

**Appendix B6**  
**Paleontological Resources Treatment Plan**

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# Acronyms and Abbreviations

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BLM	Bureau of Land Management
FLPMA	Federal Land Policy and Management Act of 1976
IPC	Idaho Power Company
NEPA	National Environmental Policy Act
PA	Paleontology Actions
PFYC	Potential Fossil Yield Classification
POD	Plan of Development
Project	Boardman to Hemingway Transmission Line Project
PRPA	Paleontological Resources Preservation Act
PRTP	Paleontological Resources Treatment Plan
ROD	Record of Decision
SVP	Society of Vertebrate Paleontology
U.S.	United States
U.S.C	United States Code
USFS	United States Forest Service
USGS	United States Geological Survey

# APPENDIX B6 – PALEONTOLOGICAL RESOURCES TREATMENT PLAN

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## **B6.1 Introduction**

Paleontological resources “means any fossilized remains, traces, or imprints of organisms, preserved in or on the earth’s crust, that are of paleontological interest and that provide information about the history of life on earth” (Paleontological Resources Preservation Act, Section 6301). The purpose of the Paleontological Resources Treatment Plan (PRTP) is to assist the Bureau of Land Management (BLM) and U.S. Forest Service (USFS) in planning and design efforts for the Boardman to Hemingway Transmission Corridor Project (Project) as it relates to paleontological resource issues. The PRTP describes in detail the specific mitigation measures needed to avoid or reduce Project-related impacts on paleontological resources, wherever feasible. This plan provides important background and contextual information useful for the paleontological resources mitigation program. The logistics, procedures, and methods outlined in this PRTP ensure compliance with federal and state regulations (BLM 1998, 2008, 2009).

The PRTP is a work plan for all of the paleontological-related activities that may ensue during the course of development of the Project. It is not the intent of the PRTP to present a comprehensive list of sites with discussions of all significant taxa found from the vicinity of the Project area. The PRTP offers a framework and accompanying logistical guidelines to ensure significant nonrenewable paleontological resources unearthed by development of the Project will be managed appropriately and in a timely manner, thereby effectively mitigating adverse impacts on these fossil resources.

As part of the Environmental Impact Statement for the Project, a review was conducted of relevant published geological and paleontological reports, unpublished geological and paleontological reports, and museum paleontological site records. This approach was followed in recognition of the direct relationship that exists between paleontological resources and the geological units in which fossils are entombed.

### **B6.1.1 Plan Updates**

This plan will support the NEPA Plan of Development (POD) sufficiently to complete and execute the BLM and USFS Records of Decision (ROD). This plan will be updated and refined through the development of the POD, as detailed engineering design of the Project is completed, to meet any stipulations of the Records of Decision and BLM right-of-way grant and USFS special-use authorization before the issuance of the Notice(s) to Proceed and commencement of construction. IPC will be responsible for updating the Paleontological Resources Treatment Plan for the construction POD and the Construction Contractor(s) will be responsible for implementing the Paleontological Resources Treatment Plan and construction POD.

## **B6.2 Regulatory Framework**

The following provides a brief overview of federal and state legislation and regulatory compliance applicable to paleontological resources in the Project area considered in the development of this Plan

### **B6.2.1 National Environmental Policy Act of 1969 Public Law 91-190, 83 Stat. 852, 42 United States Code [U.S.C. 4321-4327]**

The National Environmental Policy Act of 1969 (NEPA) mandates policies to “preserve important historic, cultural, and natural aspects of our national heritage.” NEPA further provides for reports regarding the environmental impacts of federal actions on public lands.

### **B6.2.2 Federal Land Policy and Management Act of 1976 (P.L. 94-579)**

The Federal Land Policy and Management Act of 1976 (FLPMA) was enacted “to establish public land policy; to establish guidelines for its administration; to provide for the management, protection, development, and enhancement of the public lands; and for other purposes,” and requires that important historic, cultural, and natural aspects of our natural history be preserved. Pursuant to the FLPMA, the BLM issued a regulation that provides additional protection for fossil resources. Section 8365.1-5 of Title 43 of the Code of Federal Regulations prohibits the removal of any scientific resource or natural object without authorization, with the exception of common invertebrate fossils and petrified wood. (BLM 1998, p. V-1; BLM 2009, p. 1).

### **B6.2.3 Paleontological Resources Preservation, Omnibus Public Lands Management Act, Public Law 111-011, Title VI, Subtitle D 16 U.S.C.aaa (2009)**

On March 30, 2009, the Paleontological Resources Preservation Act (PRPA) became law with enactment of the Omnibus Public Land Management Act of 2009. The PRPA requires the Secretaries of the Interior and Agriculture to manage and protect paleontological resources on federal land using scientific principles and expertise. The PRPA includes specific provisions addressing management of these resources by the BLM, the National Park Service, BOR, the U.S. Fish and Wildlife Service, and the USFS. The PRPA only applies to federal lands and does not affect private lands. It provides authority for the protection of paleontological resources on federal lands including criminal and civil penalties for fossil theft and vandalism.

### **B6.2.4 Statutes Regarding Protection of Paleontological Resources on State Lands**

Idaho Code 67-4119 mandates protection of vertebrate paleontological sites and resources and ensures their safety and availability for scientific research. In addition, Idaho Code 67-4121 protects vertebrate paleontological sites and deposits on any public land in Idaho. No person shall remove from the state of Idaho any part of any vertebrate paleontological site or deposit without first obtaining the consent of the board of trustees of the Idaho State Historical Society.

### **B6.2.5 Professional Standards**

The Society of Vertebrate Paleontology (SVP) has established professional best practices for vertebrate paleontologists, along with more specific guidelines for the assessment and mitigation of adverse impacts on significant, nonrenewable, paleontological resources. These standards and best practices were developed by SVP in cooperation with federal and state agencies. SVP Bylaws Article 12: Code of Ethics, Sections 1 and 4 state:

Section 1: It is the responsibility of vertebrate paleontologists to strive to ensure that vertebrate fossils are collected in a professional manner, which includes the detailed

recording of pertinent contextual data, such as geographic, stratigraphic, sedimentologic, and taphonomic information.

Section 4: Scientifically significant fossil vertebrate specimens, along with ancillary data, should be curated and accessioned in the collections of repositories charged in perpetuity with conserving fossil vertebrates for scientific study and education (e.g., accredited museums, universities, colleges, and other educational institutions).

These standards establish the protocol for the assessment and mitigation of impacts on paleontological resources. The SVP (1995) summarizes its expectations for professional paleontologists operating on assessment and mitigation projects as:

Vertebrate fossils are significant nonrenewable paleontological resources that are afforded protection by federal, state, and local environmental laws and guidelines. The potential for destruction or degradation by construction impacts to paleontological resources on public lands (federal, state, county, or municipal) and land selected for development under the jurisdiction of various governmental planning agencies is recognized. Protection of paleontological resources includes: (a) assessment of the potential property to contain significant nonrenewable paleontological resources which might be directly or indirectly impacted, damaged, or destroyed by development, and (b) formulation and implementation of measures to mitigate adverse impacts, including permanent preservation of the site and/or permanent preservation of salvaged materials in established institutions.

Further standards and guidelines for mitigation of paleontological resources can be found in Moses *et al.* (2014).

## **B6.3 Paleontological Potential**

### **B6.3.1 Determination of Paleontological Potential**

The Potential Fossil Yield Classification (PFYC) system is a measure of the likelihood of impacting fossil resources in a given area based on the occurrence of fossil-bearing geological units. This system predicts the probability of finding paleontological resources in a given area using geological maps of sufficient scale and detail. The numerical nature of the PFYC system also allows for ease of importation into a geographic information system, further facilitating the planning and management decision-making process. The five-part PFYC system, as defined by the BLM (2008), is explained below.

**Class 1 – Very low potential:** Geological units not likely to contain recognizable fossil remains such as:

- Units that are igneous or metamorphic, excluding reworked volcanic ash units.
- Units that are Precambrian in age and older.

The probability for impacting any fossils is negligible. Assessment or mitigation of paleontological resources is usually unnecessary. The occurrence of significant fossils is nonexistent or extremely rare.

**Class 2 – Low potential:** Sedimentary geological units not likely to contain vertebrate fossils or scientifically significant non-vertebrate fossils such as:

- Vertebrate or significant invertebrate or plant fossils not present or very rare.
- Units that are generally younger than 10,000 years before present.

- Recent Aeolian deposits.
- Sediments that exhibit significant physical and chemical changes (i.e., diagenetic alternation).

The probability for a project to impact vertebrate fossils or scientifically significant invertebrate or plant fossils is low. Assessment or mitigation of paleontological resources is not likely to be necessary. Localities containing important resources may exist, but would be rare and would not influence the classification. These important localities will be managed on a case-by-case basis and assessment or mitigation maybe unnecessary except in rare or isolated circumstances.

**Class 3 –Moderate or unknown potential:** Fossiliferous sedimentary geological units where fossil content varies in significance, abundance, and predictable occurrence, or sedimentary units of unknown fossil potential such as:

- Often marine in origin with sporadic known occurrences of vertebrate fossils.
- Vertebrate fossils and scientifically significant invertebrate and plant fossils known to occur intermittently and are predictably known to be low.
- Poorly studied and/or poorly documented. Potential yield cannot be assigned without ground reconnaissance.

Class 3, 4, and 5 units are divided into subclasses, as described below.

- Class 3a – Moderate potential: Units are known to contain vertebrate fossils or scientifically significant invertebrate or plant fossils, but these occurrences are widely scattered. Common invertebrate or plant fossils may be found in the area and opportunities may exist for hobby collecting. The potential for a project to be sited on or impact a significant fossil locality is low, but the potential is somewhat higher for common fossils.
- Class 3b – Unknown potential: Units exhibit geological features and preservational conditions that suggest significant fossils could be present, but little information about the paleontological resources of the unit or the area is known. This may indicate the unit or area is poorly studied, and field surveys may uncover significant fossils. The units in this class may eventually be placed in another class when sufficient surveying and research is performed. The unknown potential of the units in this class should be carefully considered when developing any mitigation or management plans. This classification includes a broad range of paleontological potential. It includes geological units of unknown potential, as well as units of moderate or infrequent occurrence of fossil resources. Management considerations cover a broad range of options and could include pre-disturbance surveys, monitoring, or avoidance. Ground-disturbing activities will require sufficient assessment to determine where significant paleontological resources occur in the area of the proposed action and whether the action could affect the paleontological resources. These units may contain areas that would be appropriate to designate as hobby collection areas due to the higher occurrence of common fossils and lower concern of affecting significant paleontological resources.

**Class 4 – High potential:** Geological units containing a high occurrence of significant fossils. Vertebrate fossils or scientifically significant invertebrate or plant fossils are known to occur and have been documented, but may vary in occurrence and predictability. Ground-disturbing activities may adversely affect paleontological resources in many cases.

- Class 4a – High potential: Units exposed with little or no soil or vegetative cover. Outcrop areas are extensive, with exposed bedrock areas often larger than two acres. Paleontological resources may be susceptible to adverse impacts from ground-disturbing actions. Illegal collection activities may impact some areas.

- **Class 4b – High potential:** These are areas underlain by geological units with high potential, but have lowered risks of human-caused adverse impacts and/or lowered risk of natural degradation due to moderating circumstances. The bedrock unit has high potential, but a protective layer of soil, thin alluvial material, or other conditions may lessen or prevent potential impacts to the bedrock resulting from the activity. Class 4b includes areas exhibiting:
  - Extensive soil or vegetative cover; bedrock exposures are limited or not expected to be impacted.
  - Areas of exposed outcrop smaller than two contiguous acres.
  - Outcrops forming cliffs of sufficient height and slope that impacts are minimized by topographic conditions.
- Other characteristics present that lower the vulnerability of both known and unidentified paleontological resources.

The probability for impacting significant paleontological resources is moderate to high, and is dependent on the proposed action. Mitigation considerations must include assessment of the disturbance, which may include removal or penetration of the protective surface alluvium or soils, potential for future accelerated erosion, or increased ease of access resulting in greater looting potential. If impacts to significant fossils can be anticipated, on-the-ground surveys prior to authorizing the ground-disturbing action usually will be necessary. On-site monitoring or spot-checking may be necessary during construction activities. Management prescriptions for resource preservation and conservation through controlled access or special management designation should be considered. Class 4 and 5 units may be combined as Class 5 for broad applications, such as planning efforts or preliminary assessments, when geological mapping at the appropriate scale is not available. Resource assessment, mitigation, and other management considerations are similar at this level of analysis, and impacts and alternatives can be addressed at a level appropriate to the application.

**Class 5 – Very high potential:** Highly fossiliferous geological units that consistently and predictably produce vertebrate fossils or scientifically significant invertebrate or plant fossils and are at risk of human-cause adverse impacts or natural degradation.

- **Class 5a – Very high potential:** Units are exposed with little or no soil or vegetative cover. Outcrop areas are extensive with exposed bedrock areas often larger than two contiguous acres. Paleontological resources are highly susceptible to adverse impacts from ground-disturbing activities. Unit is frequently the focus of illegal collection activities.
- **Class 5b – Very high potential:** These are areas underlain by geological units with very high potential but have lowered risks of human-caused adverse impacts and/or lowered risk of natural degradation due to moderating circumstances. The bedrock unit has very high potential, but a protective layer of soil, thin alluvial material, or other conditions may lessen or prevent potential impacts to the bedrock resulting from ground-disturbing activity. These include areas exhibiting:
  - Extensive soil or vegetative cover; bedrock exposures are limited or not expected to be impacted.
  - Areas of exposed outcrop are smaller than two contiguous acres.
  - Outcrops forming cliffs of sufficient height and slope that impacts are minimized by topographic conditions.
- Other characteristics present that lower the vulnerability of both known and unidentified paleontological resources.

The probability of impacting significant fossils is high to very high. Vertebrate fossils or scientifically significant invertebrate fossils are known or can be reasonably expected to occur in the impact area. On-the-ground surveys prior to authorizing any ground disturbing activities or land-use adjustments will

usually be necessary. On-site monitoring may be necessary during construction activities. Mitigation will often be necessary before and/or during construction. Official designation of areas of avoidance, special interest, and concern may be appropriate.

## **B6.4 Paleontological Stipulations and Methods**

The following are stipulations and methods to be employed prior to, and during construction conducted in association with development of the Project. These stipulations and methods effectively mitigate adverse impacts on paleontological resources to less than significant levels. These measures are summarized below as Paleontology Actions (PA) 1 through 6. The specifics of the efforts, including a preconstruction survey, the monitoring of excavation, curation, preparation of the final report, and storage of specimens are described in greater detail subsequently (Section B6.5 – Mitigation Recommendations). These stipulations and methods are subject to review by the federal land-management agencies and may be amended following completion of the preconstruction survey (PA-2 below).

### **B6.4.1 Stipulation and Methods**

#### **B6.4.1.1 Prior to Construction**

- PA-1 An orientation workshop will be prepared and presented by a professional paleontologist to explain paleontological mitigation guidelines and procedures to the contractor and construction workers. This workshop can be presented in conjunction with any preconstruction meetings conducted prior to excavation. The workshop will review the PRTP and will endeavor to explain the nature, appearance, and importance of fossil vertebrates, invertebrates, and plants. The responsibilities of construction personnel in a paleontological mitigation context also will be explained. Construction workers will not collect any fossils found during construction before their significance can be assessed by a qualified paleontologist. All construction inspectors and paleontological monitors will also be briefed on the locations of high to moderate potential areas for paleontological resources as part of the training program. It will be stated during the paleontology briefing that it is unlawful for construction inspectors to collect fossils from any construction area, as these fossils belong to the public and will be placed in a recognized curation facility, such as a museum or university, where they will be curated, stored, maintained, and made available for scientific study.
- PA-2 A preconstruction survey of the area of potential effect for the Project will be conducted in advance of excavation, under permits from the federal and state land-management agencies. This survey will examine existing rocks and sediments exposed in areas of moderate, high, and very high potential for paleontological resources (PFYC of 3 to 5), as well as any recorded localities in the immediate vicinity that might be affected by the development of new access roads or other construction-related activities. The survey will be along the Project areas that are slated for ground disturbance from the Project. The survey will confirm and augment geological mapping, locate and collect any significant paleontological resources exposed at the surface, and assess paleontological potential with more precision. The results of the preconstruction survey will be presented in report form at the conclusion of the study.

#### **B6.4.1.2 During Construction**

- PA-3 If paleontological resources are found at any time during construction on public or private lands, work will be redirected to another area nearby so that the scientific significance of the discovery may be assessed. Construction monitors will notify the onsite construction monitoring coordinator. As part of the monitoring procedure, a qualified professional permitted paleontologist with regional experience will then assess the significance of the discovery and recommend additional mitigation measures, as needed. The paleontologist will be retained to perform inspection of the excavation and to salvage exposed fossils. A small test sample of

fossiliferous sediment (about 100 pounds) may be collected for microvertebrate fossils (e.g., rodents, birds, rabbits, reptiles) in areas that contain microvertebrate fossils on the surface or that may contain microvertebrate fossils in the sediment. Monitors will also determine whether any fossils discovered are part of an archaeological deposit (i.e., latest Quaternary deposits). If so, it will then be considered a cultural resource discovery and treated according to the procedures specified in Appendix B5 – Historic Properties Treatment Plan prepared prior to construction.

This measure will be implemented by requiring paleontological monitoring in rock units designated as having moderate, high, or very high potential to contain paleontological resources (PFYC of 3, 4, or 5). One paleontological monitor should be placed at each construction location where and when ground disturbance is occurring in all areas of high paleontological potential (PFYC of 4 or 5). In areas of moderate or undetermined paleontological potential (PFYC of 3), full-time monitoring may not be required but instead will be determined by the paleontologist's field observation and discussions with the BLM. Monitors will be qualified, permitted paleontologists with regional experience and under permit from the BLM and USFS. Paleontological monitors are empowered to determine significance in the field and collect contextual data immediately. Paleontological monitors may, on direct examination of rock or sediment outcrops, and based on their professional experience, determine that the formation or rock unit in question differs from previous reports or geological mapping. This determination will be discussed with the agency prior to any changes to the monitoring protocol. In addition, if, after a certain amount of time monitoring, it is perceived that a geological unit is not producing fossils, it may be discussed with the agency to reduce the sensitivity of that unit for the local area and/or reduce the monitoring of that unit.

If significant fossils are discovered by environmental monitors and/or construction personnel in areas of moderate/undetermined or low paleontological potential (PFYC of 1, 2, or 3), work will be redirected so that the scientific significance of the discovery may be assessed. Where such fossils are encountered at any time during construction, crew members should proceed as outlined below.

In rock units where scientifically significant invertebrate or plant fossils are anticipated (e.g., Paleozoic limestone), rocks containing a representative sample of the overall fossil assemblage may be collected. Rock quarrying may be necessary in these instances, in which case construction personnel may be requested to provide appropriate equipment for the most efficient and timely removal of the resource. Any quarrying will need approval by the agency.

In rock units where vertebrate fossils are anticipated (e.g., Tertiary fluvial and lake sediment), fossils will be salvaged only when determined on examination in the field to be diagnostic or potentially diagnostic. If large fossils (e.g., mastodon or mammoth bones) are discovered, their mitigation and excavation will be first discussed with the agency. Large vertebrate fossils exposed by excavation will be expeditiously jacketed with plaster bandages or strips of burlap saturated with plaster, then removed and taken to the paleontology laboratory for preparation, identification, and permanent storage. Collected specimens will be identified and curated. Fossil animal trackways, if encountered, will be avoided where feasible. If avoidance is not possible, impacts on the trackways and their mitigation will be discussed with the agency. Mitigation could either be recording and photographing

(including photogrammetry), collection, or replication. Contextual data associated with the resources will be recorded in the field and sites will be photographed.

- PA-4 The preservation of significant fossils (if found during construction) by removal will occur as described in PA-3, unless it is not feasible. Due to the potential for rapid deterioration of some exposed surface fossils, preservation by avoidance generally is not an acceptable mitigation measure (except, in some cases, for exposed fossil-animal trackways). In cases where the fossil cannot be removed immediately, the location of the fossil will be stabilized to prevent further deterioration prior to data collection under the direction of a qualified paleontologist. Stabilization in these cases can (as necessary and safely feasible) include the removal of overburden, exposure of the resource, application of an appropriate hardening agent (e.g., Vinac for vertebrate fossils), and reburial of the resource in those cases where the resource cannot be collected at all. Data collection in these cases will include documentation of pertinent data (lithology, stratigraphy, taphonomy, etc.), as well as photodocumentation where possible. This measure will be implemented further by the mobilization of additional paleontological monitors if unusually large discoveries are encountered during excavation. This procedure will optimize data collection and avoid delays.

#### **B6.4.1.3 After Construction**

- PA-5 For all paleontological resources (vertebrate, invertebrate, plant, trackways) collected during the preconstruction survey or during monitoring of construction, a curation program will be undertaken that includes preparation of collected specimens to a point of identification and permanent preservation (including screen washing of fossiliferous sediment samples to collect small to microscopic vertebrate fossils); preparation of large vertebrate fossils collected in plaster jackets; long-term stabilization of all collected significant fossils; and analysis. The paleontological monitoring and salvage team will include a permitted expert in vertebrate paleontology. A final report, including an itemized and accessioned inventory of collected specimens, will be prepared by a permitted professional vertebrate paleontologist and distributed to the appropriate lead agencies. This report will include any important invertebrate and/or plant-fossil localities. These items and procedures are discussed elsewhere under Section B6.4.6 – Curation Plan.
- PA-6 All fossils collected before or during construction will be curated at the expense of Idaho Power (IPC) at a federally approved repository. A repository agreement for curation would be reviewed by the BLM, the third party contractor for IPC, and the repository, which would provide guaranteed future research access to the fossils. A review of the curation procedures for each federally approved research facility will be performed. Fossils discovered on private land would be considered property of the landowner. The landowner would have the option to keep the fossils or donate them to a federally approved repository, preferably the same repository receiving fossils discovered on federal and state lands.

### **B6.4.2 Monitoring Procedures**

The following procedures and guidelines will be used to ensure the proper protection, salvage, and collection of paleontological resources as they are encountered. Procedures for monitoring and fossil collection by qualified paleontological monitors working under permit are addressed, as well as guidelines for construction personnel and excavation contractors who may encounter paleontological resources in the course of their activities.

A qualified, professional vertebrate paleontologist trained in paleontological salvage guidelines and techniques will be onsite during all construction activities conducted in rock units identified to have high, moderate, or undetermined paleontological potential. Paleontological monitoring and fossil salvage will be conducted under permit from the BLM and USFS. Paleontological monitors will be equipped to

efficiently collect fossils as they are unearthed to avoid excavation or construction delays. Field paleontologists may, based on their experience and on consultation with senior paleontological staff and the BLM, amend determinations of potential and, accordingly, reduce or eliminate monitoring activities, as dictated by the nature of the exposed rock outcrop. Paleontological monitors and/or their necessary equipment (including trucks) will be working in the area of active excavation. Construction equipment operators will be instructed to give these monitors a wide berth for safety reasons (approximately 20 feet at least). If deemed necessary, and with BLM authorization, the paleontological monitors will be prepared to quarry rock samples where necessary and to remove samples of sediment likely to contain the remains of small to microscopic fossil invertebrates and vertebrates. The monitors may enlist the assistance of construction personnel and equipment in this undertaking to avoid delays in excavation activities. The monitors will be empowered to temporarily halt or divert equipment to allow removal of abundant or large specimens.

Paleontological monitors will be equipped with appropriate safety materials (hard hats, orange vests with reflective yellow tape, steel-toed boots, etc.).

Because the monitors will be performing their duties in proximity to the excavation equipment, they will have been trained to make themselves visible to equipment operators while in the field and will endeavor to make eye contact with the operators prior to entering a potentially hazardous area. They frequently will be required to operate vehicles or equipment near active excavation areas. For this reason, the operators must be alert at all times to the presence of paleontological monitors and their equipment.

### **B6.4.3 Construction Personnel Procedures**

Crews and supervisors should be on the lookout at all times for fossils, bones, animal trackways, or other paleontological resources exposed during all construction and excavation activities. Although paleontological monitors will be present during excavation in rock units with high fossil potential and will spot-check excavation in geological units with a moderate or undetermined potential, on-site personnel and/or other construction contractors may provide invaluable assistance in the salvage and collection of paleontological resources.

When encountering an exposed fossil or other paleontological resource, the paleontological monitor(s) will stake and flag an area of approximately 6.5 feet (2 meters) on all sides of the discovery to alert equipment operators to the presence of a potential resource. The monitor(s) will expose the discovery further to assess the potential significance and determine the appropriate collection requirements. Construction crews must avoid these staked/flagged areas by a minimum of 20 feet (6 meters) until the paleontologists have authorized continued excavation.

#### **B6.4.3.1 Fossils Discovered by Construction Personnel**

As stated above, a qualified paleontological monitor will be on-site initially during all excavation activities conducted in rock units identified to have high-to-moderate paleontological potential. However, it is possible that construction crew members or equipment operators may be the first individuals to observe paleontological resources exposed by excavation. It also is possible that fossils or other resources will be encountered in areas of low or undetermined paleontological potential at times when no paleontological monitor is present. In these cases, *it is unlawful for construction workers and other construction contractor personnel to collect fossils from any construction area during construction.* The following guidelines are, therefore, to be employed in these cases.

In the event the construction crew or the equipment operators suspect they have uncovered paleontological resources or other resources, preservation of the resource(s) and notification of the paleontological monitor are of prime importance. When uncovering a potential resource in these sensitive areas, construction personnel immediately should divert construction activities away from the potential site. Suspected resource localities shall be avoided by a *minimum* of 20 feet (6 meters) until the

paleontological monitor has approved further excavation. Subsequent to diverting construction equipment, operators and crew members *immediately* must endeavor to catch the attention of the paleontological monitor. The sooner the paleontological monitor is alerted to the presence of the discovery, the sooner he or she can stake and flag the area, assess the significance of the remains, collect the resource (if necessary), and permit construction to continue in that area. Excavation in the affected area must not continue until authorized by the paleontological monitor.

*If the paleontological monitor is not in the immediate vicinity*, the operator or crew member should immediately stake and flag the affected area so subsequent excavation equipment does not further damage or destroy the resource. Once the affected area is staked and flagged (if possible), the operator or crew member must contact the environmental inspector or compliance inspection contractor *immediately*. It is this inspector's responsibility to contact the paleontological monitor in this situation. The paleontological monitor will respond to the inspector's request for assistance as soon as it is possible for him or her to do so. Construction crews and their supervisors must keep in mind that the paleontological monitor may be involved in collecting resources elsewhere in the excavation, so an immediate response may not always be possible.

In every case, supervisors and crew members shall avoid moving or disturbing the resource(s) until the paleontologist(s) have determined the significance of the discovery. Again, it is unlawful for construction workers or other construction contractor personnel to collect fossils from any construction areas during construction. Work may not continue in the affected area until the paleontological monitor(s) have removed or otherwise mitigated impacts on the discovery(s) and authorized further excavation.

#### **B6.4.3.2 Resources Identified in Spoil Piles by the Paleontological Monitor**

Fossil resources discovered in the spoil piles by the paleontological monitor will be flagged and collected by the monitors for salvage and removal. Construction personnel must not back-fill exposed holes until the stakes and flagging have been pulled by the paleontologist on-site. Stakes and flagging will be removed subsequent to resource collection, and back-filling of holes will then be allowed to proceed. The paleontological monitor will assess fossils found in spoil piles to determine, as close as possible, their original context.

### **B6.4.4 Recordation and Documentation of Paleontological Resources**

The paleontological mitigation program is designed to collect not only exposed paleontological resources, but also significant contextual data associated with these resources. For this reason, paleontological monitors often will be required to stake and flag some areas within the excavation to plot resource localities, measure stratigraphic sections, map fossiliferous horizons, photograph exposures, and so forth.

Again, the equipment operators must avoid these staked and flagged areas until the paleontologists have authorized continued construction and/or excavation. All paleontological monitors will be trained in standardized methods and procedures to ensure data collection is uniform among all identified paleontological resource localities. All data collection and recordation techniques, as well as standard safety equipment and safety procedures, will be reviewed prior to the Project start-up. During the paleontological mitigation program, all observed pertinent data will be recorded on-site at the time the resource has been exposed and collected.

All paleontological field notes will be retained at the appropriate paleontological resource repository. The use of global positioning system units will allow monitors to accurately plot paleontological resource localities on Project maps that will be provided for them. For reporting, fossil localities will be plotted on 7.5-minute U.S. Geological Survey (USGS) topographic maps using North American Datum 83.

## **B6.4.5 Collection of Paleontological Resources**

### **B6.4.5.1 Megafaunal Sampling Plan**

The distribution of large vertebrate fossils unearthed by the excavation equipment is considered random. The megafaunal sampling plan, therefore, will be strictly dictated by the excavation activities planned for a given development project. The paleontologists will monitor *only* in the areas being excavated in rock units that have very high or high (or, in some cases, moderate or undetermined) paleontological potential. Excavation equipment may be required to remove overburden of the paleontological resources while the paleontological monitor is observing. The specific quantity and quality of the fossils cannot be known *a priori*. Based on previous studies, however, it can be proposed that the potential for vertebrate fossils is relatively high where exposures of fluvial and lake sediment, or other fine-grained sedimentary rocks are present at the surface or in the subsurface.

As discussed above, *it is not the goal of the megafaunal sampling plan to collect all paleontological resources discovered*. The paleontological monitor, through discussions with the agency, will determine whether the paleontological resource should be collected at the time of discovery. The criteria for this task are very clear. Monitors collect only fossils possessing articulated surfaces or other diagnostic features that aid in precise identification. Bones or bone fragments of an indeterminate or unidentifiable nature are usually not to be collected, except in those areas where fossil bones have not previously been recorded, or when numerous bone fragments represent part of a larger specimen. When a paleontological monitor discovers a megafaunal resource locality exposed by excavation, the monitor will first discuss the discovery with the agency. The fossils will be expeditiously jacketed with plaster bandages or strips of burlap saturated with plaster, then removed to a curatorial facility for preparation, identification, and permanent storage.

### **B6.4.5.2 Microfaunal Sampling Plan**

The sampling of microvertebrate fossils is critical to understanding both the temporal and the paleoecological aspects of the sediment encountered during construction. Microvertebrate fossils can be useful to paleontologists in determining the age of the sediment in which they are deposited. A small test sample of fossiliferous sediment (about 100 pounds) may be collected for terrestrial microvertebrate fossils (e.g., rodents, birds, rabbits, reptiles) in areas that contain microvertebrate fossils on the surface or that may contain microvertebrate fossils in the sediment. Collected specimens will be identified and curated. Additional sampling of sediment may occur, if deemed necessary by the agency.

### **B6.4.5.3 Marine Invertebrate Sampling Plan**

Many Paleozoic rocks are fossiliferous and have potential to yield significant marine invertebrate fossils. If marine invertebrates are found in a geologic unit, samples of these rocks containing representative samples of fossil assemblages contained therein may be collected from areas of potential impact and removed for laboratory preparation and storage. The size and nature of the collected samples will be determined during preconstruction field reconnaissance.

### **B6.4.5.4 Collection/Replication of Fossil Trackways**

Unique fossil trackways may occur in the Project area. In the event that trackways cannot be avoided, the third-party consultant will discuss mitigation options with the agency. Mitigation could include the removal of overburden, exposing the trackways for recordation, replication of trackways, or removal of trackways. All trackways will be recorded, documented, and photographed using standard photographic techniques and 3-D photography when possible. Collected specimens will be curated at an approved repository in accordance with appropriate federal, state, and county permits.

## **B6.4.6 Curation Plan**

Curation of fossil specimens collected during the paleontological mitigation program includes the preparation of collected specimens to a point of identification and permanent preservation, including the screen washing of small samples of sediments for microvertebrates. Large specimens encased in plaster jackets taken from the site will be prepared in the paleontology laboratory.

### **B6.4.6.1 Processing and Curation Techniques**

The curation plan calls for laboratory preparation of collected fossils to a point of identification and permanent preservation (*not* exhibition). This preparation generally requires exposure of the collected resource(s) by removal of the surrounding sedimentary matrix from the jacket. This matrix may be saved for later microfossil processing. Once the matrix has been removed and the specimen has been cleaned, the fossil is hardened with Vinac, a modified polyvinyl acetate homopolymer, which has been thinned with acetone to enable the hardener to more fully penetrate the fossil. Vinac may be applied several times before the fossil is deemed to be sufficiently sturdy for permanent storage. A review of each repository's curation guideline will determine the type of structural adhesive is preferred. Excess plaster from the jacket is then trimmed to reduce the amount of storage space required by the specimen.

The curation plan also includes the processing of small samples of fossiliferous matrix. Sedimentary matrix will be washed with water (if needed) through stacked sets of 20- and 30-mesh screens and sundried. To accelerate the breakdown of fossiliferous matrix, sediment may be first dried, then resubmerged in water to facilitate disaggregation of clays and fine silts. Subsequent screen washing will remove these fine sediments and leave fossil specimens in a clean concentrate. This concentrate will be examined visually with a binocular microscope and hand sorted to remove fossil specimens. Should plant macrofossils be exposed or identified, such fossils could be collected and prepared to a point of identification and permanent preservation (*not* exhibition).

Following preparation, the third-party consultant for IPC will discuss with the repository the correct guidelines and requirements for curation. Specimens collected during the course of the mitigation program will be identified to the appropriate level for proper paleontological resource, assessment, mitigation, preservation, and management.

#### Paleontological Resources Monitoring Report

A final report of methods and results of the paleontological mitigation plan will be provided at the cessation of the mitigation program. The report will include a detailed discussion of methods used during mitigation, general description of geological units, descriptions of significant discoveries, discussion of the curation of the resources, and results of sampling and analysis, as well as an itemized accession inventory of all specimens collected. A discussion of the significance of each taxon discovered will be provided, where feasible. All resource locality information will be presented as a confidential appendix and a printout of all locality data, as well as pull-out maps with all paleontological resource localities plotted on 7.5-minute USGS topographic maps.

## **B6.4.7 Mitigation Recommendations**

This section will summarize the results of the paleontological impact analysis presented in the Final Environmental Impact Statement for the Project. This section also applies the mitigation measures described in the previous section to the Project area according to broad geological units. These measures apply to the length of the Project, as well as to all accompanying areas of potential impact (structure work areas, access roads, multipurpose areas, etc.). These measures can be finalized upon receipt of the final construction plans. Recent sediment present at the surface throughout the extent of the Project area may be underlain by fossil-bearing geological units. Excavation in the younger sediment may expose

paleontologically sensitive rocks or deposits at depth. Implementation of the PRTP will result in less than significant impacts on paleontological resources with no selective mitigation measures needed.

## **B6.5 Literature Cited**

BLM (Bureau of Land Management). 1998. General Procedural Guidance for Paleontological Resource Management. H-8270-1.

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