bat calls for species identification clarification. He is familiar with eastern and western bat species' acoustic call characteristics used to distinguish genus and species from recordings.

9.0 Tables

Table 1. Location and History of Raptor Nests Within 0.5 Mile of the Wharf Mine Boston Expansion (2017 through 2021)

Nest ID	UTM X, UTM Y (NAD27 Zone 13)	¼ ¼ Sec T(N), R(E)	Substrate	2017	2018	2019	2020	2021
BWH2a	592280, 4909974	SW NE 2, 4, 2	PP	D/N in 2001	—	—	—	—
BWH2b	592490, 4909747	NW SE 2, 4, 2	PP	D/Nin 2015	—	—	—	—
BWH2c	592045, 4909628	NE SW 2, 4, 2	PP	D/N in 2007	—	—	—	—
BWH2d	592142, 4909576	NW SE 2, 4, 2	PP	D/N in 1999	—	—	—	—
BWH2e	592126, 4909749	SE NW 2, 4, 2	PP	D/N in 2009	—	—	—	—
BWH2f	592083, 4909633	NE SW 2, 4, 2	PP	I	D/N	—	—	—
BWH2g	592152, 4909722	NW SE 2, 4, 2	PP	D/N in 2015	—	—	—	—
REL5*^	593049, 4910063	SW NW 1, 4, 2	PP	D/N in 2017	—	—	—	—
UNK1**	590395, 4909376	NE SW 3, 4, 2	PP	D/N in 2016	—	—	—	—

In Nest ID Column

* Nest location is within the Wharf permit area (2021).

** Nest site is not within the annual Wharf wildlife survey area.

^ Relocation sites were randomly designated in 1998 (i.e., relocation numbers did not systematically correspond to the original nest numbers) as REL1 through REL5. See Wharf Mine annual reports (on file with the SD DANR) for further details.

Substrate Codes:

PP = Ponderosa Pine

Species Codes:

BWH = Broad-winged Hawk

REL = Relocated

UNK = unknown raptor species

Nest Status Codes:

D/N = destroyed by natural causes

I = inactive

— = nest undiscovered or non-existent

Table 2. Wildlife Features Found in or Near the Wharf Mine Boston Expansion

Wildlife Feature	ID	UTM X, UTM Y (NAD27 Zone 13)		Habitat	Bat Sign	Disturbance Factor	
						Type	Distance (Feet)
Bat Habitat	C1	592062	4910214	Mine shaft collapse	No	Mine activity	243
Bat Habitat	C2	592055	4910214	Mine shaft collapse	No	Mine activity	263
Bat Habitat	C3	592054	4910230	Mine shaft collapse	No	Mine activity	209
Bat Habitat	M1	592151	4910134	Surface mining feature with rock outcrop	No	Residential development	314
Bat Habitat	R1	592170	4910159	Rock outcrop	No	Residential development	280
Bat Habitat	R2	592138	4910191	Rock outcrop	No	Mine activity	415
Bat Habitat	T1	592050	4910262	Surface mining feature with tree snags	No	Mine activity	140
Bat Habitat	T2	591323	4909947	Tree snag	No	Mine road (two-track)	63
Raptor	BWHA[1]	591187	4909942	Ponderosa forest	NA[2]	---	---

[1] BWHA = Broad-winged Hawk

[2] Not applicable. No nest was found in the vicinity where the hawk was seen.

Table 3. Temperature, Wind, and Precipitation for Lead, SD during Presence/Absence Surveys

Date	Temperature (F) 7pm - 12am	Temperature (F) – Overnight Min.	Wind (MPH) – 7pm-12am	Precipitation (Inches)
9/7/2021	60-56	47	8-10	0
9/8/2021	68-61	48	9-14	0
9/9/2021	76-68	58	3-7	0
9/10/2021	82-74	56	4-8	0
9/11/2021	67-58	57	4-5	0
9/12/2021	72-63	54	0-15	0
9/13/2021	63-55	54	14-8	0

Sources: https://wunderground.com and https://www.ncdc.noaa.gov

Table 4. Status and Habitat Description of Bat Species Detected at the Wharf Mine Boston Expansion During Late-Summer and Fall 2021 Surveys

Scientific Name Common Name	Status[1*]	General Habitat Description
Townsend's big-eared bat *Corynorhinus townsendii*	G4, S2S3	Typical habitat is arid western desert scrub and pine forest regions. Maternity colonies form in mines, caves, or buildings, but males roost individually.[1] Roost sites and hibernacula are selected in areas with minimal human intervention and relatively stable, cool temperatures. Hibernacula also occur in mines and caves. Foraging primarily occurs along forested edges or in the canopy.[2]
Eastern Red Bat *Lasiurus borealis*		Red bats range in the United States from east of the Rocky Mountains to the Atlantic coast and are common throughout the United States. In South Dakota, red bats are found throughout the state except in the treeless areas and are not extremely common in the Black Hills. Population dynamics in the Black Hills are relatively unknown due to limited observations and summer residency. Red bats roost in foliage of trees and do not typically depend on cavities for shelter. Deciduous and coniferous trees are considered appropriate tree roosts.[2]
Big brown bat *Eptesicus fuscus*		Found in a variety of habitats ranging from timberline meadows to lowland deserts, though it is most abundant in deciduous forest areas. Typically form maternity colonies beneath loose bark and in small cavities of pine, oak, and other trees. Maternity roosts also occur in buildings and bridges[1], and have been documented in buildings, trees, railway tunnels, mines, caves, and at least one metal electrical fuse box within the Black Hills. Found in a variety of hibernacula with varying microclimates, in caves, mines and in buildings[3].
Hoary bat *Lasiurus cinereus*		Solitary roosting species, except during the maternity season when females roost with young in foliage along forest edges or in fencerows, generally 12 to 40 feet above ground. Occurs in arid deserts and ponderosa pine forests of the western U.S., most abundant on the edges of croplands and deciduous forests of the Plains States. It is a fast flier that commonly feeds at treetop level above the forest canopy.[4]
Silver-haired bat *Lasionycteris noctivagans*	G3G4, S4	Dependent upon roosts in Old Growth areas. Form maternity colonies almost exclusively in tree cavities or small hollows and will switch roosts throughout the maternity season. Typical hibernation roosts include small tree hollows, beneath exfoliating bark, in wood piles, and in cliff faces. Occasionally silver-haired bats will hibernate in cave entrances, especially in northern regions of their range. Feed predominantly in disturbed areas, sometimes at tree-top level, but often in small clearings and along roadways or water courses.[1]

Western small-footed bat *Myotis ciliolabrum*		Located in arid habitats with cliffs, talus fields, and prairies containing clay buttes and steep banks along rivers[2]. Maternity roosts in cliff-face crevices, erosion cavities, and beneath rocks on the ground. Some females care for their pups alone, while others form small groups. These bats can also be found hibernating in caves or mines.[1] Foraging occurs 1 to 3 m above ground over cliffs or clay buttes. [2]
Long-eared myotis *Myotis evotis*	G5, S1	Located in coniferous forests, typically only at higher elevations in southern areas (between 7,000 and 8,500 feet)[1] or arid badlands of the Great Plains. [2] Roost sites include live or dead trees (beneath bark), abandoned buildings, mines or caves, sinkholes, or cliff fissures. Winter hibernacula include primarily caves or mines. Foraging typically occurs over tree canopy, ponds, or streams. [2]
Long-legged myotis *Myotis volans*		Located in coniferous-juniper forest mountain regions at moderate elevations, although may also use lowlands or riparian areas and sometimes selected habitat areas can be relatively arid. Long-legged myotis are more commonly found in the Black Hills and are year-round residents. Long-legged myotis use trees (under bark or in cavities), caves, mines, and rock crevices for roost sites in the Black Hills.[5]
Fringe-tailed bat *Myotis thysanodes*	G5, S1	Mostly found in dry habitats where open areas (e.g., grasslands and deserts) are interspersed with mature forests (usually ponderosa pine, pinyon-juniper, or oak), creating complex mosaics with ample edges and abundant snags[6]. Day roosts include caves, mines, and buildings (typically abandoned). Hibernacula include caves and buildings, but not much is known about their wintering whereabouts[1,7].
Little brown bat *Myotis lucifugus*		Mainly in mountainous and riparian areas in a wide variety of forest habitats; from tree-lined xeric-scrub to aspen meadows. Maternity colonies often form in buildings, attics, and other man-made structures. Also roosts in tree cavities and crevices[1] as well as caves and mines. [2] Main prey consists of aquatic insects, and typical foraging habitat is over water. Will also feed over forest trails, cliff faces, meadows, and farmland.[1]
Northern long-eared bat *Myotis septentrionalis*	LT	In the United States, northern myotis range in forested regions from east to central US and south to northern Florida. Northern myotis are common throughout their range, though they are found less commonly than little brown myotis. In South Dakota, northern myotis are found rather uncommonly throughout the state. Conversely, northern myotis are rather abundant throughout the Black Hills, and few winter occurrences have been recorded. Northern myotis are state species of concern due to their rarity and limited range. Generally, northern myotis are found near water sources and dense forests. Foraging takes place over forested hillsides and ridges with prey consisting of night-flying insects.[8]

[1]Status as listed by the South Dakota Natural Heritage Program. 2018. https://gfp.sd.gov/rare-animals/. Accessed July 19, 2021.
G3- Either very rare and local throughout its range or found locally in a restricted range; G4-Apparently secure; G5-Demonstratably secure; S1-

Critically imperiled because of extreme rarity; S2- Imperiled because of rarity; S3- Either very rare and local throughout its range or found locally in a restricted range; S4- Apparently secure; LT-Listed Threatened. G – Global; S – State

[2, 3, 5, 8]Pierre, S.D.: South Dakota Bat Working Group 2004

[4]Tigner and Stukel 2003

[6]Tuttle 1995

[7]Keinath 2004

Table 5. Species Recorded at Each Monitoring Location During Passive September 2021 Presence/Absence Surveys

Species Recorded	Acoustic Detector Sites									
	A - Sites C1, C2, C3		**B** - Site R1		**C** - Site R2		**D** - Site T2		**Totals**	
	A	**M**	**A**	**M**	**A**	**M**	**A**	**M**	**A**	**M**
Townsend's big-eared bat *Corynorhinus townsendii*	15	36	1	5	1	2	2	2	**19**	**45**
Eastern red bat *Lasiurus borealis*	1	19	4	7	7	13	16	52	**28**	**91**
Big brown bat *Eptesicus fuscus*	3	24	17	33	2	3	17	25	**39**	**85**
Hoary bat *Lasiurus cinereus*	4	15	4	12	2	15	10	13	**20**	**55**
Silver-haired bat *Lasionycteris noctivagans*	109	130	126	163	55	69	118	168	**408**	**530**
Western small-footed bat *Myotis ciliolabrum*	0	11	6	24	2	5	3	11	**11**	**51**
Long-eared myotis *Myotis evotis*	0	0	2	4	0	0	4	8	**6**	**12**
Long-legged myotis *Myotis volans*	12	11	18	23	4	5	21	44	**55**	**83**
Fringe-tailed myotis *Myotis thysanodes*	0	0	1	1	0	0	0	0	**1**	**1**
Little brown bat *Myotis lucifugus*	14	16	16	31	4	10	31	59	**65**	**116**
Northern long-eared bat *Myotis septentrionalis*	3	3	0	0	0	0	0	0	**3**	**3**

Unknown Myotis (HiF)	2	23*	3	51*	0	5*	0	58*	**5**	***137**
Totals (excluding Unkn Myo HiF)	**161**	**265**	**195**	**303**	**77**	**122**	**222**	**382**	**655**	**1,072**

* Recorded as high frequency call (HiF) but due to the poor quality of the recording definitive identification could not be made

A – Automated results **M** – Manual results

Table 6. Species Recorded at Each Monitoring Location During October 2021 Hibernacula Surveys

Species Recorded	Acoustic Sites							
	A - Sites C1, C2, C3		**B** - Site R1		**C** - Site R2		**Totals**	
	A	**M**	**A**	**M**	**A**	**M**	**A**	**M**
Townsend's big-eared bat *Corynorhinus townsendii*	2	4	3	4	0	0	**5**	**8**
Eastern red bat *Lasiurus borealis*	5	0	0	0	0	0	**5**	**0**
Big brown bat *Eptesicus fuscus*	1	1	2	2	3	3	**6**	**6**
Hoary bat *Lasiurus cinereus*	11	5	26	7	8	8	**45**	**20**
Silver-haired bat *Lasionycteris noctivagans*	7	5	7	6	7	8	**21**	**19**
Western small-footed bat *Myotis ciliolabrum*	0	0	0	0	2	2	**2**	**2**
Long-eared myotis *Myotis evotis*	1	0	0	0	0	0	**1**	**0**
Long-legged myotis *Myotis volans*	0	0	0	0	0	0	**0**	**0**
Fringe-tailed bat *Myotis thysanodes*	0	0	0	0	0	0	**0**	**0**
Little brown bat *Myotis lucifugus*	0	0	0	0	0	0	**0**	**0**
Northern long-eared bat *Myotis septentrionalis*	0	0	0	0	0	0	**0**	**0**

Unknown Myotis (HiF)	0	0	0	0	0	0	**0**	**0**
Totals	**27**	**15**	**38**	**19**	**20**	**21**	**85**	**55**

A – Automated results **M** – Manual results

Table 7. Bat Echolocation Frequencies Recorded Per Survey Hour Using Elekon Heterodyne BatScanner During October 2021 Hibernacula Surveys

Site: C1	Survey Night 1 (October 6)					Survey Night 2 (October 7)				
Recorded Frequency (kHz)	Hour 1	Hour 2	Hour 3	Hour 4	Hour 5	Hour 1	Hour 2	Hour 3	Hour 4	Hour 5
24	-	1	-	-	-	-	-	-	-	-
25	-	-	5	-	-	1	5	-	-	-
26	-	1	7	10	1	-	3	-	-	
28	-	-	1	-	-	-	-	-	-	-
29	-	-	-	3	-	-	-	-	1	-
30	-	-	-	-	-	-	-	1	-	-
31	-	-	-	-	-	-	-	-	-	-
32	-	-	-	1	-	-	-	-	-	-
33	-	-	-	2	-	-	1	1	-	-
35	-	-	1	1	-	-	-	-	-	-
37	-	-	-	-	-	-	1	-	-	-
38	-	-	1	-	-	-	-	-	-	-
39	-	1	-	-	-	-	-	-	-	-
40	-	-	1	-	-	-	-	-	-	-
42	-	-	1	1	-	-	-	-	-	-
43	-	-	2	1	-	-	-	-	-	-
44	-	-	-	1	-	-	-	-	-	-
45	-	-	-	2	-	-	-	-	-	-
53	-	1	-	-	-	-	-	-	-	-

58	-	-	-	1	-	-	-	-	-	-
67	-	1	-	-	-	-	-	-	-	-

Site: C2/C3	Survey Night 1 (October 6)					Survey Night 2 (October 7)				
Recorded Frequency (kHz)	**Hour 1**	**Hour 2**	**Hour 3**	**Hour 4**	**Hour 5**	**Hour 1**	**Hour 2**	**Hour 3**	**Hour 4**	**Hour 5**
21	-	-	-	-	-	-	1	-	-	-
22	-	-	-	1	-	-	-	-	-	-
24	-	-	-	-	-	-	-	1	-	-
25	-	-	-	-	1	-	1	-	-	-
26	-	-	-	-	1	-	3	-	-	-
27	-	-	1	-	-	-	1	-	1	-
28	-	-	-	-	-	-	-	-	1	-
29	-	-	-	2	-	-	1	-	-	-
30	-	-	1	1	-	-	1	-	-	-
31	-	-	-	-	-	-	-	1	-	-
33	-	2	3	1	-	-	-	-	-	-

Table 8. Temperature and Wind Speed During the October Hibernaculum Emergence Surveys

Date	Time (pm)	Temperature (F)	Wind Speed (mph)
10/6/2021	5:51	73	9
10/6/2021	6:50	68	7
10/6/2021	7;49	63	7
10/6/2021	8;57	63	8
10/6/2021	9;47	63	8
10/6/2021	10:52	63	8
10/7/2021	5:54	66	6
10/7/2021	6:46	61	3
10/7/2021°	7:47	57	3
10/7/2021	8:46	52	4
10/7/2021	9:54	50	3
10/7/2021	10:53	48	6

Source: https://www.ncdc.noaa.gov

Table 9. Temperature, Wind, and Precipitation for Lead, SD during the Hibernaculum Surveys

Date	Temperature (F) – 6:30pm-11:30pm	Temperature (F) – Min.	Wind (MPH) – 6:30pm-11:30pm	Precipitation (in)
10/8/2021	56-53	46	7-7	0
10/9/2021	46-46	47	15-5	0.10
10/10/2021	48-37	40	3-0	0.82
10/11/2021	47-39	37	8-16	0
10/12/2021	33-33	30	12-12	0.06
10/13/2021°	30-27	25	14-12	1.28
10/14/2021	32-30	25	12-8	0.74
10/15/2021	34-37	25	9-7	0
10/16/2021	47-43	33	3-0	0
10/17/2021	54-55	37	5-7	0
10/18/2021	56-48	47	3-3	0

Sources: https://wunderground.com and https://www.ncdc.noaa.gov

°=snowstorm on 10/13/21 resulted in deployment of bat monitors until 10/18/21, 5 days beyond the planned 7-day period

10.0 Figures and Photos

Figures

Figure 1. Permit and Survey Areas at the Boston Expansion, 2010 Wharf and Golden Reward Expansion, and Current Wharf Area

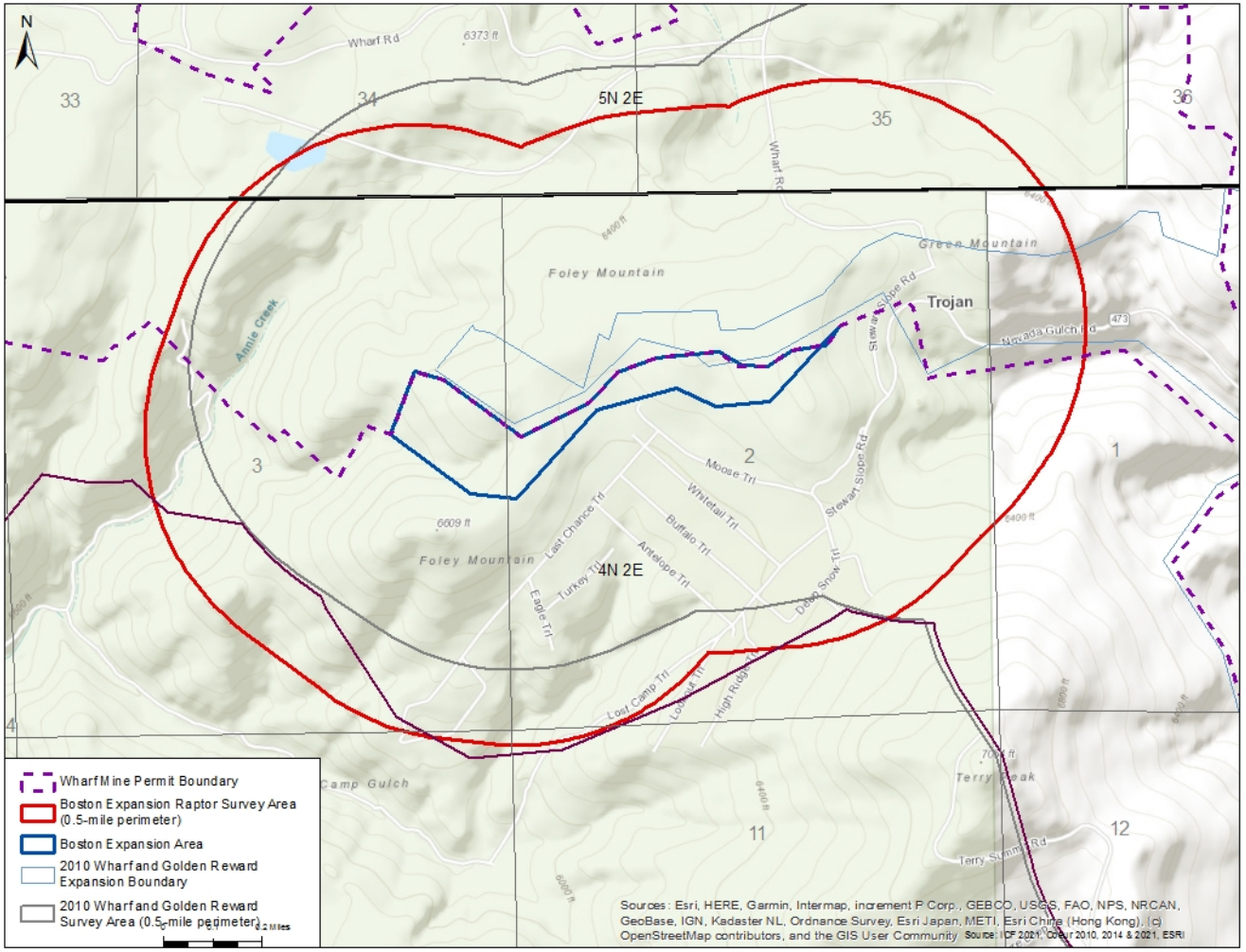


Figure 2. 2021 Raptor Nest Locations and Raptor Observations at the Wharf Mine Boston Expansion

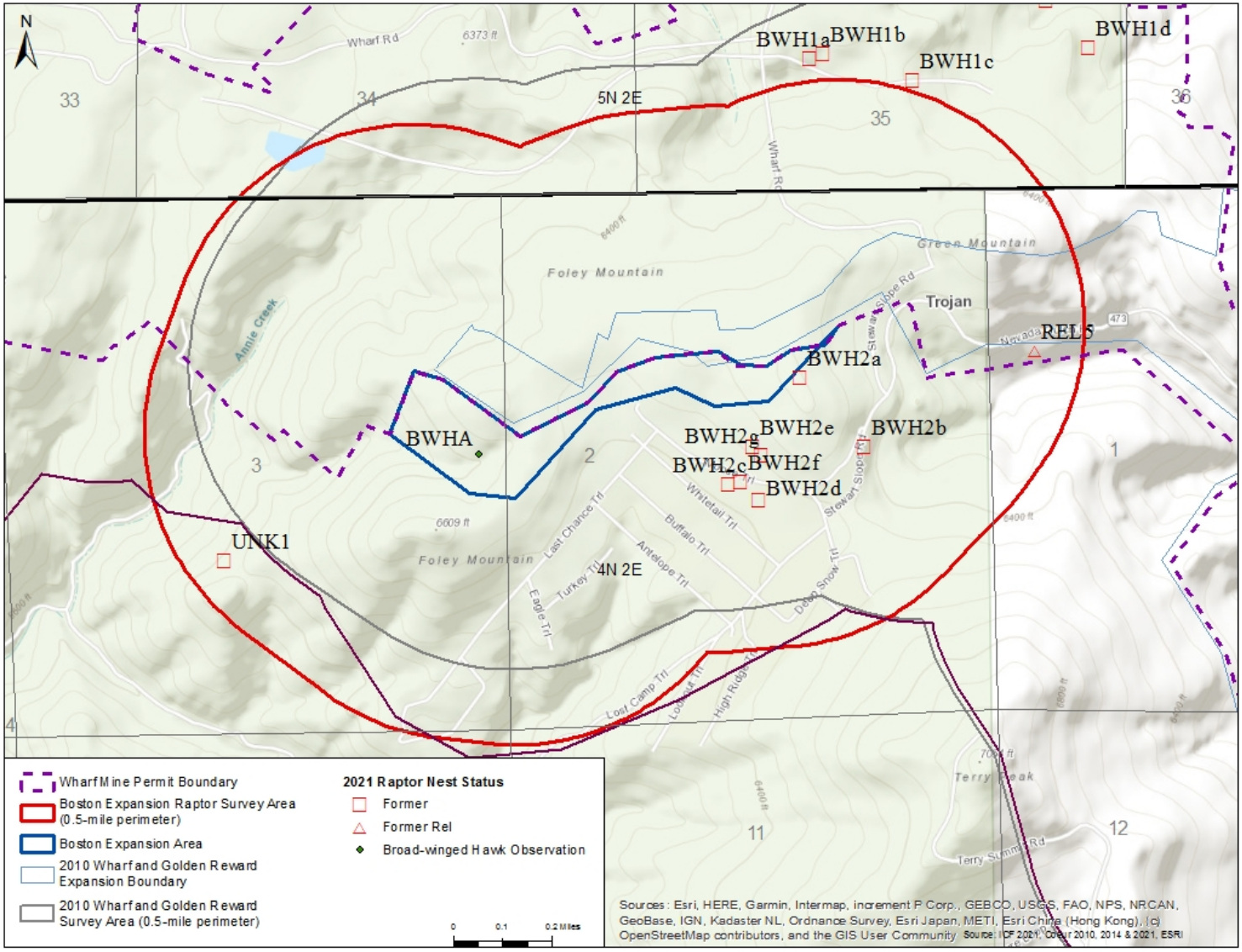


Figure 3. 2021 Bat Survey Passive Acoustic Monitor Locations at the Wharf Mine Boston Expansion

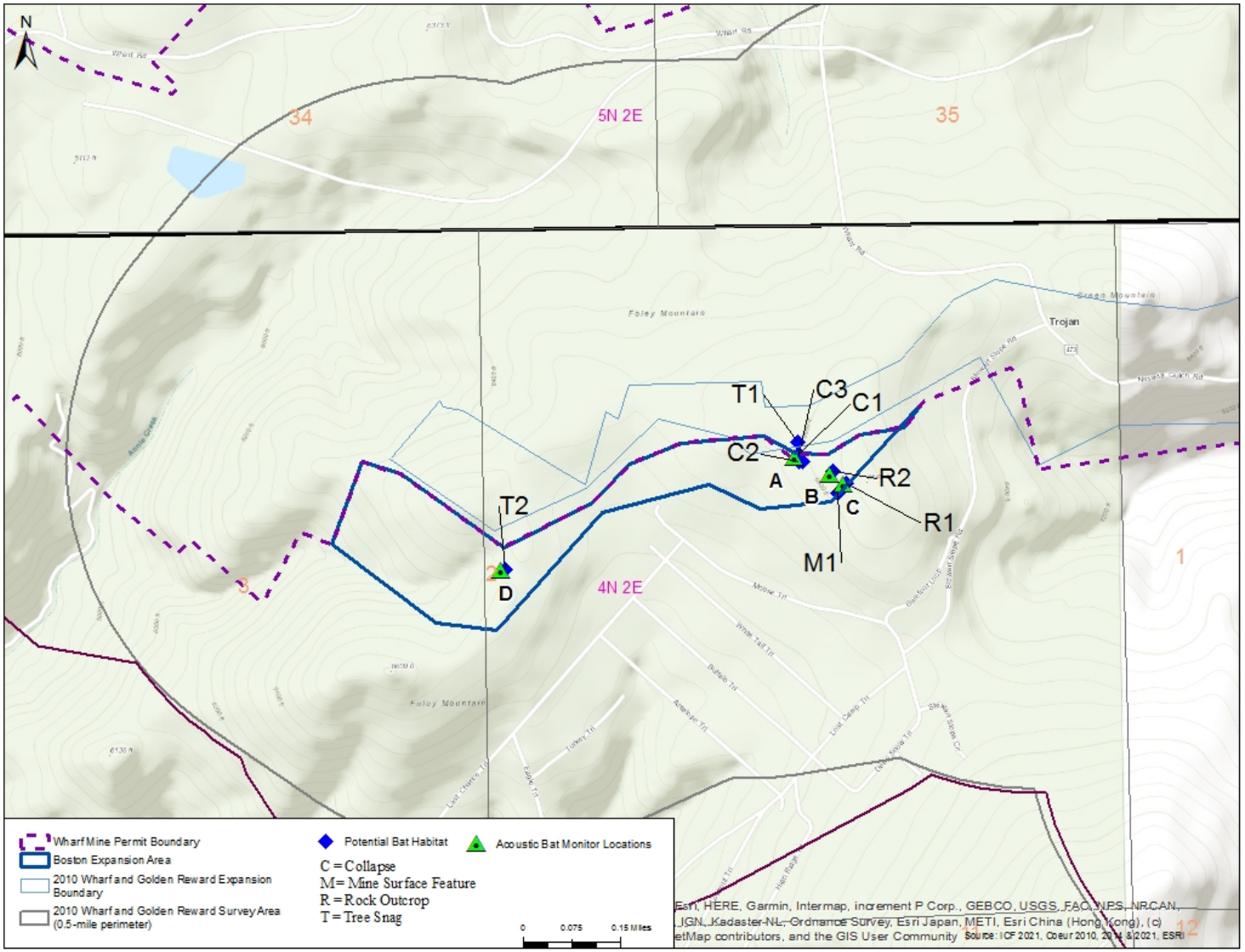
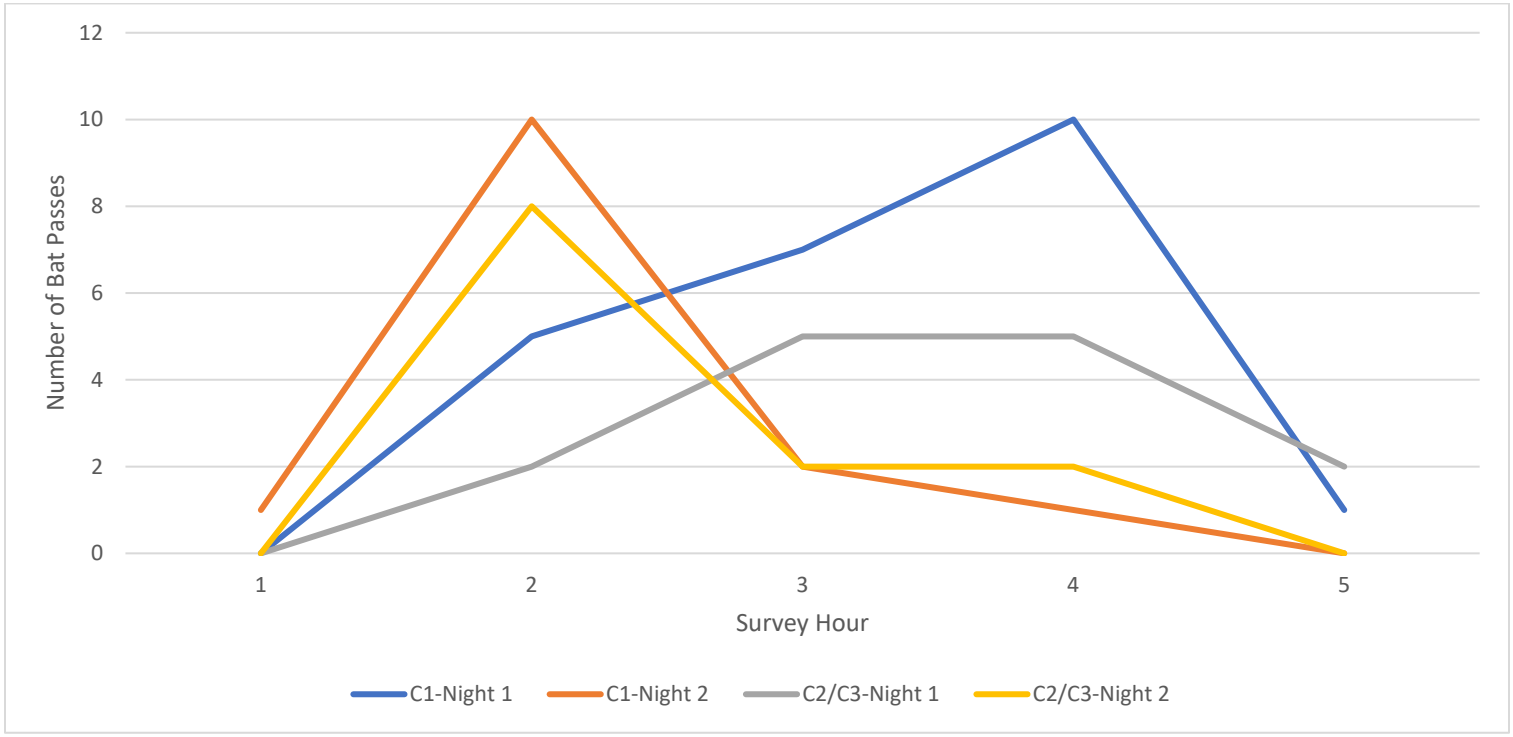


Figure 4. Bat Passes Recorded Per Survey Hour Using Elekon Heterodyne BatScanner During October 2021 Hibernacula Emergence Surveys at the Wharf Mine Boston Expansion



Photos: Bat Habitat

Photo 1: Mine Collapse (M 1)

Photo 2: Foley Collapse (C1)

Photo 3: Collapse (C2)

Photo 4: Collapse (C3)

Photo 5: Dead tree snags (T1)

Photo 6: Rock outcrop (R1)

Photo 7: Rock outcrop (R2)

Photo 8: Dead tree snag (T2)

Appendix A: Potential and Observed Species Lists

Appendix A-1. Potential[1] and Observed Mammalian Species in the Boston Expansion Survey Area

Common Name[2]	Latin Name	Recorded in 2021	Other Records in Vicinity [3]
Insectivores			
Hayden's shrew	*Sorex haydeni*	---	---
Masked shrew	*Sorex cinereus*	---	W,R,C
Merriam's shrew	*Sorex merriami*	---	---
Bats			
Big brown bat	*Eptesicus fuscus*	X	G,W
Eastern red bat	*Corynorhinus townsendii*	X	
Fringe-tailed myotis	*Myotis thysanodes*	X	---
Hoary bat	*Lasiurus cinereus*	X	G,W
Keen's myotis	*Myotis keeni*	---	---
Little brown myotis	*Myotis lucifugus*	X	R
Long-eared myotis	*Myotis evotis*	X	---
Long-legged myotis	*Myotis volans*	X	---
Northern long-eared bat	*Myotis septentrionalis*	X	G,W
Red bat	*Lasiurus borealis*	---	---
Silver-haired bat	*Lasionycteris noctivagans*	X	G,W
Western small-footed myotis	*Myotis ciliolabrum*	X	G,W
Townsend's big-eared bat	*Plecotus townsendii*	X	G,W
Unknown bat species		X	G,W
Hares and Rabbits			
Desert cottontail	*Sylvilagus audubonii*	---	---
Mountain cottontail	*Sylvilagus nuttallii*	---	R
White-tailed jackrabbit	*Lepus townsendii*	---	G,W,R,C
Cottontail species	*Sylvilagus spp.*	---	W,C

Appendix A-1. Continued

Common Name[2]	Latin Name	Recorded in 2021	Other Records in Vicinity [3]
Rodents			
Bushy-tailed woodrat	*Neotoma cinerea*	---	R,M
Deer mouse	*Peromyscus maniculatus*	---	W,R,C
House mouse	*Mus musculus*	---	---
Least chipmunk	*Tamias minimus*	---	G,W,R,M,C, D
Long-tailed vole	*Microtus longicaudus*	---	R,C
Meadow jumping mouse	*Zapus hudsonius*	---	W,C
Meadow vole	*Microtus pennsylvanicus*	---	R,C
Northern flying squirrel	*Glaucomys sabrinus*	---	---
Northern pocket gopher	*Thomomys talpoides*	---	G
Norway rat	*Rattus norvegicus*	---	---
Porcupine	*Erethizon dorsatum*	---	G,W,C
Prairie vole	*Microtus ochrogaster*	---	---
Red squirrel	*Tamiasciurus hudsonicus*	---	G,W,R,M,C,D
Southern red-backed vole	*Clethrionomys gapperi*	---	W,R,C
Thirteen-lined ground squirrel	*Spermophilus tridecemlineatus*	---	---
Vole species	*Microtus* spp.	---	W
White-footed mouse	*Peromyscus leucopus*	---	W,C
Yellow-bellied marmot	*Marmota flaviventris*	X	G,W,R, D
Carnivores			
Badger	*Taxidea taxus*	---	---
Black bear	*Ursus americanus*	---	---
Bobcat	*Lynx rufus*	---	---
Coyote	*Canis latrans*	---	G,W,R,M,C

Appendix A-1. Continued.

Common Name[2]	Latin Name	Recorded in 2021	Other Records in Vicinity [3]
Carnivores (continued)			
Eastern spotted skunk	*Spilogale putorius*	---	---
Ermine	*Mustela erminea*	---	R,C
Gray fox	*Urocyon cinereoargenteus*	---	---
Long-tailed weasel	*Mustela frenata*	---	---
Lynx	*Lynx canadensis*	---	---
Mink	*Mustela vison*	---	---
Mountain lion	*Felis concolor*	---	W
Pine marten	*Martes americana*	---	W,C
Raccoon	*Procyon lotor*	---	G,W,C
Red fox	*Vulpes*	---	---
Striped skunk	*Mephitis*	---	W,C
Weasel species	*Mustela spp.*	---	W,C
Ungulates			
Elk	*Cervus elaphus*	---	R
Mule deer	*Odocoileus hemionus*	---	G,W,R,M,C,D
Pronghorn	*Antilocapra americana*	---	W
White-tailed deer	*Odocoileus virginianus*	X	G,W,R,M,C,D
Bighorn Sheep	*Ovis canadensis*	---	W

[1] Potential Occurrence— list derived from range and habitat information in South Dakota Game Fish and Parks (2016), Sharps and Benzon (1984), Jones et al. (1983), Clark and Stromberg (1987), and Burt and Grossenheider (1976). Heritage Program (2018).

[2] Recorded in Vicinity—based on observations from the following studies in the Wharf area: Golden Reward baselines or monitoring from 1994 through 2002 (G), Wharf baselines or monitoring since 1994 (W), Clinton expansion baselines or monitoring from 1990 through 1999 (C), Ragged Top Project baseline from 1984 and 1985 (R), Minerva Project baseline from 1988 (M), and Deadwood Standard baselines from 2012 and 2013 (D).

[3] Species in **bold** indicate rare species tracked by the South Dakota Natural Heritage Program (2018).

Appendix A-2. Potential[1] and Observed Avian Species in the Boston Expansion Survey Area

Common Name[2]	Latin Name	Recorded in 2021	Other Records in Vicinity [3]
Loons and Grebes			
Common loon	*Gavia immer*	---	W
Eared grebe	*Podiceps nigricollis*	---	W
Horned grebe	*Podiceps auritus*	---	---
Pied-billed grebe	*Podilymbus podiceps*	---	---
Herons and Bitterns			
American bittern	*Botaurus lentiginosus*	---	---
Black-crowned night heron	*Nycticorax*	---	---
Great blue heron	*Ardea herodias*	---	W
Ibises			
White-faced ibis	*Plegadis chihi*	---	---
Swans, Geese, and Ducks			
American wigeon	*Anas Americana*	---	---
Blue-winged teal	*Anas discors*	---	W
Bufflehead	*Bucephala albeola*	---	W
Canada goose	*Branta Canadensis*	---	W
Canvasback	*Aythya valisineria*	---	W
Cinnamon teal	*Anas cyanoptera*	---	---
Common merganser	*Mergus merganser*	---	W
Gadwall	*Anas strepera*	---	W
Green-winged teal	*Anas crecca*	---	W
Lesser scaup	*Aythya affinis*	---	W
Mallard	*Anas platyrhynchos*	---	G,W,C
Northern pintail	*Anas acuta*	---	---
Northern shoveler	*Anas clypeata*	---	W
Redhead	*Aythya Americana*	---	W
Ring-necked duck	*Aythya collaris*	---	W
Ruddy duck	*Oxyura jamaicensis*	---	---

Appendix A-2. Continued.

Common Name[2]	Latin Name	Recorded in 2021	Other Records in Vicinity[3]
Swans, Geese, and Ducks, cont.			
Snow goose	*Chen caerulescens*	---	---
Vultures			
Turkey vulture	*Cathartes aura*	X	G,W,R,M,C,D
Diurnal Raptors			
American kestrel	*Falco sparverius*	---	W,C
Bald eagle	*Haliaeetus leucocephalus*	---	W
Broad-winged Hawk	*Buteo platypterus*	X	G,W,C,D
Cooper's Hawk	*Accipiter cooperii*	---	G,W,M,C,D
Ferruginous hawk	*Buteo regalis*	---	G,W
Golden eagle	*Aquila chrysaetos*	---	W
Merlin	*Falco columbarius*	---	W
Northern Goshawk	*Accipiter gentilis*	---	W
Northern harrier	*Circus cyaneus*	---	W
Osprey	*Pandion haliaetus*	---	W,D
Peregrine falcon	*Falco peregrines*	---	W,D
Prairie falcon	*Falco mexicanus*	---	W,C
Red-tailed Hawk	*Buteo jamaicensis*	---	G,W,R,M,C,D
Rough-legged hawk	*Buteo lagopus*	---	---
Sharp-shinned hawk	*Accipiter striatus*	---	G,W,C
Swainson's hawk	*Buteo swainsoni*	---	W
Gallinaceous Birds			
Ruffed grouse	*Bonasa umbellus*	---	G,W,M,C,D
Sharp-tailed grouse	*Tympanuchus cupido*	---	W
Wild turkey	*Meleagris gallopavo*	---	G,W,R,M,C,D
Cranes			
Sandhill crane	*Grus canadensis*	---	W
Whooping crane	*Grus americana*	---	---

Appendix A-2. Continued.

Common Name[2]	Latin Name	Recorded in 2021	Other Records in Vicinity[3]
Coots, Gallinules, and Rails			
American coot	*Fulica americana*	---	---
Sora	*Porzana carolina*	---	---
Virginia rail	*Rallus limicola*	---	W
Shorebirds, Gulls, and Terns			
American avocet	*Recurvirostra americana*	---	W
Common snipe	*Gallinago*	---	---
Greater yellowlegs	*Tringa melanoleuca*	---	---
Killdeer	*Charadrius vociferus*	---	G,W,C
Lesser yellowlegs	*Tringa flavipes*	---	---
Solitary sandpiper	*Tringa solitaria*	---	---
Spotted sandpiper	*Actitis macularia*	---	G,W
Upland sandpiper	*Bartramia longicauda*	---	---
Willet	*Catoptrophorus semipalmatus*	---	---
Wilson's phalarope	*Phalaropus tricolor*	---	W
Pigeons and Doves			
Mourning dove	*Zenaida macroura*	---	G,W,R,M,C
Rock dove	*Columba livia*	---	G,W
Cuckoos			
Black-billed cuckoo	*Coccyzus erythropthalmus*	---	---
Yellow-billed cuckoo	*Coccyzus americanus*	---	---
Owls			
Eastern screech owl	*Otus asio*	---	G
Great Horned Owl	*Bubo virginianus*	---	G,W,R,M,C
Long-eared owl	*Asio otus*	---	---
Northern saw-whet owl	*Aegolius acadicus*	---	G,W

Appendix A-2. Continued.

Common Name[2]	Latin Name	Recorded in 2021	Other Records in Vicinity[3]
Goatsuckers			
Common nighthawk	*Chordeiles minor*	---	D
Common poorwill	*Phalaenoptilus nuttallii*	---	W
Swifts			
White-throated swift	*Aeronautes saxatalis*	---	G,W,M,C
Hummingbirds			
Broad-tailed hummingbird	*Selasphorus platycercus*	---	G
Calliope hummingbird	*Stellula calliope*	---	---
Rufous hummingbird	*Selasphorus rufus*	---	---
Kingfishers			
Belted kingfisher	*Ceryle alcyon*	---	G,W
Woodpeckers			
Black-backed woodpecker	*Picoides arcticus*	---	G,W,D
Downy woodpecker	*Picoides pubescens*	---	G,W,R,C,D
Hairy woodpecker	*Picoides villosus*	---	G,W,R,M,C,D
Lewis' woodpecker	*Melanerpes lewis*	---	---
Northern flicker	*Colaptes auratus*	---	G,W,R,M,C,D
Red-headed woodpecker	*Melanerpes erythrocephalus*	---	G,W,C
Red-naped sapsucker	*Sphyrapicus nuchalis*	---	G,W,C,D
Three-toed woodpecker	*Picoides tridactylus*	---	G
Yellow-bellied sapsucker	*Sphyripicus varius*	---	G,W,R,M,C
Flycatchers			
Cordilleran flycatcher	*Empidonax occidentalis*	---	G,W,R,C,D
Dusky flycatcher	*Empidonax oberholseri*	---	G,W,R,C,D
Least flycatcher	*Empidonax minimus*	---	G,W,C
Eastern kingbird	*Tyrannus*	---	W
Eastern phoebe	*Sayornis phoebe*	---	---
Hammond's flycatcher	*Empidonax hammondii*	---	W

Appendix A-2. Continued.

Common Name[2]	Latin Name	Recorded in 2021	Other Records in Vicinity[3]
Flycatchers, cont.			
Olive-sided flycatcher	*Contopus cooperi*	---	W
Say's phoebe	*Sayornis saya*	---	---
Western kingbird	*Tyrannus verticalis*	---	G,M
Western wood pewee	*Contopus sordidulus*	---	G,W,R,D
Larks			
Horned lark	*Eremophila alpestris*	---	M
Swallows			
Barn swallow	*Hirundo rustica*	---	G,W,C
Cliff swallow	*Hirundo pyrrhonota*	---	G,W,C
Tree swallow	*Tachycineta bicolor*	---	G,W,D
Violet-green swallow	*Tachycineta thalassina*	---	G,W,R,M,C
Jays, Magpies, and Crows			
American crow	*Corvus brachyrhynchos*	---	G,W,C,D
Black-billed magpie	*Pica*	---	---
Blue jay	*Cyanocitta cristata*	---	G,W,R,M,C
Clark's nutcracker	*Nucifraga columbiana*	---	W
Common Raven	*Corvus corax*	---	G,W
Gray jay	*Perisoreus canadensis*	---	G,W,R,M,C,D
Pinyon jay	*Gymnorhinus cyanocephalus*	---	---
Chickadees			
Black-capped chickadee	*Parus atricapillus*	X	G,W,R,M,C,D
Pygmy nuthatch	*Sitta pygmaea*	---	---
Red-breasted nuthatch	*Sitta canadensis*	---	G,W,R,M,C,D
White-breasted nuthatch	*Sitta carolinensis*	---	G,W,R,M,C,D
Creepers			
Brown creeper	*Certhia americana*	---	G,W,C

Appendix A-2. Continued.

Common Name[2]	Latin Name	Recorded in 2021	Other Records in Vicinity[3]
Wrens			
Canyon wren	*Catherpes mexicanus*	---	W,R
House wren	*Troglodytes aedon*	---	G,W,C
Rock wren	*Salpinctes obsoletus*	---	G,W,R,C
Winter wren	*Troglodytes*	---	---
Dippers			
American dipper	*Cinclus mexicanus*	---	W
Gnatcatchers and Kinglets			
Golden-crowned kinglet	*Regulus satrapa*	---	G,W,C
Ruby-crowned kinglet	*Regulus calendula*	---	G,W,C
Thrushes			
American robin	*Turdus migratorius*	---	G,W,R,M,C,D
Eastern bluebird	*Sialia sialis*	---	W
Mountain bluebird	*Sialia currucoides*	---	G,W,M,C
Swainson's thrush	*Catharus ustulatus*	---	G,W,R,C,D
Townsend's solitaire	*Myadestes townsendi*	---	G,W,R,M,C,D
Veery	*Catharus fuscescens*	---	G,W,R,C
Mimic Thrushes			
Brown thrasher	*Toxostoma rufum*	---	---
Gray catbird	*Dumetella carolinensis*	---	---
Wagtails and Pipits			
American pipit	*Anthus rubescens*	---	W
Sprague’s pipit	*Anthus spragueii*	---	---
Waxwings			
Bohemian waxwing	*Bombycilla garrulus*	---	W
Cedar waxwing	*Bombycilla cedrorum*	---	W,C,D

Appendix A-2. Continued.

Common Name[2]	Latin Name	Recorded in 2021	Other Records in Vicinity[3]
Shrikes			
Northern shrike	*Lanius excubitor*	---	W,G
Loggerhead shrike	*Lanius ludovicianus*	---	W,M,C
Starlings			
European starling	*Sturnus vulgaris*	---	---
Vireos			
Bell's vireo	*Vireo bellii*	---	G,W
Red-eyed vireo	*Vireo olivaceus*	---	G,W,M,D
Plumbeous Vireo	*Vireo plumbeus*	---	W
Solitary vireo	*Vireo solitarius*	---	G,W,C
Warbling vireo	*Vireo gilvus*	---	G,W,R,M,C,D
Warblers			
American redstart	*Setophaga ruticilla*	---	W,C
Black-and-white warbler	*Mniotilta varia*	---	---
Blackburnian warbler	*Dendroica fusca*	---	G
Blackpoll warbler	*Dendroica striata*	---	M
Common yellowthroat	*Geothlypis trichas*	---	G
MacGillivray's warbler	*Oporornis tolmiei*	---	G,W,C,D
Orange-crowned warbler	*Vermivora celata*	---	W
Ovenbird	*Seiurus aurocapillus*	---	G,W,R,M,C,D
Tennessee warbler	*Vermivora peregrina*	---	W
Townsend's warbler	*Dendroica townsendi*	---	C
Wilson's warbler	*Wilsonia pusilla*	---	---
Yellow warbler	*Setophaga petechia*	X	G,W,C,D
Yellow-breasted chat	*Icteria virens*	---	G
Yellow-rumped warbler	*Dendroica coronata*	---	G,W,R,M,C,D
Tanagers			
Western tanager	*Piranga ludoviciana*	---	G,W,R,M,C,D

Appendix A-2. Continued.

Common Name[2]	Latin Name	Recorded in 2021	Other Records in Vicinity[3]
Grosbeaks and Buntings			
Black-headed grosbeak	*Pheucticus melanocephalus*	---	W,C,D
Blue grosbeak	*Guiraca caerulea*	---	---
Dickcissel	*Spiza americana*	---	---
Grosbeaks and Buntings (continued)			
Indigo bunting	*Passerina cyanea*	---	---
Lazuli bunting	*Passerina amoena*	---	---
Rose-breasted grosbeak	*Pheucticus ludovicianus*	---	---
Towhees, Sparrows, Juncos, and Longspurs			
American tree sparrow	*Spizella arborea*	---	---
Chestnut-collared longspur	*Calcarius ornatus*	---	W
Chipping sparrow	*Spizella passerina*	---	G,W,R,M,C,D
Clay-colored sparrow	*Spizella pallida*	---	---
Dark-eyed junco	*Junco hyemalis*	---	G,W,R,M,C,D
Field sparrow	*Spizella pusilla*	---	---
Harris' sparrow	*Zonotrichia querula*	---	W
Lark bunting	*Calamospiza melanocorys*	---	W
Lark sparrow	*Chondestes grammacus*	---	W
Snow bunting	*Plectrophenax nivalis*	---	W
Song sparrow	*Melospiza melodia*	---	G,W
Spotted towhee	*Pipilo maculatus*	---	W,D
Vesper sparrow	*Pooecetes gramineus*	---	W
White-crowned sparrow	*Zonotrichia leucophrys*	---	---
White-throated sparrow	*Zonotrichia albicollis*	---	---
Blackbirds, Meadowlarks, and Orioles			
Brewer's blackbird	*Euphagus cyanocephalus*	---	G,W
Brown-headed cowbird	*Molothrus ater*	---	G,W,M,C,D
Common grackle	*Quiscalus quiscula*	---	G,W

Appendix A-2. Continued.

Common Name[2]	Latin Name	Recorded in 2021	Other Records in Vicinity[3]
Blackbirds, Meadowlarks, and Orioles, cont.			
Northern oriole	*Icterus galbula*	---	G,W,C
Orchard oriole	*Icterus spurius*	---	---
Red-winged blackbird	*Agelaius phoeniceus*	---	G,W
Western meadowlark	*Sturnella neglecta*	---	W
Finches			
American goldfinch	*Carduelis tristis*	---	W,R,C
Cassin's finch	*Carpodacus cassinii*	---	G,W,R,D
Common redpoll	*Carduelis flammea*	---	W
Evening grosbeak	*Coccothraustes vespertinus*	---	G, W, C
House finch	*Carpodacus mexicanus*	---	---
Pine grosbeak	*Pinicola enucleator*	---	W
Pine siskin	*Carduelis pinus*	---	G,W,R,C,D
Purple finch	*Carpodacus purpureus*	---	---
Red crossbill	*Loxia curvirostra*	---	G,W,R,C,D
Rosy finch	*Leucosticte arctoa*	---	W
White-winged crossbill	*Loxia leucoptera*	---	---
Weaver Finches			
House sparrow	*Passer domesticus*	---	---

[1] Potential Occurrence— list derived from range and habitat information in South Dakota Game Fish and Parks (2016), Peterson (2020), Robbins et al. (2001), Stokes et al. (2013).

[2] Species in **bold** indicate rare species tracked by the South Dakota Natural Heritage Program (2018).

[3] Recorded in Vicinity—based on observations from the following studies in the Wharf area: Golden Reward baselines or monitoring from 1994 through 2002 (G), Wharf baselines or monitoring since 1994 (W), Clinton expansion baselines or monitoring from 1990 through 1999 (C), Ragged Top Project baseline from 1984 and 1985 (R), Minerva Project baseline from 1988 (M), and Deadwood Standard baselines from 2012 and 2013 (D).

Appendix A-3. Potential[1] and Observed Reptilian and Amphibian Species in the Boston Expansion Survey Area

Common Name[2]	Latin Name	Recorded in 2021	Other Records in Vicinity [3]
Salamanders			
Tiger salamander	*Ambystoma tigrinum*	---	---
Frogs and Toads			
Boreal chorus frog	*Pseudacris triseriata*	X	G,W,C
Northern leopard frog	*Rana pipiens*	---	G,W
Lizards			
Short-horned lizard	*Phrynosoma hernandesi*	---	---
Snakes			
Black hills redbelly snake	*Storeria occipitomaculata pahasapae*	---	W
Bullsnake	*Pituophis melanoleucas sayi*	---	---
Common garter snake	*Thamnophis sirtalis*	---	---
Eastern yellowbelly racer	*Coluber constrictor*	---	---
Pale milk snake	*Lampropeltis triangulum multistriata*	---	---
Smooth green snake	*Liochlorophis vernalis*	---	G,W
Western terrestrial (wandering) garter snake	*Thamnophis elegans*	---	G,W

[1] Potential Occurrence— list derived from range and habitat information in South Dakota Game Fish and Parks (2016), Kiesow (2006).

[2] Species in **bold** indicate rare species tracked by the South Dakota Natural Heritage Program (2018).

[3] Recorded in Vicinity—based on observations from the following studies in the Wharf area: Golden Reward baselines or monitoring from 1994 through 2002 (G), Wharf baselines or monitoring since 1994 (W), Clinton expansion baselines or monitoring from 1990 through 1999 (C), Ragged Top Project baseline from 1984 and 1985 (R), Minerva Project baseline from 1988 (M), and Deadwood Standard baselines from 2012 and 2013 (D).

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Appendix A-3: Amphibians and Reptiles

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COEUR WHARF BOSTON EXPANSION BAT MINIMIZATION PLAN

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May 2022

ICF. 2022. Coeur Wharf Boston Expansion Bat Minimization Plan. May. (ICF 103815.0.001) Gillette, WY. Prepared for Wharf Resources (USA), Inc., Lead, SD.

Contents

Chapter 1
Introduction and Background

Wharf Resources, (USA) Inc., Wharf Mine (Wharf) has proposed to expand existing gold mine operations in the area known as the Boston Expansion. This area is approximately three miles west of Lead, in Lawrence County, South Dakota. The proposed Boston Expansion consists of approximately 50 acres of private land located in Sections 2 and 3, T4N, R2E. The proposed Boston Expansion is located along the southern edge of the existing Wharf Mine permit boundary along the Portland Ridgeline (**Figure 1**).

The proposed Boston Expansion is in an area that has been previously surveyed for wildlife at the Wharf Mine as part of annual monitoring and proposed expansion projects (**Figure 1**). In 2010, a baseline wildlife study was conducted by ICF for the Wharf and Golden Reward Expansion (WGRE) project, which covered 573 acres. The Boston Expansion is adjacent to the Wharf permit area on the south side and is entirely within the larger WGRE survey area (**Figure 1**). The 2010 surveys identified bat habitat and detected three bat species listed in the South Dakota Natural Heritage Program (SDNHP) (ICF 2010). These bat species observations were in the vicinity of, but not within, the Boston Expansion. No evidence of collective roosting was observed in 2010, and minimization measures for potential impacts on bats were implemented to allow individuals to escape before underground habitat was backfilled.

In 2021, in cooperation with the South Dakota Game, Fish, and Parks (SDGFP), ICF conducted acoustic surveys (presence/absence) for sensitive bats species at several locations within the proposed Boston Expansion. ICF also conducted emergence surveys at three collapse and crevice features identified as potential hibernacula habitat (sites identified as C1, C2, and C3 on **Figure 1**). The acoustic survey documented several bat species in the area, including five state sensitive and/or federally listed species including the northern long-eared bat (*Myotis septentrionalis*). However, no bats were observed emerging from the collapse and crevice sites during the emergence surveys.

Results of the 2021 surveys were submitted to the SDGFP and South Dakota Department of Agriculture and Natural Resources (SDDANR) in November 2021 (ICF 2021). The U.S. Fish and Wildlife Service South Dakota Field Office (USFWS) was contacted in December 2021 regarding the presence of northern long-eared bats in the Boston Expansion (pers. comm., December 9, 2021, USFWS/SDGFP/Wharf/ICF Meeting). The USFWS stated that as there were no known hibernacula or maternity roosts in the study area, the agency would not require Wharf to complete additional surveys for the species at potential suitable habitat sites. Furthermore, the USFWS said it would not need to be involved with the project further unless additional surveys were conducted, and the species was confirmed emerging from the sites. Based on the USFWS suggestion that spring surveys be completed due to the bat's presence in the area, it was decided that a spring emergence survey at the collapse sites would be conducted in 2022 to confirm bat presence prior to site closure.

Chapter 2.0 *Current Site Conditions* provides a summary of the 2021 acoustic (presence/absence) and emergence surveys and Chapter 3.0 *Avoidance and Minimization Measures* details steps that will be implemented by Wharf prior to any potential bat habitat disturbance at the proposed Boston Expansion. Specific protocols are included in Appendix A and are similar to those previously established for the Boston Expansion, which were approved by the SDGFP (SDGFP 2021). The avoidance and minimization measures described below are based on the guidelines required for permitting and environmental analysis through the State and USFWS guidelines.

Chapter 2
Current Site Conditions

Acoustic (presence/absence) and habitat surveys for bats at Wharf Mine have been conducted in previous years as part of baseline surveys for the WGRE as well as other areas around the mine. Prior to 2021, the most recent bat surveys were conducted in 2010 as part of the WGRE baseline surveys. This information was consulted and taken into consideration prior to completing 2021 bat surveys for the proposed Boston Expansion. Results from the WGRE surveys indicate that both federally listed, and state sensitive bat species were present in the area (ICF 2010).

Preliminary habitat assessments for maternity roost and winter hibernacula sites occurred in June and August 2021. ICF biologists conducted pedestrian ground searches and assessments for potential roost and hibernacula sites (i.e., rock cavities, crevices located in rock outcrops, or trees with loose bark or cavities) that could host wintering or breeding bat species within the Boston Expansion per correspondence with SDGFP (Allen and Michaels pers. comm.). Biologists also assessed locations provided by Wharf on previous and historical mining activities in or near the Boston Expansion; these included sites identified as potential bat habitat during the 2010 WGRE baseline surveys.

During the 2021 surveys, ICF biologists assessed five historical surface mine features identified by Wharf that could potentially support bats. Of these, four (T1, C1, C2, and C3) had features that could indicate suitable summer and/or winter habitat (ICF 2021). The final site (M1, **Figure 1**) did not have bat habitat present due to a lack of shafts, adits, or tunnels. A nearby granite rock outcrop was also assessed and was determined to lack suitable habitat to host a bat roost or hibernaculum (ICF 2021).

In addition to these sites, ICF identified three other potential bat habitat sites. Two were granite rock outcrops (R1 and R2, **Figure 1**) with roosting habitat characteristics (i.e., shallow small crevices) and one was a tree snag (T2, **Figure 1**) with potential roosting site characteristics (ICF 2021).

Site T1 was originally identified as an old, excavated pit, and was assessed during the 2010 WGRE baseline surveys. No potential hibernacula or maternity roost habitats were identified at the site during that visit. T1 was revisited in 2021 because it was categorized by Wharf as an existing surface mining feature. Although the site lacked openings to underground shafts two snags in the pit could provide individual bat roosting habitat.

Sites C1, C2, and C3 are three collapsed shafts approximately 50 feet from each other (**Figure 1,** Photos 1-3) and could provide suitable roosting or winter habitat. The C1 pit (also known as the Foley Collapse) has a larger opening at the surface (approximately 35 feet in diameter) that narrows into a shaft with an opening of roughly 14 square feet (Photo 1). A safety fence installed around the C1 pit prevents a close view of the site. In August 2021, Wharf personnel used a drone to explore C1 to a point where the drone no longer fit in the passage (estimated to occur at a depth between 25 and 50 feet); no horizontal openings or crevices were observed extending from the shaft. The C2 and C3 sites have openings of approximately 10 feet and 5 feet in diameter at the surface, respectively, and shaft depths of approximately 30 feet (Photos 2 and 3). The openings to the C2 and C3 sites are within 15 feet of each other and located in the same narrow drainage, with C3 located upstream of C2.

Based on these initial inspections, and consultation with SDGFP (SDGFP pers. comm. August 31, 2021) ICF conducted acoustic presence/absence surveys in September 2022 at six potential

roosting habitat sites. Acoustic detectors were placed at four locations within the Boston Expansion area: one near C1, C2, and C3; one each by R1 and R2; and one near T2. T1 was not surveyed as it lacked features to host colonial maternity roosts. Of the 11 species identified during the surveys, five were listed as South Dakota Natural Heritage Program (SDHNP) species of concern (ICF 2021). These species included the northern long-eared bat (*Myotis septentrionalis*), a USFWS threatened species, which was recorded by the detector placed near the C1, C2, and C3 sites.

Winter habitat surveys were conducted at five sites (C1, C2, C3, R1, and R2) because they had some suitable winter habitat characteristics or the SDGFP recommended they be surveyed (ICF 2021; SDGFP pers. comm. August 31, 2021). Two sites (T1 and T2) had tree snags that could host individual roosting bats but were unsuitable as hibernacula sites and were not included in the October 2021 surveys. Visual emergence surveys were completed in October 2021 at C1, C2, and C3, while passive acoustic detectors were placed at R1 and R2 to gauge bat activity in the area.

No bats were observed emerging from the C1, C2, or C3 collapse sites during the visual surveys or during review of video footage. Acoustic detectors placed near the sites recorded six bat species, three of which were SDNHP species of concern. Four bat species, including one SDNHP species of concern, were recorded near the rock outcrops. The northern long-eared bat was not detected during the October surveys at any of the sites.

The proximity of the C1, C2, and C3 sites to one another indicates potential for underground connections between the sites, although the presence of such interconnections is unconfirmed. Because of this, SDGFP has recommend the sites be included with additional surveys in the Boston Expansion area (Michals and Kane pers. comm.).

While there are no known horizontal crevices or other workings leading from the C1 collapse, the unknown depth of the collapse indicates the site could host marginal features for suitable winter bat habitat below the point where the drone stopped. Therefore, the site is recommended for spring emergence surveys to further evaluate its suitability as winter habitat.

Wharf is proposing to conduct additional emergence counts and acoustic surveys to document presence/absence of bats within C1 C2, and C3. Following consultation with an ICF biologist with expertise in bat biology (ICF pers. comm. April 12, 2022; Droppelman and Kane pers. comm. April 15, 2022), trapping is not proposed at C1, C2, or C3 due to the following:

1. The instability and opening dimensions of C1, C2, and C3 would make harp trapping excessively problematic and present an unacceptable hazard risk to personnel.
2. Unnecessary handling of bats during spring emergence should be avoided in order to minimize stress to bats with depleted energy reserves and the potential for the spread of *Pseudogymnoascus destructans* (white nose syndrome).
3. Emergence observations and acoustic surveys will determine if bats in general are using the structure as winter habitat. Trapping would only be employed to further verify species composition and condition once presence has been established in order to inform next steps in the regulatory process.

Should state or federally listed bat species be observed using C1, C2, and/or C3 during spring surveys, additional coordination with regulatory agencies will be conducted. If required, additional conservation measures may be warranted.

Chapter 3
Avoidance and Minimization Measures

Wharf Mine is in the process of permitting the proposed Boston Expansion and anticipates issuance of the permit by the SDDANR in the fourth quarter of 2022. Current permitted mining activities, as well as those for the proposed Boston Expansion, will include blasting, haul traffic, and recovery of mineral resources. Mine activities will operate in the crevice and collapsed site areas as part of the future mine plan.

To avoid potential impacts to bats from the proposed Boston Expansion, Wharf will implement the following avoidance and minimization measures ahead of physical closure of crevice and collapse sites. Additionally, the avoidance and minimization measures outlined below will be performed using established practices as noted in Appendix A. Specific survey and closure protocols are detailed in Appendix A: Wharf Mine Boston Expansion 2022 Bat Emergence Survey Protocols.

3.1 Seasonal Restrictions

- Tree clearing and site closure activities at roost habitats will be performed outside of the bat maternity season and the active season (June 1–August 31).
- Closure activities at winter habitat sites and collapses will be performed during the bats' active season (June 1 – August 31).

3.2 Pre-closure Surveys

- Qualified biologists will conduct emergence surveys at the C1, C2, and C3 sites-consistent with protocols outlined in **Appendix A** (i.e., two rounds of surveys conducted over 2 weeks, weather permitting).
- Emergence surveys will be conducted from late April through May (**Appendix A**).

3.3 Temporary Closure

- After emergence surveys are completed, temporary physical exclusion barriers will be installed to prevent bats from re-entering the site.
- Temporary closures will remain in place for at least 1 week prior to permanent closure of the site. Closures will be functional and in good condition (i.e., no gaps, holes, or tears) 1 week prior to permanent site closure.
- Temporary enclosures will be similar to those used for the WGRE baseline area in 2010 and/or those recommended by the USFWS (2009).
- Temporary closures will occur from June 1 to August 31.

3.4 Permanent Closure

- Permanent closure should be completed at least one week (during good weather) after

temporary closure of the site is completed.

3.5 Agency Contact Protocol

- The SDGFP will be contacted in the event an injured or deceased bat is discovered during the pre-closure surveys or the temporary or permanent closure measures. The contact person is Stan Michals, Energy and Mineral Coordinator, 605-394-2589, or stan.michals@state.sd.us.
- No additional consultation with the USFWS is anticipated for these measures. As of December 2021, the USFWS stated they would not require targeted surveys for the Boston Expansion project (USFWS pers. comm. December 9, 2021). The agency declined further involvement with the project unless there is confirmation of threatened bat species use of the collapsed site.
- The SDGFP will notified during the following AMM milestones:
    - Initiation of spring emergence surveys.
    - Emergence survey results.
    - Placement of temporary closures.
    - Inspection of temporary closures 1 week prior to permanent closure.
    - Completion of permanent closure.

Chapter 4
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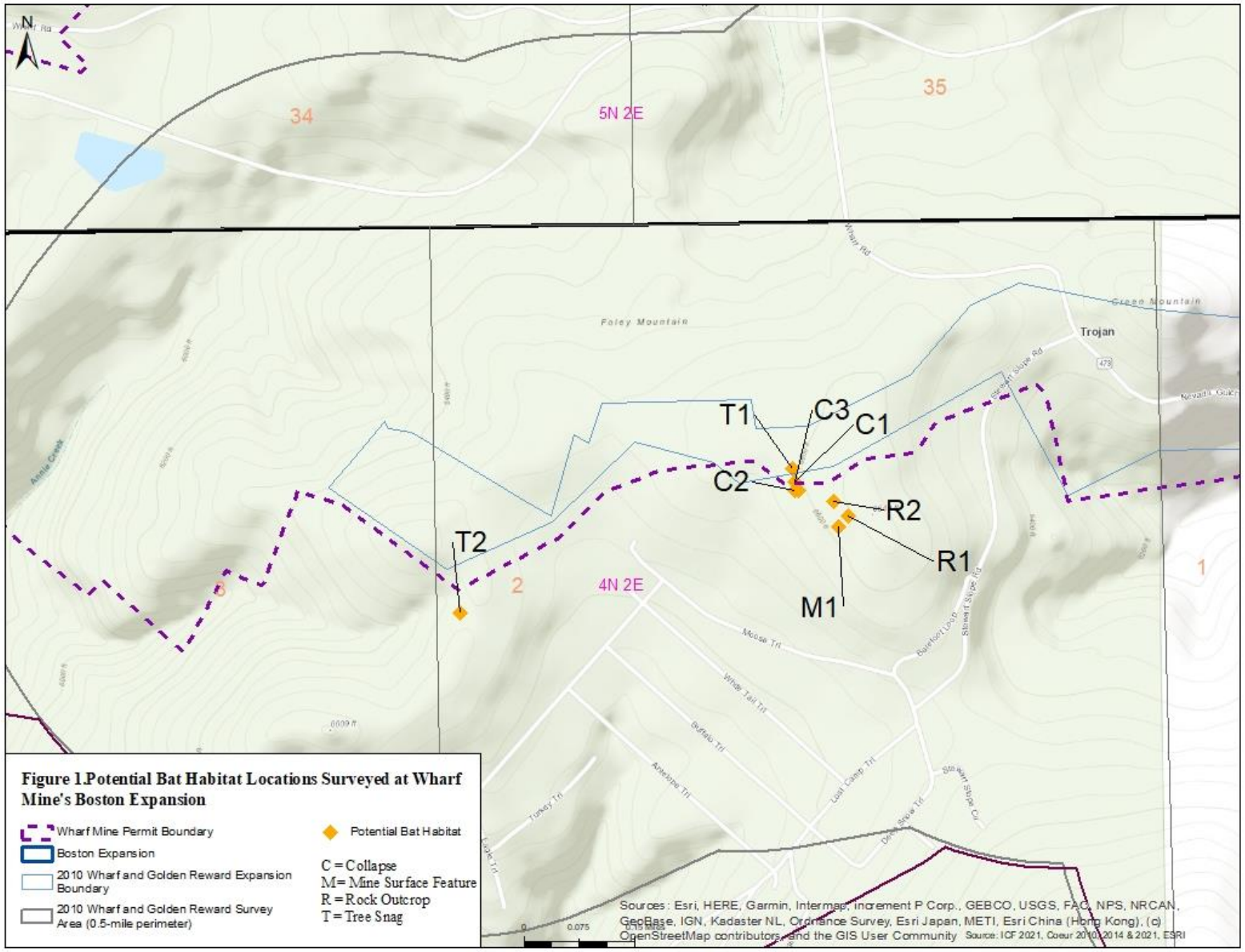
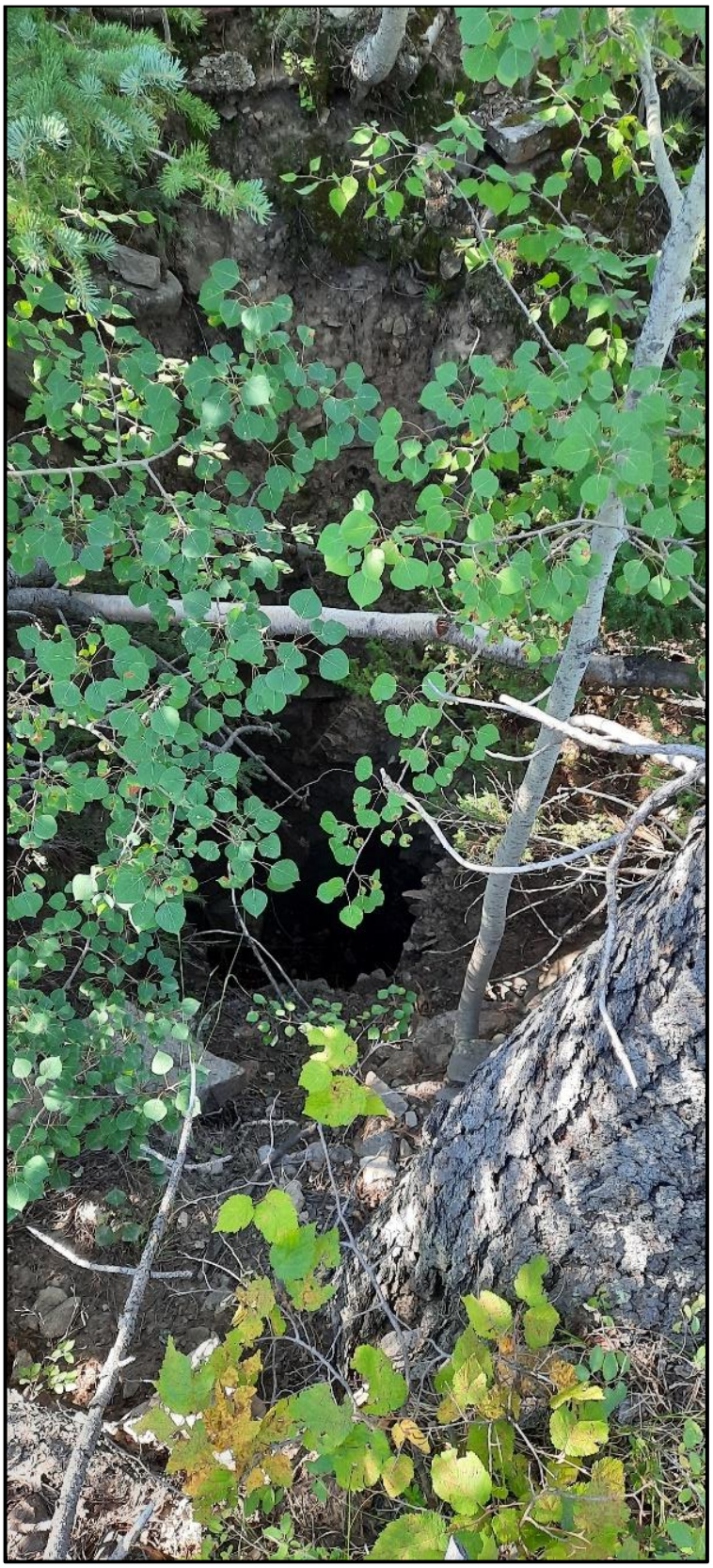

N
34
5N 2E
35
Foley Mountain
Trojan
T1
C3
C1
C2
R2
R1
M1
T2
2
4N 2E
Figure 1.Potential Bat Habitat Locations Surveyed at Wharf Mine's Boston Expansion
Wharf Mine Permit Boundary
Boston Expansion
2010 Wharf and Golden Reward Expansion Boundary
2010 Wharf and Golden Reward Survey Area (0.5-mile perimeter)
Potential Bat Habitat
C = Collapse
M = Mine Surface Feature
R = Rock Outcrop
T = Tree Snag
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community Source: ICF 2021, Coeur 2010, 2014 & 2021, ESRI

Photos

Photo 1: Foley Collapse (C1)

Photo 2: Collapse 2 (C2)

Photo 3: Collapse 3 (C3)



Appendix A

2022 Wharf Mine Boston Expansion Bat Emergence Survey Protocols

Introduction

The bat survey protocols developed for this plan are based on those previously utilized and approved by the South Dakota Game Fish and Parks (SDGFP) for the 2010 Wharf and Golden Reward Expansion (WGRE) and 2021 proposed Boston Expansion baseline surveys, and/or those recommended by state and federal agencies (ICF 2010 and 2021; SDGFP pers. comm. August 31, 2021). Also utilized for this protocol were the U.S. Fish and Wildlife Service (USFWS) *Range-wide Indiana Bat and Northern Long-eared Bat Survey Guidelines* (hereafter, USFWS Survey Guidelines 2022), the USFWS *Range-wide Indiana Bat Protection and Enhancement Plan Guidelines* (hereafter, USFWS Plan Guidelines 2009), and the *USFWS Northern Long-eared Bat Interim Conference and Planning Guidance* (hereafter, USFWS Interim Guidance 2014). Standard precautions and all recommended guidelines detailed in the *South Dakota Bat Management Plan* (Dowd-Stukel 2001) will be followed to prevent undue disturbance to any hibernating or breeding/nursing bats encountered.

Objective

The objective of this bat survey protocol is to ensure that Coeur Wharf Resources (USA), Inc. (Wharf), has an agency-approved bat minimization plan so that mining activities that include tree removal or the closures of crevices and collapses at the proposed Boston Expansion area minimize or eliminate any potential harm to bat species.

Methodology

Emergence surveys will be conducted in the spring. These will consist of visual surveys supplemented by acoustic (presence/absence) detection. Trapping of bats at the collapse site will not be conducted, primarily to prevent harm or additional stress to bats when their energy stores are at their lowest. In addition, the vertical position of the C1, C2, and C3 collapse sites, combined with unstable edges, poses a safety hazard to personnel and potential emerging bats.

Emergence surveys at the C1, C2, and C3 sites will occur in May 2022 and when overnight temperatures are a minimum of 50 degrees Fahrenheit during the survey window (Wisconsin Department of Natural Resource 2017, Pennsylvania Game Commission n.d.; USFWS 2022). Surveys will be conducted only during acceptable weather conditions (no rain or high winds, night temperatures above 50 degrees Fahrenheit during the survey period). If these conditions cannot be met during the survey window, then surveys will commence as soon as forecasts seem favorable; agencies will be notified of the change. Historic weather records for the mine (Wharf 2022) indicate April conditions are typically cool, with average overnight temperatures of 30 degrees Fahrenheit and snowstorms. Weather records in May have higher average overnight lows in the mid-40s and fewer snowstorms. Research studies show that bat will not regularly emerge from hibernacula until evening temperatures are reliably above 50 degrees for several days, as this affects other factors such as food availability and ambient cave temperature (Brack and Twente 1985; Paige 1995; Perry

2012).

A combination of passive acoustic surveys and active monitoring will be utilized, following protocols previous established for the Wharf Mine and Boston Expansion area (ICF 2021, SDGFP 2021a and 2021b). Studies by Lemen et al. (2016a and 2016b) indicate that passive acoustic detection is a reliable method of detecting long-eared bats emerging from hibernaculum. One Wildlife Acoustics SM4BAT full-spectrum bat echolocation detector (or equivalent) equipped with single omni-directional ultrasonic microphones will be placed according to the USFWS *Survey Guidelines* near the C1, C2, and C3 sites. The detector unit will be mounted to a t-post and its microphone will be positioned 3 meters above ground level.

The acoustic detector will be placed concurrently during active visual emergence surveys. Surveys will occur over 2 weeks, with two consecutive survey nights per week (USFWS 2009 and 2022). Qualified wildlife biologists will monitor the collapse entrances, using a heterodyne bat detector and/or a night-vision/infrared video recording device to record bats entering and exiting. The monitoring period will begin at dusk and continue until 2 hours after dusk (USFWS 2009).

The biologist will follow protocols established by the USFWS *Survey Guidelines*. The biologist will be in a position such that they will not interfere with the passive acoustic detector. Data reported will include the number of bat passes per hour during the period and notes describing the bat activity throughout the period. Data on weather conditions will also be recorded.

Data Analysis

Recorded acoustic signatures will be analyzed by a trained biologist using the *SonoBat* computer software (version 4.2.2) or equivalent. All calls from each survey night will be analyzed and identified to species when possible.

Temporary Site Closure

After emergence surveys are completed, temporary physical exclusion barriers will be installed to prevent bats from re-entering the site. Proper tarp placement and closure of these sites should prevent bats from flying into the underground portion of the mine. Any bats closed in with this method of temporary closure can escape by crawling out from around the edges of the tarp. There should be no openings large enough to permit a flying bat to enter or exit the mine.

Temporary closures will be functional (i.e., still in place and intact with no gapes, holes, or tears that could allow bats to enter the collapses) for 1 week prior to closure. If storm or other damage occurs to the temporary closure it will be returned to functional condition and operation and remain in place for 1 additional week prior to permanent site closure.

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Appendix A

2022 Wharf Mine Boston Expansion Bat Emergence Survey Protocols

Introduction

The bat survey protocols developed for this plan are based on those previously utilized and approved by the South Dakota Game Fish and Parks (SDGFP) for the 2010 Wharf and Golden Reward Expansion (WGRE) and 2021 proposed Boston Expansion baseline surveys, and/or those recommended by state and federal agencies (ICF 2010 and 2021; SDGFP pers. comm. August 31, 2021). Also utilized for this protocol were the U.S. Fish and Wildlife Service (USFWS) *Range-wide Indiana Bat and Northern Long-eared Bat Survey Guidelines* (hereafter, USFWS Survey Guidelines 2022), the USFWS *Range-wide Indiana Bat Protection and Enhancement Plan Guidelines* (hereafter, USFWS Plan Guidelines 2009), and the *USFWS Northern Long-eared Bat Interim Conference and Planning Guidance* (hereafter, USFWS Interim Guidance 2014). Standard precautions and all recommended guidelines detailed in the *South Dakota Bat Management Plan* (Dowd-Stukel 2001) will be followed to prevent undue disturbance to any hibernating or breeding/nursing bats encountered.

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2012).

A combination of passive acoustic surveys and active monitoring will be utilized, following protocols previous established for the Wharf Mine and Boston Expansion area (ICF 2021, SDGFP 2021a and 2021b). Studies by Lemen et al. (2016a and 2016b) indicate that passive acoustic detection is a reliable method of detecting long-eared bats emerging from hibernaculum. One Wildlife Acoustics SM4BAT full-spectrum bat echolocation detector (or equivalent) equipped with single omni-directional ultrasonic microphones will be placed according to the USFWS *Survey Guidelines* near the C1, C2, and C3 sites. The detector unit will be mounted to a t-post and its microphone will be positioned 3 meters above ground level.

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Temporary closures will be functional (i.e., still in place and intact with no gapes, holes, or tears that could allow bats to enter the collapses) for 1 week prior to closure. If storm or other damage occurs to the temporary closure it will be returned to functional condition and operation and remain in place for 1 additional week prior to permanent site closure.

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———. September 3, 2021b—email from Stan Michals (SDGFP) to Amy Allen (Wharf) and Silka Kemperna (SDGFP) titled “RE: GFP Proposed Boston Expansion Bat Work Plan,” providing approval of the ICF-drafted bat survey plan.

Technical Memorandum

To:	Matt Zietlow, Coeur Wharf Resources (USA), Inc., Environmental Manager
From:	Stephanie Kane, Senior Wildlife Biologist, ICF
Date:	August 16, 2022
Re:	**Wharf Mine Boston Expansion – 2022 Bat Emergence Surveys**

Introduction and Project Location

Coeur Wharf Resources (USA), Inc., Wharf Mine (Wharf) has proposed to expand existing gold mine operations in the area known as the Boston Expansion. This area is approximately 3 miles west of Lead, in Lawrence County, South Dakota. The Boston Expansion consists of approximately 50 acres of private land located in Sections 2 and 3, T4N, R2E. The area is within both the Wharf Mine annual wildlife survey area and the 2010 Wharf Golden Reward Expansion (WGRE) baseline survey area (Figure 1). Wildlife surveys, including those for bat presence, absence, and emergence at potential winter habitat locations, were first conducted for the project in 2021. Several sensitive bat species, including the federally listed northern long-eared bat (*Myotis septentrionalis* [NLEB]), were recorded in the area during surveys. Based on survey results and discussions with the South Dakota Game, Fish, and Parks (SDGFP) and the U.S. Fish and Wildlife Service (USFWS), ICF Jones & Stokes, Inc., (ICF) worked with Wharf to develop a *Bat Minimization Plan* for the Boston Expansion.

In accordance with the *Boston Expansion Bat Minimization Plan*, ICF biologists completed spring bat emergence surveys at the three collapsed mine shaft sites (C1, C2, and C3) identified as potential winter habitat in the Boston Expansion. The objective of the surveys was to determine if bats were using the shaft collapse sites as winter or roost habitat. Surveys occurred in May and June 2022.

Field Methods

Bat survey protocols followed those outlined in the *Boston Expansion Bat Minimization Plan* (ICF 2022). These protocols were previously approved by the SDGFP and utilized for the 2010 WGRE and 2021 Boston Expansion baseline surveys (ICF 2010 and 2021; SDGFP pers. comm. August 31, 2021). Methods integrate guidelines and protocols recommended by state and federal agencies, including: the USFWS *Range-wide Indiana Bat and Northern Long-eared Bat Survey Guidelines* (hereafter, *Survey Guidelines*, USFWS 2022), the USFWS *Range-wide Indiana Bat Protection and Enhancement Plan Guidelines* (2009), and the *USFWS Northern Long-eared Bat Interim Conference and Planning Guidance* (2014). Standard precautions and all recommended guidelines detailed in the *South Dakota Bat Management Plan* (Dowd-Stukel 2001) were followed to prevent undue disturbance to any hibernating or breeding/nursing bats encountered.

Emergence surveys at the C1, C2, and C3 sites occurred in May and June 2022 and when overnight temperatures were a minimum of 50 degrees Fahrenheit (°F) during the survey window (Wisconsin

Department of Natural Resource 2017; Pennsylvania Game Commission n.d.; USFWS 2022). Surveys were conducted during acceptable weather conditions (no rain or sustained high winds, night temperatures above 50°F during the survey period). A combination of passive acoustic surveys and active monitoring was employed.

Surveys were conducted over two consecutive nights during each emergence survey period (USFWS 2009 and 2022). The monitoring period began at dusk and continued until 2 hours after dusk (USFWS 2009). ICF biologists observed shaft collapse entrances, using an Elekon Heterodyne BatScanner to monitor bat activity and a night-vision/infrared video recording device to record bats entering and exiting the sites. Openings that were within line of sight of each other were monitored simultaneously by one biologist. Acoustic detectors were placed concurrently during the visual emergence surveys and left onsite through overnight hours. Two Titley Scientific AnaBat SD2 Compact Flash Bat Detectors equipped with digitally calibrated microphones were placed according to the USFWS *Survey Guidelines* near the C1, C2, and C3 sites. One detector was placed near the C1 collapse, while a second was placed near the C2 and C3 sites.

ICF biologists followed protocols established by the USFWS *Survey Guidelines* and were positioned such that they would not interfere with the passive acoustic detector. Data reported included the number of bat passes per hour during the period. Data on weather conditions was also recorded.

Data Analysis

All bat calls that were recorded during the May and June emergence surveys were identified using a USFWS-approved Automated Acoustic Bat Identification Software Program, BCID Version 2.8b. When performing batch analysis of the data sets, the South Dakota Species Filter was used to determine the regional species assemblage within the project area. Noise scrubbing filters and minimum 5 pulses per call sequence parameters were utilized to reduce the amount of noise files and fragmented calls recorded during the surveys. If the automated bat identification program identified calls from NLEB with a high degree of probability ($p < 0.05$) and adequate number of pulses per call sequence, then manual analysis and call reference comparison were be conducted to determine if NLEB calls were recorded at the site. If probable NLEB call sequences identified by BCID were not characteristic of NLEB calls, contained distinct calls produced by species other than NLEB, or were of insufficient quality, they were reclassified. All high frequency and low frequency calls that were recorded during the spring emergence surveys were manually vetted to account for all bat species passes. Call analysis was conducted by a biologist experienced with acoustic identification of potential species occurring within the Boston Expansion.

Bat Emergence Survey Results

Bat emergence surveys at the C1, C2, and C3 sites were conducted on May 26, May 27, June 15, and June 16. Results for both the visual emergence surveys and the acoustic data analyses are presented in Tables 1 through 5 and discussed below.

Visual Emergence Surveys

No bats were visually observed emerging from the C1, C2, or C3 sites during the May and June onsite surveys. Additionally, no bats were seen while reviewing the infrared video footage taken during

each survey night. Multiple bat echolocations were detected by the BatScanner during both nights of emergence surveys (Table 1). Site C1 registered peak number of bat passes on the May 26 survey (Table 1). Sites C2 and C3 (surveyed concurrently as one site due to their proximity) registered peak number of bat passes during the May 27 survey (Table 1). Bat echolocation frequencies ranged from 21 kilohertz (kHz) to 41 kHz at C1 across each survey night while frequencies recorded at C2/C3 ranged from 18 kHz to 44 kHz across each survey night (Table 1).

Weather during the emergence surveys varied but was largely within accepted parameters (Pennsylvania Game Commission n.d.; USFWS 2022). Weather data (temperature and wind) were recorded onsite during surveys (Table 2). Temperatures during the survey periods ranged from 49°F to 62°F, with cooler temperatures recorded during the May 26 survey (Tables 2 and 3). Wind speeds ranged from 5 mph to 10 mph during the May surveys and from 10 mph to 15 mph during the June surveys (Table 2); wind speeds during the June survey were variable and not sustained for prolonged periods of time. No precipitation was recorded during the surveys (Table 2).

Acoustic Data Analysis

The data collected from all three collapse sites during the May and June surveys included multiple noise files, which were most likely produced by background noise such as leaves rustling, other animals passing nearby, heavy mining machinery, or other audible human disturbances. All noise files were inspected to ensure no bat passes were present within the call files. All auto-identification (ID) and manual analysis results are represented in Table 4 and Figure 2. Table 5 summarizes the state status and basic habitat characteristics for each of the confirmed species.

Monitor A

The acoustic detector at site C1 was placed on the south side of the fence that encloses the shaft collapse (Figure 1). Throughout the four nights monitored in May and June, the auto-ID software identified a total of 12 calls produced by 5 species (big brown bat [*Eptesicus fuscus*], silver-haired bat [*Lasionycteris noctivagans*], little brown bat [*Myotis lucifugus*], NLEB, and evening bat [*Nycticeius humeralis*]). All 12 recorded calls occurred outside of the emergence survey period (Figure 2).

All high frequency calls identified through the manual analysis process were determined to be produced by myotis species. It was not possible to identify these calls to the species level due to the poor quality of these call recordings and the limited number of pulses recorded at the high frequency. A majority of the calls recorded during the emergence surveys in May and June were identified as noise files. Further inspection of these files revealed that the sounds originated from noise caused by the mine (heavy mining machinery or rocks tumbling), or other human disturbances near the project area. All species identified through the automated identification software are represented in Figure 2.

Monitor B

The acoustic detector at sites C2 and C3 was deployed slightly north of the C2 site. During the May and June emergence surveys the auto-ID software did not identify any calls produced by bat species. All calls recorded at this site location were identified as noise files. The recorded

noise files were likely produced by mine activity (heavy mining machinery or rocks tumbling) or other human disturbances near the project area.

Conclusion

No bats were visually observed emerging from the shaft collapse sites during either the May or June 2022 spring emergence surveys in the Boston Expansion. Analysis of collected bat acoustic data indicated the presence of five bat species in the area during the May and June 2022 emergence surveys. High frequency calls identified by the auto-ID software were produced by myotis species that were present during the time of survey. These included one NLEB, a federally threatened and South Dakota state sensitive species. The NLEB call was recorded at Monitor A (placed near site C1) during the May 27 emergence survey; however, the bat was recorded after the emergence survey period (i.e., after 10:30 pm), indicating a random flight pattern in the study area and not a bat exiting the collapse sites. While this species has been sporadically documented during other bat surveys conducted in the Wharf Mine area, the total number of recorded calls is very low when compared to numbers for other species (ICF 2010 and 2021). Other surveys in the Black Hills of South Dakota indicate the species occurs throughout the region, most notably in the southern portions of the Black Hills. The NLEB has been documented in Lawrence, Pennington, and Custer counties, South Dakota (USFWS 2017; SDGFP 2016). Hibernacula sites have been recorded near Jewel Cave and Hill City, while maternity roosts have been found near Sturgis and Wall (U.S. National Park Service 2019; Tigner and Dowd-Stukel 2003).

In addition to the NLEB, two other bat species (silver-haired bat and evening bat) listed by the SDGFP as Rare Animals (South Dakota Natural Heritage Program 2018) were recorded at site C1 during the emergence surveys (Table 5). The silver-haired was detected during both May and June surveys while the evening bat was only detected in May (Figure 2). The silver-haired bat has been recorded previously in the area (ICF 2010 and 2021); the evening bat has not been detected during prior surveys. The timing of the recordings (i.e., after the emergence survey period) and lack of visual evidence of bats exiting the collapse sites during the emergence surveys indicates bat fly-bys and not usage of the mine shaft collapses.

No bats were visually observed emerging from the C1, C2, or C3 sites during the four 2022 emergence surveys, and no bat passes were identified during review of the infrared video recordings taken during these surveys. Furthermore, no bats were observed emerging from the shaft collapse locations during surveys conducted in October 2021 (ICF 2021). With no visual observations of bats exiting from the C1, C2, or C3 sites during any of the six emergence surveys in 2021 and 2022, it is highly likely that high frequency calls recorded in the area were produced by bats foraging in or simply moving through the surrounding landscape and not by bats utilizing the sites as roosting or winter habitat.

While NLEB and other state sensitive bat species were recorded in the Boston Expansion during 2021 and 2022 surveys, no bats were documented emerging from the C1, C2, or C3 sites. Per conversations with USFWS in December 2021, further consultation with that agency is not required due to a lack of observed bat emergence (USFWS pers. comm. December 9, 2021). Per the *Bat Minimization Plan*, ICF will work with Wharf to erect temporary closures over the C1, C2, and C3 sites prior to September 1, 2022. The SDGFP will be notified after temporary closures are placed, and photos of closures will be provided.

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Personal Communications

South Dakota Game, Fish, and Parks (SDGFP). August 31, 2021—Meeting with ICF and Coeur Wharf Resources (USA) Inc., Wharf Mine, Lead, South Dakota.

———. September 3, 2021—email from Stan Michals (SDGFP) to Amy Allen (Wharf) and Silka Kemperna (SDGFP) titled "RE: GFP Proposed Boston Expansion Bat Work Plan," providing approval of the ICF-drafted bat survey plan.

U.S. Fish and Wildlife Service – South Dakota Ecological Field Services Office. December 9, 2021. USFWS Meeting with South Dakota Game, Fish, and Parks (SDGF), ICF, and Coeur Wharf Resources, Inc. Wharf Mine, Lead, South Dakota.

Tables

Table 1. Bat Echolocation Frequencies Recorded Per Survey Hour Using Elekon Heterodyne BatScanner During May and June 2022 Emergence Surveys

Site: C1	May 26		May 27		June 15		June 16	
Recorded Frequency (kHz)	Hour 1	Hour 2	Hour 1	Hour 2	Hour 1	Hour 2	Hour 1	Hour 2
21-33	1	-	-	-	-	-	-	-
22-26	-	-	1	-	-	-	-	-
23-27	-	1	-	-	-	-	-	-
25-26	-	-	-	-	-	-	1	-
26-30	-	1	-	-	-	-	-	-
27	-	-	-	-	1	-	-	-
27-32	-	-	-	-	-	-	-	1
27-37	-	-	1	-	-	-	-	-
30	-	-	-	-	-	1	-	-
36	-	-	-	-	-	1	-	-
40-41	-	1	-	-	-	-	-	-
Total Passes	1	3	2	0	1	2	1	1

Site: C2/C3	May 26		May 27		June 15		June 16	
Recorded Frequency (kHz)	Hour 1	Hour 2	Hour 1	Hour 2	Hour 1	Hour 2	Hour 1	Hour 2
18	-	-	-	1	-	-	-	-
22	-	-	1	-	-	-	-	-
26	-	-	-	-	1	-	-	-
26-27	-	1	-	-	-	-	-	-
28	-	-	1	-	-	-	-	-
28-29	-	1	-	-	-	-	-	-
28-30	-	-	-	-	-	-	1	-
33	-	-	1	-	-	-	-	-
39-44	-	1	-	-	-	-	-	-
41	-	-	2	-	-	-	-	-
44	1	-	1	-	-	-	-	-
Total Passes	1	3	6	1	1	-	1	-

Table 2. Temperature and Wind Speed During the May and June Emergence Surveys

Date	Time (pm)	Temperature (F)	Wind Speed (mph)
5/26/2022	8:30	52	5
5/26/2022	10:30	49	5
5/27/2022	8:30	58	5
5/27/2022	10:30	52	10
6/15/2022	8:45	56	15
6/15/2022	10:45	53	15
6/16/2022	8:45	62	10
6/16/2022	10:45	59	15

Table 3. Temperature, Wind, and Precipitation for Lead, SD during the Emergence Surveys

Date	Temperature (F) – 8:30pm-10:30pm	Temperature (F) – Overnight Min.	Wind (MPH) – 8:30pm-10:30pm	Precipitation (in)
5/26/2022	52-49	43	5-5	0
5/27/2022	58-52	49	5-10	0
6/15/2022	56-53	43	10-15*	0
6/16/2022	62-59	50	10-15*	0

Sources: https://wunderground.com and https://www.ncdc.noaa.gov
*Wind speeds not sustained during survey period.

Table 4. Species Recorded Occurrence at Each Monitoring Location During May and June 2022 Emergence Surveys

Species Recorded	Acoustic Detector Site					
	A - C1		**B** – C2, C3		**Totals**	
	A	**M**	**A**	**M**	**A**	**M**
Big brown bat *Eptesicus fuscus*	2	2	0	0	**2**	**2**
Silver-haired bat *Lasionycteris noctivagans*	5	5	0	0	**5**	**5**
Evening Bat *Nycticeius humeralis*	2	2	0	0	**2**	**2**
Little brown bat *Myotis lucifugus*	2	Myotis* (2)	0	0	**2**	**2***
Northern long-eared bat *Myotis septentrionalis*	1	Myotis* (1)	0	0	**1**	**1***
Totals	**12**	**12**	**0**	**0**	**12**	**12**

* High frequency call (MYLU, MYSE) but due to the poor quality of the recording definitive species identification could not be made.

A – Automated results **M** – Manual results

Table 5. Status and Habitat Description of Bat Species Detected at the Wharf Mine Boston Expansion During 2022 Bat Emergence Surveys

Scientific Name Common Name	Status[1*]	General Habitat Description
Big brown bat *Eptesicus fuscus*		Found in a variety of habitats ranging from timberline meadows to lowland deserts, though it is most abundant in deciduous forest areas. Typically form maternity colonies beneath loose bark and in small cavities of pine, oak, and other trees. Maternity roosts also occur in buildings and bridges[1], and have been documented in buildings, trees, railway tunnels, mines, caves, and at least one metal electrical fuse box within the Black Hills[2]. Found in a variety of hibernacula with varying microclimates, in caves, mines and in buildings[3].
Silver-haired bat *Lasionycteris noctivagans*	G3G4, S4	Dependent upon roosts in Old Growth areas. Form maternity colonies almost exclusively in tree cavities or small hollows and will switch roosts throughout the maternity season. Typical hibernation roosts include small tree hollows, beneath exfoliating bark, in wood piles, and in cliff faces. Occasionally silver-haired bats will hibernate in cave entrances, especially in northern regions of their range. Feed predominantly in disturbed areas, sometimes at tree-top level, but often in small clearings and along roadways or water courses.[1]
Evening bat *Nycticeius humeralis*	G5, S1	Habitat consists of highly forested areas. Roost sites occur in trees or buildings and almost never caves.[4] Large nursery colonies are formed in buildings or attics, whereas small nursery colonies are formed behind loose bark or in tree cavities[5].
Little brown bat *Myotis lucifugus*		Mainly in mountainous and riparian areas in a wide variety of forest habitats; from tree-lined xeric-scrub to aspen meadows. Maternity colonies often form in buildings, attics, and other human-made structures. Also roosts in tree cavities and crevices[1] as well as caves and mines. [2] Main prey consists of aquatic insects, and typical foraging habitat is over water. Will also feed over forest trails, cliff faces, meadows, and farmland.[1]
Northern long-eared bat *Myotis septentrionalis*	LT	In the United States, northern myotis range in forested regions from east to central US and south to northern Florida. Northern myotis are common throughout their range, though they are found less commonly than little brown myotis. In South Dakota, northern myotis are found uncommonly throughout the state. Conversely, northern myotis are abundant throughout the Black Hills, and few winter occurrences have been recorded. Northern myotis are state species of concern due to their rarity and limited range. Generally, northern myotis are found near water sources and dense forests. Foraging takes place over forested hillsides and ridges with prey consisting of night-flying insects.[6]

[1]Status as listed by the South Dakota Natural Heritage Program. 2018. https://gfp.sd.gov/rare-animals/. Accessed July 26, 2022.
G3- Either very rare and local throughout its range or found locally in a restricted range; G4-Apparently secure; G5-Demonstratably secure; S1-Critically imperiled because of extreme rarity; S2- Imperiled because of rarity; S3- Either very rare and local throughout its range or found locally in a restricted range; S4- Apparently secure; LT-Listed Threatened. G – Global; S – State

[2, 3, 4, 6] Pierre, S.D.: South Dakota Bat Working Group 2004

[5]Harvey et al. 1999, TPW 2001

Figures

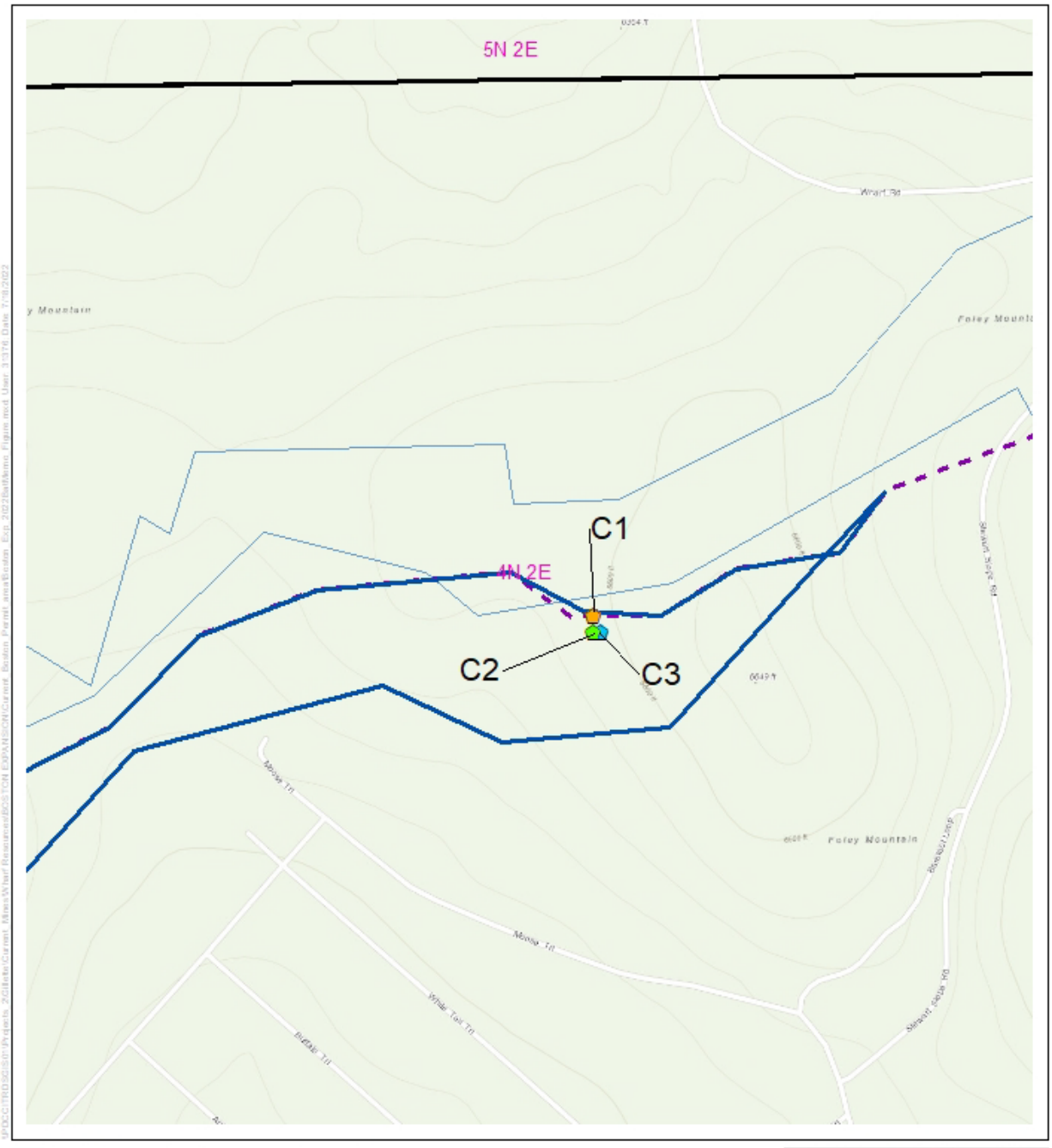

Figure 1
Boston Expansion
2022 Bat Emergence Survey Locations

Figure 2. Bat Species Identified During the May and June 2022 Boston Expansion Bat Emergence Surveys Using Automated Acoustic Bat Identification Software Program, BCID Version 2.8b

BCID Version 2.8b								
d:/wharf/may_2022/c1_night1_052622								
FILENAME	**SPECIES**	**SP PERCENT**	**GROUP**	**GR PERCENT**	**TOTAL PULSES**	**DISC PROB**	**FOLDER**	
W5270203_41.zc	MYLU	60	MYOTIS	60	5	0.344392	c1_night1_052622	
W5270433_48.zc	LANO	50	LOW	80	10	0.339765	c1_night1_052622	
IDENTIFICATION SUMMARY								
ID	**LANO**	**MYLU**		**LOW**	**MYOTIS**	**Total**		
N	1	1		1	1	**2**		
%	50.00	50.00		50.00	50.00			
MLE (p)	0.004246	0.000001						
HOURLY BREAKDOWN								
TIME	**EPFU**	**LANO**	**LABO**	**LACI**	**MYLU**	**MYSE**	**NYHU**	**PESU**
6:00 pm	0	0	0	0	0	0	0	0
7:00 pm	0	0	0	0	0	0	0	0
8:00 pm	0	0	0	0	0	0	0	0
9:00 pm	0	0	0	0	0	0	0	0
10:00 pm	0	0	0	0	0	0	0	0
11:00 pm	0	0	0	0	0	0	0	0
12:00 am	0	0	0	0	0	0	0	0
1:00 am	0	0	0	0	0	0	0	0
2:00 am	0	0	0	0	1	0	0	0
3:00 am	0	0	0	0	0	0	0	0
4:00 am	0	1	0	0	0	0	0	0
5:00 am	0	0	0	0	0	0	0	0
6:00 am	0	0	0	0	0	0	0	0
7:00 am	0	0	0	0	0	0	0	0
TOTALS	0	1	0	0	1	0	0	0

EPFU = *Eptesicus fuscus*; LANO = *Lasionycteris noctivagans*; LABO = *Lasiurus borealis*; LACI = *Lasiurus cinereus*; MYLU = *Myotis Lucifugus*; MYSE = *Myotis septentrionalis*; NYHU = *Nycticeius humeralis*; PESU = *Perimyotis subflavus*

BCID Version 2.8b								
d:/wharf/may_2022/c1_night2_052722								
FILENAME	**SPECIES**	**SP PERCENT**	**GROUP**	**GR PERCENT**	**TOTAL PULSES**	**DISC PROB**	**FOLDER**	
W5272234_34.zc	NYHU	66.6667	MID	100	15	0.653535	c1_night2_052722	
W5272234_37.zc	NYHU	66.6667	MID	100	6	0.639291	c1_night2_052722	
W5272341_04.zc	MYLU	85.7143	MYOTIS	85.7143	7	0.711187	c1_night2_052722	
W5272353_18.zc	MYSE	37.5	MYOTIS	62.5	8	0.221545	c1_night2_052722	
IDENTIFICATION SUMMARY								
ID	**MYLU**	**MYSE**	**NYHU**		**MID**	**MYOTIS**	**Total**	
N	1	1	2		2	2	**4**	
%	25.00	25.00	50.00		50.00	50.00		
MLE (p)	0.000001	0.000001	0.000854					
HOURLY BREAKDOWN								
TIME	**EPFU**	**LANO**	**LABO**	**LACI**	**MYLU**	**MYSE**	**NYHU**	**PESU**
6:00 pm	0	0	0	0	0	0	0	0
7:00 pm	0	0	0	0	0	0	0	0
8:00 pm	0	0	0	0	0	0	0	0
9:00 pm	0	0	0	0	0	0	0	0
10:00 pm	0	0	0	0	0	0	2	0
11:00 pm	0	0	0	0	1	1	0	0
12:00 am	0	0	0	0	0	0	0	0
1:00 am	0	0	0	0	0	0	0	0
2:00 am	0	0	0	0	0	0	0	0
3:00 am	0	0	0	0	0	0	0	0
4:00 am	0	0	0	0	0	0	0	0
5:00 am	0	0	0	0	0	0	0	0
6:00 am	0	0	0	0	0	0	0	0
7:00 am	0	0	0	0	0	0	0	0
TOTALS	0	0	0	0	1	1	2	0

EPFU = *Eptesicus fuscus*; LANO = *Lasionycteris noctivagans*; LABO = *Lasiurus borealis*; LACI = *Lasiurus cinereus*; MYLU = *Myotis Lucifugus*; MYSE = *Myotis septentrionalis*; NYHU = *Nycticeius humeralis*; PESU = *Perimyotis subflavus*

*The NYHU calls were recorded at 10:34 p.m.

BCID Version 2.8b								
d:/wharf/may_2022/c2c3_night1_052622								
FILENAME	**SPECIES**	**SP PERCENT**	**GROUP**	**GR PERCENT**	**TOTAL PULSES**	**DISC PROB**	**FOLDER**	
IDENTIFICATION SUMMARY								
ID		**Total**						
N		**0**						
%								
MLE (p)								
HOURLY BREAKDOWN								
TIME	**EPFU**	**LANO**	**LABO**	**LACI**	**MYLU**	**MYSE**	**NYHU**	**PESU**
6:00 pm	0	0	0	0	0	0	0	0
7:00 pm	0	0	0	0	0	0	0	0
8:00 pm	0	0	0	0	0	0	0	0
9:00 pm	0	0	0	0	0	0	0	0
10:00 pm	0	0	0	0	0	0	0	0
11:00 pm	0	0	0	0	0	0	0	0
12:00 am	0	0	0	0	0	0	0	0
1:00 am	0	0	0	0	0	0	0	0
2:00 am	0	0	0	0	0	0	0	0
3:00 am	0	0	0	0	0	0	0	0
4:00 am	0	0	0	0	0	0	0	0
5:00 am	0	0	0	0	0	0	0	0
6:00 am	0	0	0	0	0	0	0	0
7:00 am	0	0	0	0	0	0	0	0
TOTALS	0	0	0	0	0	0	0	0

EPFU = *Eptesicus fuscus*; LANO = *Lasionycteris noctivagans*; LABO = *Lasiurus borealis*; LACI = *Lasiurus cinereus*; MYLU = *Myotis Lucifugus*; MYSE = *Myotis septentrionalis*; NYHU = *Nycticeius humeralis*; PESU = *Perimyotis subflavus*

BCID Version 2.8b								
d:/wharf/may_2022/c2c3_night2_052722								
FILENAME	SPECIES	SP PERCENT	GROUP	GR PERCENT	TOTAL PULSES	DISC PROB	FOLDER	
IDENTIFICATION SUMMARY								
ID		Total						
N		0						
%								
MLE (p)								
HOURLY BREAKDOWN								
TIME	EPFU	LANO	LABO	LACI	MYLU	MYSE	NYHU	PESU
6:00 pm	0	0	0	0	0	0	0	0
7:00 pm	0	0	0	0	0	0	0	0
8:00 pm	0	0	0	0	0	0	0	0
9:00 pm	0	0	0	0	0	0	0	0
10:00 pm	0	0	0	0	0	0	0	0
11:00 pm	0	0	0	0	0	0	0	0
12:00 am	0	0	0	0	0	0	0	0
1:00 am	0	0	0	0	0	0	0	0
2:00 am	0	0	0	0	0	0	0	0
3:00 am	0	0	0	0	0	0	0	0
4:00 am	0	0	0	0	0	0	0	0
5:00 am	0	0	0	0	0	0	0	0
6:00 am	0	0	0	0	0	0	0	0
7:00 am	0	0	0	0	0	0	0	0
TOTALS	0	0	0	0	0	0	0	0

EPFU = *Eptesicus fuscus*; LANO = *Lasionycteris noctivagans*; LABO = *Lasiurus borealis*; LACI = *Lasiurus cinereus*; MYLU = *Myotis Lucifugus*; MYSE = *Myotis septentrionalis*; NYHU = *Nycticeius humeralis*; PESU = *Perimyotis subflavus*

BCID Version 2.8b								
d:/wharf/june_2022/c1_night1_061522/data.zc								
FILENAME	**SPECIES**	**SP PERCENT**	**GROUP**	**GR PERCENT**	**TOTAL PULSES**	**DISC PROB**	**FOLDER**	
W6160213_25.zc	LANO	88.8889	LOW	100	9	0.849991	data.zc	
W6160312_07.zc	LANO	75	LOW	100	8	0.709341	data.zc	
IDENTIFICATION SUMMARY								
ID	**LANO**		**LOW**	**Total**				
N	2		2	**2**				
%	100.00		100.00					
MLE (p)	0.000053							
HOURLY BREAKDOWN								
TIME	**EPFU**	**LANO**	**LABO**	**LACI**	**MYLU**	**MYSE**	**NYHU**	**PESU**
6:00 pm	0	0	0	0	0	0	0	0
7:00 pm	0	0	0	0	0	0	0	0
8:00 pm	0	0	0	0	0	0	0	0
9:00 pm	0	0	0	0	0	0	0	0
10:00 pm	0	0	0	0	0	0	0	0
11:00 pm	0	0	0	0	0	0	0	0
12:00 am	0	0	0	0	0	0	0	0
1:00 am	0	0	0	0	0	0	0	0
2:00 am	0	1	0	0	0	0	0	0
3:00 am	0	1	0	0	0	0	0	0
4:00 am	0	0	0	0	0	0	0	0
5:00 am	0	0	0	0	0	0	0	0
6:00 am	0	0	0	0	0	0	0	0
7:00 am	0	0	0	0	0	0	0	0
TOTALS	0	2	0	0	0	0	0	0

EPFU = *Eptesicus fuscus*; LANO = *Lasionycteris noctivagans*; LABO = *Lasiurus borealis*; LACI = *Lasiurus cinereus*; MYLU = *Myotis Lucifugus*; MYSE = *Myotis septentrionalis*; NYHU = *Nycticeius humeralis*; PESU = *Perimyotis subflavus*

BCID Version 2.8b								
d:/wharf/june_2022/c1_night2_061622/data								
FILENAME	**SPECIES**	**SP PERCENT**	**GROUP**	**GR PERCENT**	**TOTAL PULSES**	**DISC PROB**	**FOLDER**	
W6162344_44.zc	LANO	75	LOW	100	12	0.715677	data	
W6162344_46.zc	LANO	100	LOW	100	12	0.9332	data	
W6170305_20.zc	EPFU	100	LOW	100	5	0.255632	data	
W6170305_22.zc	EPFU	86.6667	LOW	100	15	0.334563	data	
IDENTIFICATION SUMMARY								
ID	**EPFU**	**LANO**		**LOW**	**Total**			
N	2	2		4	**4**			
%	50.00	50.00		100.00				
MLE (p)	0.025595	0.001166						
HOURLY BREAKDOWN								
TIME	**EPFU**	**LANO**	**LABO**	**LACI**	**MYLU**	**MYSE**	**NYHU**	**PESU**
6:00 pm	0	0	0	0	0	0	0	0
7:00 pm	0	0	0	0	0	0	0	0
8:00 pm	0	0	0	0	0	0	0	0
9:00 pm	0	0	0	0	0	0	0	0
10:00 pm	0	0	0	0	0	0	0	0
11:00 pm	0	2	0	0	0	0	0	0
12:00 am	0	0	0	0	0	0	0	0
1:00 am	0	0	0	0	0	0	0	0
2:00 am	0	0	0	0	0	0	0	0
3:00 am	2	0	0	0	0	0	0	0
4:00 am	0	0	0	0	0	0	0	0
5:00 am	0	0	0	0	0	0	0	0
6:00 am	0	0	0	0	0	0	0	0
7:00 am	0	0	0	0	0	0	0	0
TOTALS	2	2	0	0	0	0	0	0

EPFU = *Eptesicus fuscus*; LANO = *Lasionycteris noctivagans*; LABO = *Lasiurus borealis*; LACI = *Lasiurus cinereus*; MYLU = *Myotis Lucifugus*; MYSE = *Myotis septentrionalis*; NYHU = *Nycticeius humeralis*; PESU = *Perimyotis subflavus*

BCID Version 2.8b								
d:/wharf/june_2022/c2c3_night1_061522								
FILENAME	**SPECIES**	**SP PERCENT**	**GROUP**	**GR PERCENT**	**TOTAL PULSES**	**DISC PROB**	**FOLDER**	
IDENTIFICATION SUMMARY								
ID		**Total**						
N		**0**						
%								
MLE (p)								
HOURLY BREAKDOWN								
TIME	**EPFU**	**LANO**	**LABO**	**LACI**	**MYLU**	**MYSE**	**NYHU**	**PESU**
6:00 pm	0	0	0	0	0	0	0	0
7:00 pm	0	0	0	0	0	0	0	0
8:00 pm	0	0	0	0	0	0	0	0
9:00 pm	0	0	0	0	0	0	0	0
10:00 pm	0	0	0	0	0	0	0	0
11:00 pm	0	0	0	0	0	0	0	0
12:00 am	0	0	0	0	0	0	0	0
1:00 am	0	0	0	0	0	0	0	0
2:00 am	0	0	0	0	0	0	0	0
3:00 am	0	0	0	0	0	0	0	0
4:00 am	0	0	0	0	0	0	0	0
5:00 am	0	0	0	0	0	0	0	0
6:00 am	0	0	0	0	0	0	0	0
7:00 am	0	0	0	0	0	0	0	0
TOTALS	0	0	0	0	0	0	0	0

EPFU = *Eptesicus fuscus*; LANO = *Lasionycteris noctivagans*; LABO = *Lasiurus borealis*; LACI = *Lasiurus cinereus*; MYLU = *Myotis Lucifugus*; MYSE = *Myotis septentrionalis*; NYHU = *Nycticeius humeralis*; PESU = *Perimyotis subflavus*