

# ENVIRONMENTAL CONSEQUENCES

## GENERAL ANALYSIS METHOD

For each impact topic, applicable regulations were identified and the techniques used to perform the analysis were defined. Each impact topic analysis then involved the following steps.

*Define issues of concern*, based on internal and public scoping.

*Identify the geographic area* that could be affected.

*Define the general assumptions* used in the analysis.

*Define the resource* within that area that could be affected. This information was included in “Affected Environment.”

*Compare the resources* to the area of potential effect.

*Identify the effects* caused by the alternative, in comparison to the baseline represented by the no action/continue current management alternative, to determine the relative change in resource conditions. Both direct and indirect effects are considered. An effect can be a direct result of an action or can occur indirectly if it is later in time or farther in distance than the action. An example of an indirect impact would be increased mortality of an aquatic species later in time because an alternative would increase soil erosion, which would reduce water quality.

*Characterize the effects* based on the following factors:

- Whether the effect would be beneficial or adverse.
- Context or area affected by the alternative: site-specific, local, parkwide, regional.
- Duration of the effect, either short-term or long-term.
- Intensity of the effect, whether negligible, minor, moderate, or major. Impact-topic-specific thresholds for each of these classifications are provided in each impact topic methodology section. Threshold values were developed based on federal and state standards, consultation with regulators from applicable agencies, and discussions with subject matter experts.

*Determine whether impairment would occur* to resources and values that are considered necessary and appropriate to fulfill the purposes of the monument.

*Determine cumulative effects* by evaluating the effect in conjunction with the past, present, or foreseeable future actions.

If appropriate, *identify mitigation measures* that may be employed to offset potential adverse impacts.

## CUMULATIVE EFFECTS ANALYSIS METHOD

The Council on Environmental Quality (1978) regulations for implementing the National Environmental Policy Act require an assessment of cumulative effects in the decision-making process for federal actions. Cumulative effects are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR 1508.7). Cumulative effects are considered for the no action and action alternatives.

Past, ongoing and future actions or plans that have the potential to have a cumulative effect in conjunction with this plan include:

**General Management Plan.** The monument's general management plan guides management actions to protect natural and cultural resources; upgrade facilities, staffing, and services necessary to support recreational uses; upgrade roads; and improve visitor opportunities to experience monument resources. Specifically, the general management plan recognized the structural problems associated with expansive soils underlying the Quarry Visitor Center and the frequent maintenance requirements and recommended performance of a professional engineering structure structural analysis (NPS 1986).

**Comprehensive Interpretive Plan.** The monument's Comprehensive Interpretive Plan, completed in 2003, was developed to define and guide the monument-wide interpretive program consistent with achievement of the monument's goal for interpretation. The Long-Range Interpretive Plan component of the Comprehensive Interpretive Plan serves as the long-range vision of the monument's interpretive program for the next several years. The plan addressed the desired future interpretive program to help most effectively communicate each of the monument's primary interpretive themes to each identified audience in a way that assures balance, effectiveness, and attainability.

**Utah Field House of Natural History State Park Museum.** A new 22,000-square-foot natural history field house and museum opened in June 2004 in nearby Vernal, Utah, approximately 20 miles from Dinosaur National Monument. This museum was constructed to preserve and reveal the abundance of the earth's history found in the Uintah Basin and Uintah Mountains. The museum stores and displays the fossil remains of ancient plant and animal life and other objects of natural history. In the future, the museum is expected to house Dinosaur National Monument's collections, specimens, and paleontological laboratory.

**Road Improvement Project.** This project involves rehabilitation of pavement and drainage conditions along the primary road network in the visitor center area of the monument. This includes 9.4 miles along the main park road, the access road and parking lot at the Quarry Visitor Center and the access road and campground roads at the Green River campground. This project was completed in 2006.

## **IMPAIRMENT ANALYSIS METHOD**

*Management Policies 2006* (NPS 2006b) require analysis of potential effect to determine whether or not actions would impair monument resources or values.

The impairment that is prohibited by the Organic Act and the General Authorities Act is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values. Impairment may result from NPS activities in managing Dinosaur National Monument, from visitor activities, or from activities undertaken by concessioners, contractors, and others operating in the monument.

An impact on any park resource or value may constitute impairment. However, an impact would be most likely to constitute impairment if it affects a resource or value whose conservation is:

- Necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Dinosaur National Monument;
- Key to the natural or cultural integrity or to opportunities for enjoyment of the monument; or
- Identified as a goal in the general management plan or other relevant NPS planning documents.

A determination of impairment is included in the impact analysis section for all impact topics that addresses park resources or values.

## CULTURAL RESOURCES

### Guiding Regulations and Policies

The 1916 Organic Act established the NPS with the fundamental purpose of conserving park resources and values while providing for the public enjoyment of the parks, leaving resources unimpaired for future generations. “If they [resources] are degraded or lost, so is the parks' reason for being” (NPS 1998). Thus, the NPS has become the steward of many of America’s most important cultural resources, defined as archeological resources, cultural landscapes, ethnographic resources and concerns, historic and prehistoric structures, and museum collections.

Finite and nonrenewable, these tangible resources begin to deteriorate almost from the moment of their creation, and, once destroyed, these resources cannot be recovered. The NPS cultural resource management program involves research, planning, stewardship, and preservation. As part of that stewardship, numerous laws, regulations, and policies guide NPS management of cultural resources. Cultural resources eligible for or listed on the National Register of Historic Places include the Quarry Visitor Center, which also has been designated a National Historic Landmark. While most collections, including artifacts, archival materials, and paleontological resources are not eligible for the National Register, their management and protection also are provided by many of the same laws and guidelines.

The **National Historic Preservation Act (NHPA)**, as amended, requires in Section 106 that federal agencies with direct or indirect jurisdiction over undertakings take into account the effect of those undertakings on properties that are listed on, or eligible for listing on, the National Register of Historic Places. This act and its implementing regulations provide guidance for deciding whether cultural resources are of sufficient importance to be determined eligible for listing on the National Register of Historic Places. The National Historic Preservation Act uses the term “historic properties,” to mean all prehistoric and historic sites, buildings, structures, and objects included in, or eligible for inclusion in, the National Register of Historic Places. Regulations that guide the implementation of National Historic Preservation Act are contained in *36 Code of Federal Regulations, Part 800* (36 CFR 800).

Other laws and policies that guide the management and protection of cultural resources include:

- Antiquities Act of 1906;
- NPS Organic Act of 1916;
- Historic Sites Act of 1935;
- Archaeological and Historic Preservation Act of 1974;
- General Authorities Act of 1976;
- Management of Museum Properties Act of 1955, as amended;

- National Environmental Policy Act of 1969;
- Executive Order 11593;
- Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation;
- Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation with Guidelines for the Treatment of Cultural Landscapes;
- Departmental Manual 411 DM 1-3, Managing Museum Property;
- Departmental Manual 519 DM 1, Protection of the Cultural Environment;
- Departmental Manual 519 DM 2, Preservation of American Antiquities and Treatment and Disposition of Native American Cultural Items;
- Programmatic Agreement among the NPS, Advisory Council on Historic Preservation, and the National Council of State Historic Preservation Officers (1995);
- Management Policies 2006;
- *Director's Order 28*, Cultural Resource Management; and
- *Director's Order 24*, NPS Museum Collections Management.

In this final EIS, paleontological resources are treated both as a cultural resource (collections) and as a natural resource (fossils). In addition to mandates for collections management described above, several NPS publications provide for the protection and management of paleontological resources and include:

- *Director's Order 77*, Natural Resource Protection;
- Natural Resources Data Management Guidance, NPS-75;
- Natural Resources Inventory and Monitoring;
- Reference Manual 77, Natural Resource Management; and
- Management Policies 2006.

## Methodology and Assumptions

### Geographic Area Evaluated for Impacts

Direct and indirect impacts upon cultural resources are evaluated at the Quarry Visitor Center and its immediate surroundings and at the shuttle staging area (site of the new visitor center under Alternative B).

### Impact Criteria and Methodology

The following issues were identified through public and internal scoping:

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- The Quarry Visitor Center is a National Historic Landmark recognized as one of the most significant Park Service Modern design visitor centers produced by the Mission 66 program. The structural integrity of the building is threatened by prolonged movement caused by expansive soils under the shallow building foundation system. This movement has persisted ever since initial construction despite repeated stabilization efforts, and a continuation of these existing conditions could lead to structural failure.
- Structural conditions do not assure the most optimal care for the monument's paleontological and other collections. For example, structural cracks allow egress for moisture, rodents, insects, vermin, and birds, all of which can damage *in situ* paleontological specimens and their setting. Falling glass panes can physically damage specimens.
- There are potential hazards to geological and paleontological resources from activities undertaken near the geologic formation, both under continued current management and under the proposed action alternatives.

Cultural resources are subject to provisions of the National Environmental Policy Act (NEPA) and the National Historic Preservation Act (NHPA) and their implementing regulations. Regulations for both the National Environmental Policy Act and National Historic Preservation Act require analysis of the impacts or effects of proposed projects on important cultural resources, although there are two different sets of definitions in the regulations. Impact analyses in this final EIS are intended, however, to comply with the requirements of both the National Environmental Policy Act and Section 106 of the National Historic Preservation Act as defined in 36 CFR 800.8.

Under the National Environmental Policy Act, potential impacts are described in terms of: type (the effects are beneficial or adverse); context (the effects are site-specific, local, or even regional); duration (the effects are short-term – lasting less than one year, long-term – lasting more than one year, or permanent); and intensity (the effects are negligible, minor, moderate, or major). For cultural resources, the duration of effects on virtually all cultural features other than vegetation components would be long-term effects because most cultural resources are non-renewable. These would include any effects on archeological, historic, or on non-vegetative elements of a cultural landscape.

Impacts also were evaluated to determine if they would impair the monument's cultural resources. Because definitions of intensity (negligible, minor, moderate, or major) vary by impact topic, intensity definitions are provided separately for each impact topic analyzed in this final EIS.

Museum collections (prehistoric, historic and paleontological objects and artifacts, works of art, archival documents, and natural history specimens) are generally ineligible for listing in the National Register and not subject to Section 106 of the National Historic Preservation Act. Therefore, potential impacts to museum collections are described using National Environmental Policy Act terminology (above). The definitions of impact intensity for museum collections are included in the following section.

CEQ regulations and NPS policy call for a discussion of the appropriateness of mitigation, and analysis of how effectively mitigation would reduce intensity of a potential impact, e.g. reducing the intensity of an impact from major to moderate or minor. Any resultant reduction in intensity of impact through mitigation is an estimate of the effectiveness of mitigation under National Environmental Policy Act definitions. It does not suggest that the level of effect as defined by Section 106 is similarly reduced. Cultural resources are non-renewable resources and adverse effects generally consume, diminish, or destroy the original historic materials or form, resulting in a loss in the integrity of the resource that can never be recovered. Unlike the National Environmental Policy Act, where mitigation may result in a no-effect determination, actions determined to have an adverse effect under Section 106 may be mitigated, but the effect remains adverse.

A Section 106 summary is included following the cultural resource impact analysis sections. The Section 106 summary is intended to meet the requirements of Section 106 and is an assessment of the effect of the undertaking (implementation of the alternative) on cultural resources, based upon the criterion of effect and criteria of adverse effect found in the Advisory Council's regulations.

In accordance with Section 106 of the National Historic Preservation Act, impacts to archeological resources, buildings and structures, and cultural landscapes were identified and evaluated by (1) determining the area of potential effects; (2) identifying cultural resources present in the area of potential effects that are either listed in or eligible to be listed in the National Register of Historic Places; (3) applying the criteria of adverse effect to affected cultural resources either listed in or eligible to be listed in the National Register; and (4) considering options to avoid, minimize, or mitigate adverse effects.

The Section 106 criteria for characterizing the severity or intensity of impacts are the determinations of effect: *no historic properties affected*, *adverse effect*, or *no adverse effect*.

- A determination of no historic properties affected means that either there are no historic properties present or there are historic properties present but the undertaking will have no effect upon them (36 CFR 800.4(d)(1)).
- A determination of no adverse effect means there is an effect, but the effect would not meet the criteria of an adverse effect, i.e., diminish the characteristics of the cultural resource that qualify it for inclusion in the National Register (36 CFR 800.5(b)). A no adverse effect finding also may include beneficial effects of an action.
- An adverse effect occurs whenever an impact alters, directly or indirectly, any characteristic of a cultural resource that qualifies it for inclusion in the National Register, e.g., diminishing the integrity (or the extent to which a resource retains its historic appearance) of its location, design, setting, materials, workmanship, feeling, or association. Adverse effects also include reasonably foreseeable effects caused by the alternatives that would occur later in time, be farther removed in distance or be cumulative (36 CFR 800.5(a)(1)). Because cultural resources are nonrenewable, all adverse effects on National Register-eligible cultural resources in the monument would be long term and would have a high level of concern.

## Impact Threshold Definitions

Impact threshold definitions have been drafted for and are included with each of the two cultural resource topics (historic structures and museum collections) to help ensure that the intent and legal requirements of both the National Environmental Policy Act and National Historic Preservation Act mandates are met in this document.

## Methodology for Historic Structures

To be listed in the National Register of Historic Places, a structure or building must meet the following criteria:

- Be associated with an important historic context. That is, it must possess significance such that a meaning or value is ascribed to the structure or building.
- Have integrity of those features necessary to convey its significance. Typically, these would include location, design, setting, workmanship, materials, feeling, and national association.

Complete information on criteria for listing is included in National Register Bulletin 15, *How to Apply the National Register Criteria for Evaluation*.

Impacts on historic structures were evaluated using the process described in the beginning of this section. Definitions of intensity levels are as follows:

**Negligible impact:** The action would not have the potential to cause effects on historic structures that would alter any of the characteristics that would qualify the resource for inclusion in or eligibility for the National Register of Historic Places. For purposes of Section 106, the determination would be *no historic properties affected*.

**Minor adverse impact:** The action would affect a feature(s) of a National Register of Historic Places-eligible or -listed structure, but would not alter its character-defining features, nor would the action diminish the overall integrity of the property. For purposes of Section 106, the determination of effect would be *no adverse effect*.

**Minor beneficial impact:** The action would maintain the character-defining features of a National Register of Historic Places-eligible or -listed structure in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties* (NPS 1995). For purposes of Section 106, the determination of effect would be *no adverse effect*.

**Moderate adverse impact:** The action would alter a character-defining feature of the structure but would not diminish the integrity of the resource to the extent that its National Register eligibility is jeopardized. For purposes of Section 106, the determination of effect would be *adverse effect*.

**Moderate beneficial impact:** Positive actions would be taken to help preserve character-defining elements of a structure in accordance with the *Secretary of the Interior's Standards*



*for the Treatment of Historic Properties* (NPS 1995). For purposes of Section 106, the determination of effect would be *no adverse effect*.

**Major adverse impact:** The action would alter a character-defining feature(s) of the structure, seriously diminishing the overall integrity of the resource to the point where its National Register eligibility may be in question. For purposes of Section 106, the determination of effect would be *adverse effect*.

**Major beneficial impact:** The action would noticeably enhance the character-defining features of a structure that represent important components of the nation's historic heritage, and would foster conditions under which these cultural foundations of the nation and modern society could exist in productive harmony and fulfill the social, economic, and other requirements of present and future generations. Enhancement would be in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties* (NPS 1995). The Section 106 determination of effect would be *no adverse effect*.

### Methodology for Museum Collections

Impacts on museum collections, including paleontological remains, are evaluated using National Environmental Policy Act terminology. Only those fossil remains found *in situ* on the sloping stone formation exposed within the Quarry Visitor Center, as well as collections displayed in the glass exhibits, are discussed under "Collections." The rest of the monument's collections, including archival materials such as photographs, manuscripts, topical publications, archeological resources, and natural resource and paleontological specimens removed from their original context will be relocated to the curatorial facility in Vernal under a separate action. These items would be moved prior to implementation of this project and would not be affected by any of the alternatives.

The *in situ* fossil wall exposed within the Quarry Visitor Center is managed as part of the monument's collection and is therefore evaluated in this section under "Collections." Paleontological resources present in the vicinity of the proposed project [the fossil-bearing Morrison formation beneath the Quarry Visitor Center site and limited areas of the bone-bearing strata exposed on both the east and west sides of the Exhibit Hall] are evaluated as a natural resource under "Geologic and Paleontological Resources."

Definitions of intensity levels for collections are as follows:

**Negligible impact:** Effects of the action would be at the lowest levels of detection – barely measurable with no perceptible consequences, either adverse or beneficial, to museum collections.

**Minor adverse impact:** The action would affect the integrity of few items in the museum collection but would not degrade the usefulness of the collection for future research and interpretation.

**Minor beneficial impact:** The action would contribute to stabilization of the current condition of the collection or its constituent components to minimize degradation.

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**Moderate adverse impact:** The action would affect the integrity of many items in the museum collection and diminish the usefulness of the collection for future research and interpretation.

**Moderate beneficial impact:** The action would improve the condition of the collection and help protect its constituent parts from the threat of degradation.

**Major adverse impact:** The action would affect the integrity of most items in the museum collection and destroy the usefulness of the collection for future research and interpretation.

**Major beneficial impact:** The action would secure the condition of the collection as a whole or its constituent components from the threat of further degradation.

### Cumulative Effects

Cumulative effects that would occur within and outside this area were determined based on the “Cumulative Effects Analysis Method” section. Cumulative effects on cultural resources were determined by combining the impacts of each alternative with other past, present, and reasonably foreseeable future actions.

Other important actions that occurred in the past and will continue into the future include the deterioration of cultural sites, structures, and paleontological resources from development, wind, weather, erosion, rodent activity, vegetation, vandalism, and unauthorized collection. Cultural resources and paleontological resources are non-renewable, so over time these various threats cumulatively diminish the regional resource base, and reduce the number and variety of resource sites available for visitor appreciation and scientific study.

### Impacts of Alternative A – the No Action Alternative

#### Historic Structures

The Quarry Visitor Center was specially designed for this site. Use of the fossil-bearing natural strata as one wall of the building anchors the building to the site and its fossils while, at the same time, the glass and steel superstructure allows for a visual connection from the interior of the building to the broader natural landscape that provides the context for the fossil exhibit.

Even with on-going maintenance, monitoring, and use of stop-gap measures, the National Historic Landmark Quarry Visitor Center faces an almost certain threat of deterioration and future failure. Emergency measures intended to shore up the building would continue to have only a temporary effect, and would contribute to further incremental losses of integrity of this National Historic Landmark (NHL) structure.

The combination of continued maintenance, monitoring, and repair efforts with ongoing deterioration would eventually result in long-term, major, adverse effects as the condition of the building worsens, and the structure eventually fails. It is currently unsafe and

uninhabitable, and has been closed to visitors and staff because of irreversible structural problems that result in safety concerns. Under Alternative A, continued deterioration of the Quarry Visitor Center would have direct, long-term, major, adverse effects on the structure, and would justify delisting of the Quarry Visitor Center as a National Historic Landmark.

**Cumulative Effects.** The gradual deterioration and loss of integrity of the Quarry Visitor Center has been ongoing since its construction and would continue under the No Action Alternative. No other past, present, or reasonably foreseeable future actions are known to affect the NHL structure; therefore, there would be no additive cumulative effects.

**Conclusion.** Alternative A would have long-term, major, adverse effects on the Quarry Visitor Center from continued damage and loss of structural elements and integrity.

## Collections

Long before the present Quarry Visitor Center was constructed, Dinosaur National Monument was created to protect the extraordinary collections that are now exposed along the north wall of the building. Care of these fossil collections is a primary concern for the monument. As the building ages and its structural elements become more unstable, threats to these collections would increase. That is, structural cracks in the walls or foundations would allow insects, birds, bats, mice and other rodents to find their way into the collections area. Mice and other rodents tunnel and build burrows that could undermine the fossil wall, causing the fossils to be more susceptible to gravity. Vermin deposits have the potential to change the chemical composition of the soil matrix around the fossils. The effect that these deposits would have on the consolidants used on the fossil bones is undetermined, but there appears to be some potential for deterioration and loss of integrity.

The biggest threat to collections is from continued deterioration of the structure leading to failure of structural elements. Such failures would have corresponding adverse repercussions on the paleontological collections should glass or metal structural parts fall onto the fossil wall. Structural cracks would allow egress for moisture, which would exacerbate the structural problems and increase the potential for damage to fossils from rain, snow, and falling glass panes. Continuation of localized emergency repairs and adherence to the structural monitoring program would help identify potential hazards and identify triggers for corrective and protective actions. However, concerns for the safety of workers would tend to limit the amount and frequency of preventative maintenance operations that could be conducted to preserve the *in situ* collections.

The gantry crane currently is inoperable. Without the gantry crane, researchers and maintenance staff must ascend and descend the steep slope to reach the fossils or building elements that require maintenance. This situation is dangerous for staff and researchers and would continue to pose a potential threat (moderate and adverse) to the paleontological collections in case of dropped equipment or slips and falls by researchers/staff. Under Alternative A, the damage to the collections would be incremental through time, resulting in long-term, minor to major, adverse effects.

### Cumulative Effects.

Fossils have become highly valued by collectors, and each year increasing numbers are unearthed, removed from their geologic context, and are sold or placed in private collections. Wind, water, and the effects of gravity also take their toll on fossil remains. Fossils are non-renewable resources, so each of these actions and occurrences would cumulatively reduce the number and types of specimens available for scientific study, research, and interpretation, although the extent of these effects are unknown and cannot be quantified. The park implements its museum management plan to ensure proper documentation, physical preservation and protection, research, and use of the park's museum collections, which represents a long-term, moderate, beneficial effect to collections. Under the No Action Alternative, continuing threats to the building carry corresponding threats to the *in situ* fossil collections from water leaks (from rain and snow), falling glass panes, vermin, etc. Because the gantry crane cannot be used, any activities on the fossil wall (e.g., cleaning, maintenance, research, emergency stabilization efforts) would continue to have potential for damage to the deposits. The effects of the No Action Alternative would be long-term, minor to major, and adverse, and would contribute to cumulative effects because some of the fossils at Dinosaur National Monument are rare or one-of-a-kind and are not found in other collections or known deposits. Overall, when these effects are combined with other projects and actions – both in the park and the nearby region – the result would be long-term, minor to moderate, adverse cumulative effects on paleontological collections.

**Conclusion.** Continuation of monitoring efforts and localized repairs would help reduce the intensity of adverse effects, but Alternative A would have long-term, minor to major, adverse effects on collections from loss of integrity and failure of structural elements that would physically damage collections and allow egress for rodents, birds, insects, and moisture. The inoperative gantry crane would contribute to these adverse effects on collections because researchers and maintenance crews would have to continue to climb the steep slope to access fossils or building elements requiring work, and slips and falls could damage fossils.

Cumulative effects on paleontological collections would be long-term, minor to moderate, and adverse.

Should conditions worsen to the point where structure failure of the Exhibit Hall seems likely, proactive measures would be developed for the *in situ* collections so that Alternative A would not result in impairment of cultural resources or values.

### Impacts of Alternative B, the Preferred Alternative – Rehabilitate or Replace the Exhibit Hall and Construct a New Facility Off-Site

#### Historic Structures

**Rehabilitation of the Exhibit Hall.** The choices available to the NPS for future treatment or preservation of the Quarry Visitor Center are dictated by the existing unsafe conditions of the building and by the inexorable threat to its structural integrity posed by underlying expansive soils. Continued stop-gap maintenance and monitoring of the building are not

viable solutions, particularly when the critical factors of human health and safety are considered.

The existing Administrative Wing, South Wing, Serpentine Entry Ramp, and Exhibit Hall combine to form the Quarry Visitor Center building. Structural failures and deficiencies in the other three sections of the building threaten the structural stability of the Exhibit Hall. Removal of these structural segments would relieve part of the stress on the Exhibit Hall, and hopefully, allow its rehabilitation.

During the 1950s, the design of the Exhibit Hall represented a major change in the way the NPS exhibited and interpreted resources. Instead of a small, windowless museum room in a rustic building, this exhibit space was built over the paleontological resources, still in their original context. The soaring glass roof and glass walls brought in the sunlight, and allowed views of the spectacular terrain surrounding the site. The gantry crane provided a way for researchers and workers to interact safely with the specimens, without harm to the resources.

Of the Quarry Visitor Center's four basic structural components, the Exhibit Hall is perhaps the most crucial in terms of the monument's purpose and significance. This structure protects and showcases the *in situ* fossil bones that were a major part of the reason for the monument's creation, while the rest of the Quarry Visitor Center serves, in many ways, as a support facility. Ultimately, choices for preservation must fall on the side of the collections displayed on the quarry wall, for it was these resources that helped to generate creation of the monument long before the building was designed or built.

Under Alternative B, removal of three of the four structural components of the Quarry Visitor Center would make it impossible to retain the NHL (and National Register of Historic Places) integrity of the overall structure. Modern materials and methodologies would be used to rehabilitate the Exhibit Hall but every effort would be made to see that new designs and materials are in keeping with the original design. That is, wherever possible, new construction would attempt to retain the massing and general appearance of the structure that are consistent with the basic Modern character of the original building.

Access for moisture, birds, bats, and vermin would be reduced. Use of modern materials would help decrease ultraviolet rays and temperature variations that can adversely affect paleontological specimens. Rehabilitation of the traveling gantry crane would allow safe egress for researchers and maintenance workers. Rehabilitation of the first and second floor visitors' gallery would provide new opportunities for interpretation of the fossils.

Typically, when major modifications are proposed for a National Historic Landmark, the structure would be documented using Historic American Buildings Standards (HABS). In this case, however, the original construction drawings, the historic structure report, and a variety of engineering and architectural studies have been completed and adequately document the structure. Park and regional files detail later structural modifications. To help mitigate project effects, these data would be consolidated and placed in the park archives, along with large scale black and white record photographs of the building.

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Protective measures would be implemented to ensure that the structural integrity of the Exhibit Hall would not be diminished during the project. For example, initial construction procedures would include shoring and/or stabilization of the structure prior to separation of the building segments and removal of the Administrative and South Wings. The stability and condition of the Exhibit Hall would be monitored during construction and demolition phases. Other mitigating measures are listed in Table 2, Mitigation Measures.

However, the rehabilitated Exhibit Hall would still be a 50-year-old building. It would continue to suffer from design inadequacies, particularly in the roof system. Threats from expansive soils would continue to be a concern.

In summary, retention and rehabilitation of the Exhibit Hall would allow it to serve as a visual reminder of the post-World War II Modern style of visitor center pioneered by the NPS, a minor benefit. However, despite its rehabilitation, the 50-year-old Exhibit Hall would still contain aging components. Rehabilitation of the Exhibit Hall and removal of the Administrative and South Wings and the Serpentine Entry Ramp would have a major adverse effect on the Landmark building.

**New Construction of the Exhibit Hall.** On the other hand, it may not be possible to rehabilitate the Exhibit Hall. Numerous factors have contributed, and would continue to contribute, to the continuing deterioration of the Quarry Visitor Center, including its design, weather, wind, materials, utility problems, and most important, expansive soils. These constraints are varied and unpredictable. If it is found that the Exhibit Hall cannot be safely retained and rehabilitated, the structure would be removed, and a new structure erected to protect and showcase the *in situ* paleontological collections. Although this would be a major adverse effect on the existing structure, the new structure would occupy a footprint similar to that of the existing building, and would be reconfigured to provide more protection for the fossil wall as well as replacement by a more accessible, sustainable, people-friendly building.

The same protective measures described above for rehabilitation of the Exhibit Hall would apply to its removal and new construction. The stability and condition of the structure would be monitored before and during the demolition phase, and work would be done in a manner that would preserve and protect the fossil wall. Documentation of the structure would be guided by a future memorandum of agreement among the NPS, the Utah State Historic Preservation Officer, and the Advisory Council on Historic Preservation.

It is unfortunate that NPS Modern design visitor centers all across the nation that date to the Mission 66 era have been modified or replaced, and only four extant buildings (including the Quarry Visitor Center) have been determined to meet National Register of Historic Places criteria. Razing the Quarry Visitor Center would be a loss to the few examples of this design style that reflect a crucial stylistic change in architecture in the parks, as well as an important new approach to interpretation and visitor use, a major adverse effect. As partial mitigation for these effects, the original drawings, plans, and reports for the Quarry Visitor Center would be archived at the park, along with large scale black and white photographs.

Construction of the new visitor center facilities at the shuttle staging area would provide a new layout and infrastructure, provide adequate space for park administration, and give visitors an improved “climate” during their visit. The new visitor center would help reduce crowding, and make exhibits and facilities more accessible to visitors. These changes would result in longer visits and a better appreciation for the paleontological resources, which would, in turn, build support for park programs and encourage preservation of paleontological resources both within and outside of the monument.

In summary, construction of new visitor and administrative facilities, both at the site of the fossil wall and at the shuttle staging area, would alter the basic form, features, materials, and spatial arrangement of the Quarry Visitor Center and justify its delisting as a National Historic Landmark, resulting in an overall long-term, major, adverse effect on the historic qualities of the structure.

**Cumulative Effects.** No other past, present, or reasonably foreseeable future actions are known to affect the Quarry Visitor Center; therefore, there would be no additive cumulative effects.

**Conclusion.** If the condition of the Exhibit Hall allows its rehabilitation, Alternative B would have a long-term, major adverse effect on the Quarry Visitor Center by changing the character of the building and by altering its basic form, features, materials, and spatial arrangement. Rehabilitation of the Exhibit Hall would have a minor beneficial effect by preserving some of the ambiance of this NPS Modern building.

If the condition of the Exhibit Hall precludes its reconstruction, and a new building is erected over the fossil wall, the effects also would be adverse, long-term, and major. In either case, the existing structure would be de-listed as a National Historic Landmark, a long-term, major adverse effect.

There are no other projects that would affect the Quarry Visitor Center at present or in the foreseeable future, so there would be no cumulative effects on the structure.

## **Collections**

**Rehabilitation of the Exhibit Hall.** Given the nature of the project, the steep slope of the fossil wall, and the fragility of the fossils, some adverse impacts would be likely under Alternative B. For this reason, protection of the collections on the fossil wall and in the display area would be a high priority before, during, and after the proposed project. Items in the display area would be carefully removed, and housed temporarily in an appropriate facility. To ensure protection of the collections on the fossil wall, the Exhibit Hall and gallery area glass would have to be removed before demolition/construction work began. Glass removal would be done carefully to prevent panes from shattering and/or falling onto fossil specimens or workers below. The fossil collections would also require protection from minor damage from dropped tools or other similar mishaps.

Repair of the gantry crane rail along the floor or the beam along the inside of the north wall foundation would involve moving large steel beams in and around the quarry face. If the

gantry crane were to be entirely replaced, the rail system and supports would need to be removed from their locations adjacent to the fossil bed. Both actions would pose a threat of damage to the fossil collections below. However, rehabilitation or replacement of the gantry crane would allow future researchers and staff to more easily access the area without posing a threat to the collections.

Removal of the Exhibit Hall glass as part of the rehabilitation process would result in other concerns. Without side wall protection of the quarry face, rain and snow would introduce moisture into the area, causing further damage both to the structure and to the fossil collections. With parts of the building removed during construction, security would be a problem because of the ease of unauthorized access. However, potential effects to the collection from these threats would be reduced by implementing mitigation measures outlined in Table 2, Mitigation Measures, in the “Alternatives” chapter.

There are great temperature variations at this site; in winter the temperature may drop as low as minus 48 degrees Fahrenheit with a maximum daytime temperature of around 0 degrees Fahrenheit. In summer, the site experiences extremely hot daytime temperatures. With the removal of the windows and the South Wing, the fossil area would experience the same temperature extremes. The effect of these extreme temperatures on consolidants and adhesives used in fossil repair in the *in situ* exhibit is unknown, but is not likely to be beneficial. Accepted curatorial practices strongly discourage extreme temperature variations that can cause materials to contract and expand unevenly, causing cracking and other damage.

Structural monitoring would continue, and to counter the various threats to the fossils enumerated above, a variety of protective measures would be developed prior to the beginning of construction. Most important of these would be installation of a stable, easily removed, physical protection over the fossil wall. Installation of physical protection such as hard-surfaced metal or plywood sheeting would require a framework whose installation and subsequent removal poses its own problems, particularly when the steep slope is considered. An inflatable structure over the quarry face might be one option to consider, but it is not clear whether this would provide effective protection. If the quarry face was “embedded” in a hard material such as plaster or a soft material such as foam, the area would require “re-excavation” of the fossil face, posing an additional threat to the collection. Before initiation of the project, engineering solutions would be developed to protect the fossil wall from temperature extremes and variations, moisture, and physical damage or loss.

There is a natural crack system on the quarry face resulting from the uplift of the rock layers during the formation of the Split Mountain anticline. These cracks cut across both rock and bone. This system appears to be active as repairs and patches to cracks in the *in situ* bones now show separation and gaps. Why such growth is occurring is unknown although it could be related to isostatic rebound from the removal of the overlying mudstones and sandstones to create the cut that the Quarry Visitor Center now occupies. A crack monitoring system would be installed as far ahead of proposed construction as possible in order to obtain baseline data on the present conditions.



Monitoring also would help define the amount of vibration caused by demolition and construction activities. During construction, vibrations can be transmitted through underlying strata to the fossil area. Vibrations pose a very real threat to fossil vertebrate remains because they can cause cracks to develop and existing cracks to expand and grow. The amount of vibration that would be generated by the proposed demolition and construction is presently unknown, but is expected to be moderate in nature. However, if monitoring indicated that substantive vibrations were reaching the quarry area fossil deposits, work would be halted and alternative construction procedures implemented.

Other measures designed to help avoid secondary damage to or loss of the fossils in the Exhibit Hall or to buried resources during demolition of building elements are listed in Table 2, Mitigation Measures.

Fossil specimens of the collection, and their cases, on display in the Exhibit Hall would be moved to a safe location prior to project implementation. The movement and storage of these objects would be performed in accordance with the monument's Museum Management Plan (NPS 2002a) to minimize the risk of damage to or loss of these fossils.

With mitigating measures, long-term adverse impacts to the collections during rehabilitation of the Exhibit Hall would be negligible to minor. (The fossil wall contains non-renewable paleontological resources, so any effects resulting from rehabilitation actions would be long-term). Once construction was complete, the improved stability and environmental conditions of the Exhibit Hall would produce long-term minor to moderate benefits. That is, benefits accruing from a rehabilitated building and gantry crane would include better protection from ultraviolet energy, sharp temperature changes, incursions by vermin, bats, and insects, and fewer threats of damage from research and maintenance activities. Benefits would, however, be tempered by the fact that some elements of the original 50-year-old building would still suffer from age and deteriorating conditions.

**New Construction of the Exhibit Hall.** Procedures for protection of the fossil wall would be much the same as described above if the Exhibit Hall were to be razed and a new structure built. With new construction there would be slightly added potential for damage to the fossil wall from exposure to the elements, unauthorized intrusion, and dropped tools or structural elements or materials. With mitigating measures, long-term adverse effects would range from minor to moderate; long-term moderate benefits would result from erection of a new facility.

**Cumulative Effects.** Collecting, development projects, and natural forces would continue to diminish the numbers and types of non-renewable fossil resources available for research and public education. These long-term, adverse activities and losses would be expected to continue into the future. The actions taken by park staff to implement the museum management plan would result in long-term, moderate benefits to collections. The long-term, negligible to moderate (or minor to moderate with new construction), adverse effects and long-term, moderate, beneficial effects of Alternative B would contribute to overall cumulative effects to collections that would be long-term, minor and beneficial. (Effects would be minor because continuing losses of paleontological materials elsewhere far outweigh the number of specimens preserved at Dinosaur National Monument.)

**Conclusion.** With mitigation during rehabilitation, construction activities and installation/removal of protective coverings, repairs to the gantry crane, etc. would result in long-term, negligible to minor, adverse effects to the collections from direct disturbance, vibrations, temperature changes, and exposure. Long-term moderate benefits would accrue from implementation of this alternative by providing a secure, environmentally sound environment for the collections for the foreseeable future.

Removal and replacement of the Exhibit Hall would have long-term minor to moderate adverse effects on the park's collections from exposure to the elements, unauthorized intrusion, and dropped tools or materials. Benefits would accrue from a new building and include better protection from the elements and natural forces.

Cumulative effects on the paleontological resource collection would be long-term, minor, and beneficial.

Should conditions worsen to the point where structure failure of the Exhibit Hall seems likely, proactive measures would be developed for the *in situ* collections so that Alternative B would not result in impairment of cultural resources or values.

### **Impacts of Alternative C – Retain the Exhibit Hall and Construct a New Facility at the Quarry Visitor Center Site**

#### **Historic Structures**

**Rehabilitation of the Exhibit Hall.** With a few exceptions, the effects of Alternative C on historic structures would be virtually identical to those described for Alternative B. Removal and replacement of all structural components except the Exhibit Hall would make it impossible to retain the NHL integrity of the overall structure, a major adverse effect. Use of modern materials and methodologies to rehabilitate the Exhibit Hall would further diminish its basic historic character, but every effort would be made to help ensure that the designs and materials used in the rehabilitation result in a structure that is reminiscent of the original Modern design. Careful design of the new addition would help ensure that the basic appearance and massing of the overall building blend into the area unobtrusively. The original intent of the Exhibit Hall—to showcase and interpret the paleontological collections—would be retained, a minor benefit.

Rehabilitation would reduce opportunities for moisture, birds, bats, and vermin to come into the building; provide enhanced opportunities for interpretation of the fossils; and decrease ultraviolet rays and temperature variations. Rehabilitation or replacement of the traveling gantry crane would allow safe egress for researchers and maintenance workers.

Mitigation measures would include consolidation and archival treatment of original drawings, photography of the building to meet Historic American Buildings Standards (HABS), and other provisions as defined a future Memorandum of Agreement. As described in Alternative B, protective measures and monitoring would be established prior to demolition of the southern portions of the building. Other mitigating measures are listed in Table 2, Mitigation Measures.

Structural components of the new building would occupy a footprint similar to that of the existing Administrative and South Wings, but would be slightly larger and reconfigured to provide a more accessible, sustainable, people-friendly building. As described for Alternative B, rehabilitation of the Exhibit Hall and construction of a new building adjacent would improve the indoor climate and benefit the visitor experience and appreciation of the fossils, improve visitor flow and accessibility, and reduce crowding.

However, construction of a new facility adjacent to the existing Exhibit Hall would involve more ground disturbing work, including placement of deeply buried pilings to support the new structure. Despite monitoring and stabilization efforts, vibrations from new construction and connection of the new building with the Exhibit Hall likely would have additional adverse effects on the structural integrity of the Exhibit Hall and the condition of the collections. Some parts of the 50-year-old building such as the roof system would continue to be threatened by weather and age.

In summary, the Exhibit Hall would be rehabilitated in a manner that would retain some of its historic ambiance, but replacement of the Quarry Visitor Center Administrative Wing, South Wing, and the Serpentine Entry Ramp with new structural components would alter the basic form, features, materials, and spatial arrangement of the building. This would result in a long-term, major, adverse effect on the overall historic structure. Construction of a new building adjacent to the Exhibit Hall would have an adverse effect on its structural integrity because of additional ground disturbance and vibrations. The numerous structural changes that would be made would be extensive enough to justify delisting of the Quarry Visitor Center as a National Historic Landmark, a long-term, major, adverse effect.

**Cumulative Effects.** No other past, present, or reasonably foreseeable future actions are known to affect the Quarry Visitor Center; therefore, there would be no additive cumulative effects.

**Conclusion.** Alternative C (including rehabilitation of the Exhibit Hall) would have a long-term, major, adverse effect on this NHL structure by changing the character of the building and by altering its basic form, features, materials, and spatial arrangement. Construction activities during erection of a new building adjacent to the Exhibit Hall would likely have an adverse effect on the Exhibit Hall.

There are no other projects that would affect the Quarry Visitor Center at present or in the foreseeable future, so there would be no cumulative effects on the structure.

## **Collections**

**Rehabilitation of the Exhibit Hall.** Effects on collections, and mitigating measures developed for their protection, would be the same as discussed in Alternative B, above. That is, with mitigation during rehabilitation, construction activities and installation/removal of protective coverings, repairs to the gantry crane, etc. would result in long-term, negligible to minor, adverse effects to the collections from direct disturbance, vibrations, temperature changes, and exposure. Long-term minor to moderate benefits would accrue from implementation of this alternative by providing a secure, environmentally sound

environment for the collections for the foreseeable future (benefits would be minor to moderate because the Exhibit Hall would still contain 50-year-old structural elements that could fail within the life of the entire building).

In conclusion, with mitigating measures, long-term adverse impacts to the collections during implementation of the project would be negligible to minor. Once rehabilitation was complete, the improved stability and environmental conditions of the Exhibit Hall would produce long-term minor to moderate benefits.

**Cumulative Effects.** Collecting, development projects, and natural forces would continue to diminish the numbers and types of non-renewable fossil resources available for research and public education. These long-term, adverse activities and losses would be expected to continue into the future. The actions taken by park staff to implement the museum management plan would result in long-term, moderate benefits to collections. The long-term, negligible to minor, adverse effects and long-term, minor to moderate, beneficial effects of Alternative C would contribute to overall cumulative effects to collections that would be long-term, minor and beneficial. (Effects would be minor because continuing losses of paleontological materials elsewhere far outweigh the number of specimens preserved at Dinosaur National Monument.)

**Conclusion.** Construction activities and installation/removal of protective coverings, repairs to the gantry crane, etc. would result in long-term, negligible to minor, adverse effects to the collections from direct disturbance, vibrations, temperature changes, and exposure. Long-term minor to moderate benefits would accrue from implementation of this alternative by providing a secure, environmentally sound environment for the collections for the foreseeable future.

Cumulative effects on the paleontological resource collection would be long-term, minor, and beneficial.

Should conditions worsen to the point where structure failure of the Exhibit Hall seems likely, proactive measures would be developed for the *in situ* collections so that Alternative C would not result in impairment of cultural resources or values.

### **Impacts of Alternative D – Retain the Exhibit Hall and Reconstruct Wings Similar to Existing Facility**

#### **Historic Structures**

**Rehabilitate the Exhibit Hall.** This alternative would retain and rehabilitate the Exhibit Hall and Serpentine Entry Ramp and demolish the Administrative and South Wings. The two latter components would be replaced with new structural elements, built with similar materials and methods and designed with the intent of replicating the basic form, appearance and scale of the original structure. The replaced structural elements would be clearly identified as a contemporary re-creation.

Rehabilitation/stabilization of the Exhibit Hall and ramp and razing and rebuilding of the other component parts of the visitor center would constitute a major change in the structure itself. Basically, parts of the structural complex would be new and other parts would consist of a mixture of old and new, with the original functions and layout retained to the extent possible. Rehabilitation of the Exhibit Hall and Serpentine Entry Ramp would be done in a manner that, wherever possible, would retain the overall impression – the size, scale, materials, and design of the rebuilt/rehabilitated structure so that it would be similar to the original NPS Modern design. The new building would, however, still have some of the same limitations as the existing visitor center—a long narrow area below the fossil wall that limits exhibit placement and visitor movement, lack of usable space for administrative facilities, and awkward access and egress for visitors. The building's roof system could still pose problems. As described for Alternative C, implementation of Alternative D would result in major, long-term, adverse effects from loss of integrity for the National Historic Landmark structure.

**Cumulative Effects.** As described for Alternative C, no other past, present, or reasonably foreseeable future actions are known to affect the Quarry Visitor Center; therefore, there would be no additive cumulative effects.

**Conclusion.** Implementation of Alternative D would have long-term, major, adverse effects on the historic Quarry Visitor Center by replacing original structural elements with modern buildings (albeit with a similar design and scale). There would be no cumulative effects on the Quarry Visitor Center.

**Collections.** With mitigation, effects to the collections from Alternative D would be the same as described for Alternative C; that is, negligible to minor, long-term, adverse impacts to the collections resulting from construction activities such as direct disturbance, vibrations, temperature changes, exposure, and movement and storage of display specimens. Long-term, minor to moderate, beneficial effects would accrue because improvements in the building would provide a more environmentally stable atmosphere for the fossil collection.

**Cumulative Effects.** Cumulative effects on collections would be the same as those described for Alternative C, which would be long-term, minor, and beneficial.

**Conclusion.** Long-term, negligible to minor, adverse effects to collections would accrue during construction (from collateral damage, exposure, etc.), but long-term, minor to moderate benefits would be gained as collections would be better protected for future research and education.

Cumulative effects on collections would be long-term, minor, and beneficial.

Should conditions worsen to the point where structure failure of the Exhibit Hall seems likely, proactive measures would be developed for the *in situ* collections so that Alternative D would not result in impairment of cultural resources or values.

## **Impacts of Alternative E – Demolish the Entire Facility and Construct a New Facility at the Quarry Visitor Center Site**

### **Historic Structures**

This alternative would demolish the structure in its entirety and construct a new structure designed to meet park interpretation, operation, and maintenance needs. The Quarry Visitor Center would lose both its National Historic Landmark and National Register designations. While the new building would be designed for compatibility with its setting and purpose, it would no longer reflect the historic Park Service Modern design or the innovative ideas about visitor centers inherent in its predecessor. Although additional documentation (as appropriate) to HABS/HAER standards would be completed prior to demolition, this one small piece of American history and architecture in its original context and setting would, in effect, be lost to future generations. Demolition of the Quarry Visitor Center would have a major, long-term adverse effect on this historic NHL structure, and would reduce the number of NPS Modern visitor centers eligible for the National Register in the parks to only three.

**Cumulative Effects.** There are no other projects that would affect the Quarry Visitor Center at present or in the foreseeable future, so there would be no cumulative effects on the structure.

**Conclusion.** Even with mitigation, complete demolition of the Quarry Visitor Center would be a long-term, major, adverse effect on this historic structure. There would be no cumulative effects on the Quarry Visitor Center.

### **Collections**

During both the razing and construction processes, the fossil wall would be at risk because large segments of the building and the gantry crane would need to be removed from over and around the fossil wall without affecting the bones. During both demolition and construction of the new building, special engineering techniques would be devised to protect the fossil wall. Protective coverings would have to be designed to protect the fossils from construction accidents and vibrations, as well as from wind, rain, snow, temperature extremes, theft, and vandalism. As described for Alternatives B, C, and D removal of the protective coverings once the building was in place could also inadvertently threaten the stability of fragile items. And, as in the other action alternatives, use of vibration and crack monitoring equipment would be necessary to ensure safety of the collection.

Under Alternative E, construction of a new facility would be more complicated and would run more risk of damage to the fossils than in the other action alternatives that retain and rehabilitate the Exhibit Hall. On the other hand, with the use of modern materials and design, the new building would provide more protection from temperature variations, vermin, incursion of moisture, and other threats than would the rehabilitated Exhibit Hall. Effects to the display specimens would be the same as those described for Alternatives B, C, and D.

The potential effects on collections generated by implementation of Alternative E would be long-term, minor to moderate, and adverse resulting from demolition and construction activities, and long-term, moderate, and beneficial resulting from the increased protection provided by the new structure.

**Cumulative Effects.** As described under Alternative A, collecting, development projects, and natural forces have in the past, and would continue to diminish the numbers and types of non-renewable fossil resources available for research and public education. These long-term, adverse activities and losses would be expected to continue into the future. The actions taken by park staff to implement the museum management plan would result in long-term, moderate benefits to collections. The long-term, minor to moderate, adverse effects and long-term, moderate, beneficial effects of Alternative E would contribute to overall cumulative effects to collections that would be long-term, minor and beneficial.

**Conclusion.** Long-term effects on collections of implementing Alternative E would be adverse (minor to moderate) during the project from demolition and construction activities, and beneficial (moderate) upon its completion as the museum collections benefit from increased protection beneath a new structure.

Cumulative effects on collections would be long-term, minor, and beneficial.

Alternative E would not result in impairment of cultural resources or values.

## SECTION 106 SUMMARY

This final EIS provides detailed descriptions of five alternatives: Alternative A – No Action/Continue Current Management; Alternative B, the Preferred Alternative – Rehabilitate or Replace the Exhibit Hall and Construct a New Facility Off-Site; Alternative C – Retain the Exhibit Hall and Construct a New Facility at the Quarry Visitor Center Site; Alternative D – Retain the Exhibit Hall and Reconstruct Wings Similar to Existing Facility; and Alternative E – Demolish the Quarry Visitor Center and Construct a New Facility at the Existing Site.

This environmental document also analyzes the potential impacts associated with possible implementation of the Preferred Alternative, describes the rationale for choosing the Preferred Alternative, and outlines a series of best management practices that would help avoid adverse effects on cultural resources (see Table 2, Mitigation Measures).

**Archeological and Cultural Landscape Resources.** Resources within the area of potential effect have been identified and evaluated. There are no known archeological sites or features in the area of potential effect because previous excavations of the fossil deposits, and subsequent construction of various buildings, roadways, and parking, have removed any archeological resources that once might have been present.

No cultural landscapes have been formally defined within the area of potential effect, which includes the Quarry Visitor Center, the adjacent parking and park use areas, access roads, and the shuttle staging area area. The monument's collections include both museum collections and the some 1,500 paleontological fossil remains preserved on the uptilted slab of stone that forms the north wall of the Quarry Visitor Center.

**Historic Structures.** Built as part of the NPS Mission 66 program, the Quarry Visitor Center is listed on the National Register of Historic Places and is a National Historic Landmark. The Mission 66 program reflected the post-World War II era of planning for American national parks intended to replace small, antiquated, and inadequate Rustic style park museum facilities with a new interpretive concept – visitor centers that would serve as orientation and information hubs to provide visitors access to a broad range of visitor services and interpretative programs.

The Quarry Visitor Center is one of the foremost examples of the Park Service Modern style developed as part of Mission 66. This design style incorporated modernistic designs, new technological solutions, and industrial materials such as glass, aluminum, concrete, and exposed structural steel that made it possible for the NPS to serve numerous visitors as quickly and as efficiently as possible on a limited budget.

However, preservation of the Quarry Visitor Center building itself is problematic. As described previously in this document, the Quarry Visitor Center has had to be closed due to severe structural problems that pose a safety hazard for visitors and staff. The building consists of four main structural elements: the glass and steel butterfly canopy Exhibit Hall that arches over and protects the paleontological specimens, a Serpentine Entry Ramp, and the Administrative and South Wings. The structure was built on bentonitic soils that readily



expand and contract with increased/decreased moisture. Water leaks have caused severe soil heaving, resulting in substantial damage to the building (uplifted floor slabs, cracked interior walls, shifted plumbing, cracked glass). In an attempt to stabilize and preserve the structure, it has undergone numerous repairs and modifications over the past half century. However, conditions continue to worsen, and the damage caused by on-going fluctuations in the soils beneath and around the Quarry Visitor Center severely threatens the integrity of the building as well as the health and safety of visitors and staff. Thus the building has had to be closed.

In addition, accessibility for individuals with limited mobility is restricted within the Quarry Visitor Center; circulation patterns are poor; and heating, ventilation, and air conditioning systems are inadequate. Even with on-going maintenance, continuation of these existing structural conditions would continue, and it is clear that eventually the building would deteriorate to the point of irreversible structural failure.

Under the Preferred Alternative, the Exhibit Hall would be retained and rehabilitated in a manner that would retain the massing and much of the basic design of this structural element. Work on the Exhibit Hall would occur in consultation with the Utah SHPO. The rest of the Quarry Visitor Center would be razed, and replaced at a new location (the shuttle staging area) with a modern structure that would meet park interpretation, operational, and maintenance needs and that would safely accommodate visitors of all ages and abilities. The new structural elements and materials used in the Exhibit Hall would be compatible in scale, location and design with the historic structure. However, because three of the four building elements would be removed and replaced with modern structures; because the building would no longer retain integrity as a National Historic Landmark; and because the project would leave only three NPS Modern design visitor centers that are eligible for the National Register in parks across the nation, the NPS finds that the Preferred Alternative would have an adverse effect.

In the event that further investigations, monitoring and testing of the Quarry Visitor Center indicate that the Exhibit Hall cannot be safely rehabilitated, the entire building would be demolished, a new structure would be constructed to protect the fossil wall, and the administrative and visitor center functions would be contained in a new building at the shuttle staging area.

Numerous reports, drawings, and engineering and architectural studies document the Quarry Visitor Center. Park and regional files provide additional details of later structural modifications. As part of the mitigation process, these data would be consolidated and placed in the park archives, along with large scale black and white record photographs of the building. Other mitigating measures will be developed in consultation with the Utah State Historic Preservation Officer and included in the Memorandum of Agreement currently underway for this project.

**Collections.** The Quarry Visitor Center also represents a striking interpretive innovation – by protecting in place one of the richest and varied deposits of dinosaur fossils in the world, the facility affords visitors a marvelous opportunity to better understand the context in which these huge animals lived and died. A wide variety of mitigation measures would be specially

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designed to protect the *in situ* paleontological collections before and during construction; some of these measures are described in Table 2, Mitigation Measures. Movement and storage of display specimens during construction would be performed in accordance with the monument's Museum Management Plan. Under the Preferred Alternative, these collections would be better protected and preserved than under existing conditions.

**Conclusion.** As provided for in the implementing regulations for Section 106 (36 CFR 800) of the National Historic Preservation Act, the NPS has complied with the requirements for using the National Environmental Policy Act process to achieve Section 106 compliance. Concerned American Indian tribes, the Utah and Colorado state historic preservation officers (SHPO), and the Advisory Council on Historic Preservation (ACHP) have been formally notified about the project, and a variety of public involvement activities have been undertaken. A draft EIS was forwarded to these groups for their review and comment of which are further discussed in the Consultation and Coordination section of this document.

The NPS has determined that implementation of any of the alternatives described in this final EIS would have an adverse effect on the Quarry Visitor Center, a National Historic Landmark. Once the NPS makes its decision as to which alternative presented in this final EIS would be implemented, a memorandum of agreement would be developed among the NPS, the Utah State Historic Preservation Officer, the Advisory Council on Historic Preservation, and, as appropriate, Tribal Historic Preservation Officer(s) (THPO). This agreement will outline measures to ensure best possible treatments for the Quarry Visitor Center and will include additional mitigative measures. The Memorandum of Agreement would be completed and signed prior to completion and signature of the Record of Decision.

## GEOLOGIC AND PALEONTOLOGICAL RESOURCES

### Guiding Regulations and Policies

Current laws and policies require that the NPS preserve and protect geologic resources as integral components of park natural systems as specified in *NPS Management Policies 2006* (NPS 2006b). Geologic resources include both geologic features, such as rock formations, soils, or fossils, and geologic processes, such as, but not limited to, erosion and sedimentation or swelling of clay formations. Paleontological resources as part of geologic features, will also be protected, preserved, and managed for public education, interpretation, and scientific research (NPS 2006b). Soils in national park units are to function as naturally as possible as specified in *Management Policies 2006* (NPS 2006b). The NPS will “seek to prevent the unnatural erosion, physical removal, or contamination of the soil, or its contamination of other resource” (NPS 2006b).

The NPS will allow natural geologic processes to proceed unimpeded and will protect geologic features such as rock formations and paleontology from the adverse effects of human activity, while allowing those natural processes to continue. The NPS will address “geologic processes during planning and other management activities in an effort to reduce hazards that can threaten the safety of park visitors and staff and the long-term viability of the park infrastructure” (NPS 2006b). Intervention in natural geologic processes will be permitted only when: necessary in emergencies threatening human life and property; there is no other way to feasibly protect natural resources, park facilities, or historic properties; or in intervention necessary to restore impacted conditions and processes. *Management Policies 2006* also states that the NPS will: assess the impacts of natural processes and human related events on geologic resources; maintain and restore the integrity of existing geologic resources; and integrate geologic resource management into operations and planning (NPS 2006b). Management actions will be taken to prevent or minimize adverse, potentially irreversible impacts on geological resources and fossils. The monument’s general management plan and resource management plans support preserving the natural character of geologic resources, including fossils and soils. Areas with potential paleontological resources must be monitored during construction projects (NPS 2006b).

### Methodology and Assumptions

#### Geographic Area Evaluated for Impacts

The area analyzed for possible impacts on geologic and paleontological resources is contained in the area affected by the siting of and limits of construction activities at the shuttle staging area and the Quarry Visitor Center sites.

#### Impact Criteria and Methodology

The following issues were identified through public and internal scoping:

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- Geologic resources (rock formations and fossils) are threatened by prolonged movement caused by the bentonite content of the surrounding soil strata. This movement, caused by water seepage associated with the Quarry Visitor Center, disrupts rock formation and soil integrity and can loosen and damage fossils.
- There are potential hazards to geological and paleontological resources from activities undertaken near the geologic formation, both under continued current management and under the proposed action alternatives.

Information on geologic and paleontological resources and response of geologic and paleontological resources to various impacts were compiled from NPS and other documentation, relevant literature, and resource experts. General geologic features, structure, and function were discussed, and impacts of each alternative were analyzed, based on reference information, anticipated effects of management actions by alternative and professional judgment.

The analysis of geologic and paleontological resources includes rock formations, fossil-bearing strata, fossils, and subsurface materials derived from the Morrison Formation in the vicinity of the Quarry Visitor Center. These resources were combined because they are all part of or derived from erosional and geologic processes of the Morrison Formation. Fossil remains found *in situ* on the sloping stone formation exposed within the Quarry Visitor Center are considered a paleontological collection of Dinosaur National Monument and are evaluated in the “Collections” section of “Cultural Resources.”

Similar analysis of geologic and paleontological resources of the Mancos Shale and derived pediment deposits will be considered during construction and operation of the new visitor center at the shuttle staging area.

### Definition of Adverse and Beneficial Effects

Adverse effects to geologic and paleontological resources are related to human activities that would increase or decrease the biological, chemical or mechanical breakdown of rock formations or fossils beyond that of natural conditions. Beneficial effects would reduce the effects of human activities that result in unnatural (accelerated or decelerated) biological, chemical or mechanical breakdown of geologic formations or fossils.

### Impact Threshold Definitions

Impacts were evaluated using these threshold definitions:

**Negligible:** Effects on geologic and paleontological resources would not be measurable. Any effects would be so small that they would not be of any measurable or perceptible consequence and would occur in a relatively small area. There would be no measurable impact to or loss of fossils.

**Minor:** Effects to geologic and paleontological resources would be detectable, but any changes would be small and localized. There would be a low probability of impact to fossils due to ground-disturbing activities. Few fossils would be affected by the activities.

**Moderate:** Effects to geologic and paleontological resources would be readily apparent, measurable and would occur over a relatively large area. A number of fossils may be lost due to a moderate probability of impact from ground-disturbing activities.

**Major:** Effects on geologic and paleontological resources would be readily apparent, and would substantially change the geologic characteristics over a large area. Many fossils may be lost due to the high probability of impacts due to ground-disturbing activity.

### **Duration**

Because geologic and paleontological resources (rock formations, fossil-bearing strata, fossils, and subsurface materials derived from the Morrison or Mancos Shale formations and other sediments) are essentially non-renewable, any effects would be long term.

### **Impacts of Alternative A – the No Action Alternative**

The presence of the Quarry Visitor Center and parking lot above the Morrison Formation has altered the drainage and infiltration of the site. Inadequate stormwater management and leakage from site utilities has led to increased water infiltration into the underlying soil and bedrock. This increase in moisture would continue to exacerbate the effects of expansion and contraction of bentonite-bearing formations. Accelerated shrink-swell cycles could disrupt bedrock and soil by heaving and rebounding along individual layers and/or by asymmetrical thrust heaving along bedding planes and fractures (NPS 2004a). These movements, along with the actions of freeze-thaw, fracture and loosen rock and fossils and result in breakdown of surrounding rock formations, including the fossil-bearing strata. Thus, the drainage problems of the Quarry Visitor Center would continue to produce long-term, localized, minor, adverse effects to the underlying rock formation and fossil-bearing strata. However, since closure of the visitor center, water is being supplied only to the employee's restroom (Dye 2007) and as such, leakage from the water line has been minimized thereby reducing the adverse impacts to the shrink-swell affects.

**Cumulative Effects.** There are no known past, present, or reasonably foreseeable future projects that would affect geologic resources in the vicinity of the Quarry Visitor Center, and therefore there would be no additive cumulative effects.

**Conclusion.** Alternative A would produce long-term, localized, minor, adverse effects on geologic resources, including the fossil-bearing strata, from altered drainage and infiltration at the site and repair activities. However, these adverse affects are being ameliorated by a reduced water supply to the visitor caused by its closure. There would be no impacts to geologic and paleontological resources from implementation of this alternative at the shuttle staging area.

There would be no cumulative effects from implementation of Alternative A.

Alternative A would not result in impairment of geologic or fossil resources or values in Dinosaur National Monument.

### **Impacts of Alternative B, the Preferred Alternative – Rehabilitate or Replace the Exhibit Hall and Construct a New Facility Off-Site**

Facility, utility, and site improvements would be implemented to dramatically reduce water infiltration and eliminate leakage from plumbing and utilities. Site regrading would direct flows away from the foundation. Monitoring systems would be installed in order to give warning of any leaks or potential problems that can be fixed and thus reduce the effects of water on the expansive bedrock and soils. Long-term, localized, minor benefits to these rock formations and fossil-bearing strata would be realized because expansion and contraction of neighboring soils would be reduced, and thus the potential to fracture and loosen fossils and breakdown of surrounding rock formations.

Under Alternative B, the Exhibit Hall would be either rehabilitated or rebuilt. In either case the foundation would be improved, and utilities and piping would be minimized. Structural piers would be drilled to a depth of approximately 65 to 85 feet below grade. Minor, long-term, localized, adverse effects would occur to the rock formations and subsurface materials derived from the Morrison Formation from the direct effects of foundation removal, grading, drilling, concrete pumping, utility installation and other similar activities. Depending upon the depth and locations of the drilled piers and extent and depth of the steeply dipping fossiliferous bone bed, long-term, localized, minor to moderate, adverse effects on these fossils could occur if the drilled piers intersect this bone bed and thus potentially disrupt or destroy any affected fossil(s).

Under Alternative B, a new visitor center and administrative offices would be built at the shuttle staging area to replace the facilities currently located at the Quarry Visitor Center. As described for the Quarry Visitor Center, facility, utility, and site improvements to minimize water infiltration and eliminate leakage from plumbing and utilities would be implemented, along with site grading, to direct flows away from the foundation. In the past moisture has caused expansion and contraction of soils, helping to break down the surrounding rock formations and surface soils. Elimination of leakage would result in long-term, localized, minor benefits to the Mancos Formation and site surface soils.

Minor, long-term, localized, adverse effects at both locations would occur to the rock formations and surface soils/materials from the direct effects of foundation removal/installation, grading, drilling, concrete pumping, utility installation and other similar activities.

**Cumulative Effects.** There are no known past, present, or reasonably foreseeable future projects that would affect geologic resources in the vicinity of the Quarry Visitor Center and shuttle staging area, and therefore there would be no additive cumulative effects.

**Conclusion.** Alternative B would produce long-term, localized, minor, beneficial effects on geologic resources, including the fossil-bearing strata, from altered drainage and infiltration at the site and repair activities. Minor, long-term, localized, adverse effects at both locations would occur to the rock formations and surface soils/materials from the direct effects of construction and use of the structures.

There would be no cumulative effects from implementation of Alternative B.

Alternative B would not result in impairment of geologic or fossil resources or values in Dinosaur National Monument.

### **Impacts of Alternative C – Retain the Exhibit Hall and Construct a New Facility at the Quarry Visitor Center Site**

Facility, utility, and site improvements to dramatically reduce water infiltration and eliminate leakage from plumbing and utilities would be implemented, along with site regrading, to direct flows away from the foundation. Monitoring systems would be installed in order to give warning of any leaks or potential problems that can be fixed and thus reduce the effects of water on the expansive bedrock and soils. Long-term, localized, minor benefits to these rock formations and fossil-bearing strata would be realized because expansion and contraction of neighboring soils would be reduced, and thus the potential to fracture and loosen fossils and breakdown of surrounding rock formations.

Under Alternative C, the existing foundation system for the Administrative and South Wings and Serpentine Entry Ramp would be removed and a new foundation installed, the Exhibit Hall foundation would be improved, and utilities and piping would be replaced. Structural piers would be drilled to a depth of approximately 65 to 85 feet below grade. Minor, long-term, localized, adverse effects would occur to the rock formations and subsurface materials derived from the Morrison Formation from the direct effects of foundation removal, grading, drilling, concrete pumping, utility installation and other similar activities. Depending upon the depth and locations of the drilled piers and extent and depth of the steeply dipping fossiliferous bone bed, long-term, localized, minor to moderate, adverse effects on these fossils could occur if the drilled piers intersect this bone bed and thus potentially disrupt or destroy any affected fossil(s).

**Cumulative Effects.** There are no known past, present, or reasonably foreseeable future projects that would affect geologic and or paleontological resources in the vicinity of the Quarry Visitor Center, and therefore there would be no additive cumulative effects.

**Conclusion.** There would be long-term, localized, minor, beneficial effects on rock formations and fossil-bearing strata. These effects would result from the site improvements designed to eliminate water seepage into and affecting the underlying expansive bentonite-bearing bedrock and soil. Long-term, localized, minor, adverse effects on geologic resources would result from site construction activities such as foundation removal and installation of the new foundation and utilities. Depending on the extent and depth of the bone bed, piers drilled into the sandstone could produce long-term, localized, minor to moderate, adverse effects on fossils if the fossiliferous bed is encountered.

There would be no cumulative effects from implementation of Alternative C.

Alternative C would not result in impairment of geologic or fossil resources or values in Dinosaur National Monument.

### **Impacts of Alternative D – Retain the Exhibit Hall and Reconstruct Wings Similar to Existing Facility**

The long-term, localized, minor, beneficial effects on rock formations and fossil-bearing strata would be the same as for Alternative C. These would result from eliminating water sources affecting bentonite-bearing soil and rock from inadequate building drainage and leaky and faulty plumbing and piping.

Similar to C, demolition of existing wings and foundations, installation of the new foundation, drilled piers, utilities, plumbing, and piping would have the same long-term, localized, minor, adverse effects on rock formations and subsurface materials derived from the Morrison Formation. As described in Alternative C, depending upon the depth and locations of the drilled piers and extent and depth of the steeply dipping fossiliferous bone bed, long-term, localized, minor to moderate, adverse effects on these fossils could occur if the drilled piers intersect this bone bed and thus potentially disrupt or destroy any affected fossil(s).

**Cumulative Effects.** There are no known past, present, or reasonably foreseeable future projects that would affect geologic or paleontological resources in the vicinity of the Quarry Visitor Center, and therefore there would be no additive cumulative effects.

**Conclusion.** There would be the same long-term, localized, minor, adverse and beneficial effects on geologic or paleontological resources as outlined for Alternative C. Beneficial effects would result from the site improvements designed to eliminate water seepage into and affecting the underlying expansive bentonite-bearing bedrock and soil, and adverse effects would result from the direct effects of site construction activities. As described in Alternative C, depending on the extent and depth of the bone bed, piers drilled into the sandstone could produce long-term, localized, minor to moderate, adverse effects on fossils if the fossiliferous bed is encountered. There would be no cumulative effects from implementation of Alternative D.

Alternative D would not result in impairment of geologic or fossil resources or values in Dinosaur National Monument.

### **Impacts of Alternative E – Demolish the Entire Facility and Construct a New Facility at Quarry Visitor Center Site**

The effects on Morrison Formation geologic resources and fossils would be the same as for Alternatives C and D except that the Exhibit Hall would also be demolished and a new 13,000-square-foot visitor center would be erected.

As in Alternatives C and D there would be long-term, localized, minor, beneficial effects on rock formations and fossil-bearing strata from eliminating water sources affecting bentonite-bearing soil and rock from inadequate building drainage and leaky and faulty plumbing and piping. As described in Alternatives C and D depending upon the depth and locations of the drilled piers and extent and depth of the steeply dipping fossiliferous bone bed, long-term,



localized, minor to moderate, adverse effects on these fossils could occur if the drilled piers intersect this bone bed and thus potentially disrupt or destroy any affected fossil(s).

**Cumulative Effects.** There are no known past, present, or reasonably foreseeable future projects that would affect geologic or paleontological resources in the vicinity of the Quarry Visitor Center, and therefore there would be no additive cumulative effects.

**Conclusion.** There would be the same long-term, minor, localized, adverse and beneficial effects on geologic resources as outlined for Alternatives C and D. Beneficial effects would result from the site improvements designed to eliminate water seepage into and affecting the underlying expansive bentonite-bearing bedrock and soil, and adverse effects would result from the direct effects of site construction activities. As described in Alternatives C and D depending on the extent and depth of the bone bed, piers drilled into the sandstone could produce long-term, minor to moderate, localized adverse effects on fossils if the fossiliferous bed is encountered.

There would be no cumulative effects from implementation of Alternative E.

Alternative E would not result in impairment of geologic or fossil resources or values in Dinosaur National Monument.

## VISITOR USE AND EXPERIENCE

### Guiding Regulations and Policies

*Management Policies 2006* (NPS 2006b section 8.2) states that the enjoyment of park resources and values by the people of the United States is part of the fundamental purpose of all park units and that the NPS is committed to providing appropriate, high-quality opportunities for visitors to enjoy at the park units. Because many forms of recreation can take place outside of a national park setting, the NPS therefore seeks to:

- Provide opportunities for forms of enjoyment that are uniquely suited and appropriate to the superlative natural and cultural resources found in a particular park unit.
- Defer to others to meet the broader spectrum of recreational needs and demands that are not dependent on a national park setting. Those others can include local, state, and other federal agencies; private industry; and non-governmental organizations.

Management controls are sometimes necessary in order to maintain the quality of visitor experience and protection of resources. This might include closures or limited access to park facilities for maintenance or upgrading. Under section 8.2 (Visitor Use) of *Management Policies 2006* (NPS 2006b), any closures or restrictions, other than those imposed by law, must be consistent with applicable laws, regulations, and policies, and (except in emergency situations) require a written determination by the superintendent that such measures are needed to:

- Protect public health and safety;
- Prevent unacceptable impacts to park resources and values;
- Carry out scientific research;
- Minimize visitor use conflicts; or
- Otherwise implement management responsibilities.

*Management Policies 2006* (NPS 2006b section 7.5.3) also states that park managers may need to make controversial decisions regarding resources, and that in making these decisions, parks should integrate the resource issues and park initiatives into their interpretive and educational programs. This serves to build public understanding of, and support for, such decisions.

### Methodology and Assumptions

#### Geographic Area Evaluated for Impacts

Evaluation of impacts to visitor use and experience was based upon the resources available within the park boundary and primarily the area associated with the fossil quarry.

## **Impact Criteria and Methodology**

The following issues were identified by the NPS, other agencies, and the public during internal and public scoping. These issues relate to conditions prior to closure of the Quarry Visitor Center and how structural rehabilitation work at the visitor center may affect visitor use and experience.

- The Quarry Visitor Center is closed. It is important to communicate to park visitors that they cannot access the facility. It is unlikely all visitors could be notified, and some would be very disappointed. It is also important to notify people that Dinosaur National Monument is open and still provides a wealth of experiences.
- Ultraviolet light that enters the Exhibit Hall can degrade exhibits.
- The conditions at the Quarry Visitor Center resulted in poor visitor flow, hot and cold temperatures in the Exhibit Hall, difficulty in understanding interpretive messages, and crowding in the bookstore area.

The purpose of the impact analysis was to determine if the stabilization and rehabilitation activities under the action alternatives would be compatible with:

- The desired visitor experience goals, and
- The purpose of the monument as identified in the enabling legislation and in other laws and policies affecting visitor use.

To determine the overall impact of the action alternatives on visitor use and experience, the issues were evaluated using the procedures described in the general methodologies section of this document, the effect of Quarry Visitor Center closure on the visitor, the current facility's indirect effects on exhibit quality and preservation, and the potential effect of rehabilitation or reconstruction activities. The impact analysis evaluates several aspects of the visitor experience at the monument.

For this impact topic, impacts on the visitor were evaluated and determined qualitatively, based on the best professional judgment of NPS staff and consultants. The primary sources of information used in this analysis include existing park management documents, NPS policy documents, and unpublished observations and insights from knowledgeable park staff.

The effects on visitor experience were based on noise, visual intrusion, access restrictions, and changes in interpretive opportunities. Two assumptions were made to assist in the analysis of the rehabilitation or reconstruction activities affects on visitor use and experience:

- The necessary construction period associated with any action alternative would last approximately 18 months to 2 years.
- Implementation of an action alternative would noticeably change the trend in declining visitation as a result of the closure of the Quarry Visitor Center.

## Definition of Adverse and Beneficial Effects

Adverse effects would create disruptions to interpretive opportunities, impede visitor circulation and diminish comfort, or reduce access to the monument's *in situ* fossil wall and other monument resources.

Beneficial effects would enhance interpretive opportunities, improve visitor circulation and comfort, or improve access to the monument's *in situ* fossil wall and other monument resources.

## Impact Threshold Definitions

The following threshold definitions were developed and applied to determine the intensity of rehabilitation efforts on visitor use and experience.

**Negligible:** Visitors would not be affected, or changes in visitor experience and/or understanding would be at or below the level of detection. The visitor would not likely be aware of the effects associated with the alternative.

**Minor:** Changes in visitor experience and/or understanding would be detectable, although the changes would be slight. Visitors could be aware of effects associated with the alternative, but slightly.

**Moderate:** Changes in visitor experience and/or understanding would be readily apparent. Visitors would be aware of the effects associated with the alternative and would likely be able to express an opinion about the changes.

**Major:** Changes in visitor experience and/or understanding would be readily apparent and would have important consequences, such as changes to visitor access to resources. Visitors would be aware of the effects associated with the alternative and would likely express a strong opinion about the changes.

### Duration:

Short-term – Effects would be intermittent or occur during project implementation activities.

Long-term – Effects would persist beyond project implementation activities.

## Impacts of Alternative A – the No Action Alternative

Under Alternative A, the Quarry Visitor Center would remain closed to visitors. Visitors would no longer be able to experience the fossil wall *in situ*, but would have access to limited exhibit materials of fossils from the quarry and interpretation of the paleontological and geological resources of the park at the shuttle staging area.

The interim interpretive and educational program implemented during the summer of 2006 would continue to off-set, to some degree, the adverse effects of the Quarry Visitor Center closure. The auditorium, ranger-led activities, shuttle tram park tours, hiking programs, and children's activities would continue. In addition, monument staff would continue to evaluate means to provide additional interpretive opportunities for visitors in an effort to educate and promote the unique fossil resources found in the park. Visitors would be directed by monument staff to other areas of the park that provide access to fossils.

However, over half of park visitors come to the national monument to view the fossil wall. Under this alternative, the fossil wall would remain inaccessible to the visitors, reducing to a large degree the visitors' ability to touch, appreciate, and understand this unique and significant monument resource which is to be protected and interpreted to meet the monument's purpose. The continued closure of the Quarry Visitor Center would result in long-term, major, adverse effects.

The bookstore has also been relocated to office space located at the shuttle staging area. This space is not conducive to circulation and would not meet the needs of visitors particularly during the high visitation period during the summer months. Under Alternative A, these conditions would not change, and would produce minor long-term adverse effects on the visitor experience.

**Cumulative Effects.** The Utah State Field House of Natural History State Park Museum contributes to the regional focus on dinosaurs, and will soon house the paleontology laboratory functions currently located in the Quarry Visitor Center. The presence of this facility complements the visitor experience and understanding of the resources and would be long-term, minor, and beneficial. Ongoing implementation of the Comprehensive Interpretive Plan would continue to produce long-term, minor benefits to visitor experience by enhancing interpretation and visitor education throughout the park. The No Action Alternative would contribute long-term, major, adverse effects. The adverse effects from the continued closure of the Quarry Visitor Center within the monument cannot be offset by other beneficial projects because the *in situ* fossil wall experience of seeing and touching real dinosaur bones in their original setting is incredibly unique and is not offered elsewhere. Therefore, overall cumulative effects on the visitor experience would be long-term, major, and adverse.

**Conclusion.** Continued closure of the Quarry Visitor Center would result in long-term, major, adverse effects on visitor use and experience. Although interpretation and exhibits of the monument's fossils would be made available at the shuttle staging area and other areas of the park, this does not mitigate the effects of the quarry closure and the inability of visitors to handle, understand, and appreciate the unique park resource. The confined space of the bookstore would result in minor, long-term adverse effects.

The cumulative effect on the visitor experience would be long-term, adverse, and major.

### **Impacts of Alternative B, the Preferred Alternative – Rehabilitate or Replace the Exhibit Hall and Construct a New Facility Off-Site**

Under Alternative B, the Exhibit Hall would be rehabilitated or newly constructed while the Administrative and South Wings, and the Serpentine Entry Ramp, would be demolished. The rehabilitation work on the Exhibit Hall, or new construction if rehabilitation is not feasible, would allow the NPS to meet the monument's purpose by protecting and providing access to the fossil wall, improving interpretation, and providing climate controlled and safe facilities. Implementation of Alternative B would result in overall long-term, major benefits to visitor use and experience compared to Alternative A as it would allow visitors to experience the fossils *in situ* in an environmentally comfortable and safe setting in accordance with the monument's purpose. The following details the improvements associated with rehabilitation or construction of a new Exhibit Hall and a construction of a new visitor center at that would contribute to the long-term major benefits to visitor use and experience under this alternative.

Several elements of the new construction would provide visitor comfort in the Exhibit Hall. The heating and cooling system would be replaced and the glass window wall would be rehabilitated or replaced using ultraviolet-protective transparent materials to improve ventilation and insulation. This action would protect the fossil resources and exhibits, as well as visitors, from ultraviolet exposure and regulate the temperature inside the Exhibit Hall. In addition, the newly constructed visitor center would be designed to give visitors a sense of entry, provide greeting and orientation space, facilitate efficient circulation patterns, and provide sufficient space for a bookstore. This new facility would also be climate controlled enhancing both visitor experience and safety. These improvements contribute to the overall long-term benefit of this alternative.

The exhibits presented at the Quarry Visitor Center would have protection from ultraviolet rays, which have degraded the information panels through the windows of the Exhibit Hall. Interpretation would be provided at both the Quarry Visitor Center and at the newly constructed visitor center. The height of interpretive displays would be adjusted throughout the visitor centers providing greater access to this interpretive information for visitors in wheelchairs and small children. The greater preservation and improved placement of the exhibits in the Exhibit Hall and at the new visitor center would contribute to the overall long-term, major, beneficial effects for visitor use and experience.

In addition, many elements of the interim interpretive and educational program implemented during the summer of 2006 would continue under the preferred alternative. Ranger-led activities, tours, hiking programs, and children's activities would continue to provide a range of options for park visitors. In addition, monument staff would continue to evaluate means to provide additional interpretive opportunities for visitors in an effort to educate and promote the unique fossil resources found in the park.

All demolition, stabilization work, and construction activities would be expected to last approximately 18 months. During this time, visitors using the shuttle staging area and, to a smaller degree, those who would access the upper site would be disturbed due to construction activities that would cause noise, interruption of traffic flow, and restrictions

on vehicle parking to allow movement and staging of construction equipment. At the shuttle staging area, construction of the new visitor center would incorporate, to the extent possible, the existing structure and replace the ranger station and shuttle stop currently being used for visitor services. Under this alternative visitor use at the shuttle staging area would be periodically interrupted as portions of the site may be closed or restricted and services provided may be interrupted or unavailable for brief periods of time. The adverse impacts during construction would be short-term and minor to moderate in intensity.

**Cumulative Effects.** The long-term benefits of the Utah State Field House of Natural History and implementation of the Comprehensive Interpretive Plan would be as described for Alternative A, above. There are no other projects or plans that would contribute short- or long-term, adverse effects. Alternative B would overall result in long-term major benefits from improved visitor facilities and visitor access to the fossil wall *in situ*. The beneficial effects of Alternative B would contribute to the long-term benefits of other actions to produce overall cumulative long-term, major, beneficial effects on the visitor experience.

**Conclusion.** Rehabilitation of the existing or construction of a new Exhibit Hall to protect and provide an *in situ* viewing of fossils and construction of a new visitor center that would provide enhanced interpretation in a climate controlled safe environment would result in long-term, major, beneficial effects. During demolition and reconstruction, noise, delays, and access restrictions at the upper and lower sites and interruption of visitors services at the visitor parking lot and shuttle staging area would produce short-term, minor to moderate, adverse effects on visitors.

Cumulative effects to visitor experience would be long-term, major, and beneficial.

### **Impacts of Alternative C – Retain the Exhibit Hall and Construct a New Facility at the Quarry Visitor Center Site**

Under Alternative C, the Exhibit Hall would be retained and the Administrative Wing, South Wing, and Serpentine Entry Ramp would be demolished and replaced. Space within the new structure would give visitors a sense of entry, provide greeting and orientation space, facilitate efficient circulation patterns, clarify direction for the proper progression through the exhibits, and improve integration of the exhibit area and bookstore. The quality of the visitor experience within the facility would be enhanced by structural changes that would allow for adequate visitor flow, comfortable environmental conditions, and enhanced interpretation. The rehabilitation and new construction would provide access to the fossil wall and improve interpretation of the resource allowing the monument's staff to meet the park's purpose, producing long-term, major, beneficial effects on visitor use and experience.

Increased space would be available for the bookstore and special programs, and visitors would continue to have the opportunity to touch fossils *in situ*. The new building would keep focus on the quarry wall as the centerpiece of the Exhibit Hall.

Several elements of the new construction would improve visitor comfort in the Quarry Visitor Center. The heating and cooling system would be replaced and the glass window wall would be rehabilitated using ultraviolet-protective transparent materials to improve

ventilation and insulation. This action would protect the fossil resources and exhibits, as well as visitors, from ultraviolet exposure and regulate the temperature inside the Exhibit Hall. The improvements to environmental factors would enhance the visitor experience contributing to the long-term, major, beneficial effects.

The improved preservation and placement of interpretive exhibits at the Quarry Visitor Center would be the same as described in Alternative B.

All demolition, stabilization work, and construction activities would be expected to last approximately 2 years. During this time, visitors using the parking lot and shuttle staging area and, to a smaller degree, those who would access the upper site would be disturbed due to construction activities that would cause noise, interruption of traffic flow, and restrictions on vehicle parking to allow movement and staging of construction equipment. The adverse impacts during construction would be short-term and minor in intensity.

**Cumulative Effects.** Cumulative effects would be similar as described for Alternative B. The overall long-term, major, beneficial effects of Alternative C would contribute to the long-term benefits of other actions to produce overall cumulative long-term, major, beneficial effects on the visitor experience.

**Conclusion.** Rehabilitation of the Exhibit Hall, replacing the wings and entry ramp to protect and provide an *in situ* viewing of fossils and providing enhanced interpretation in a climate controlled safe environment would result in long-term, major, beneficial effects under Alternative C. During demolition and reconstruction, noise, delays, and access restrictions at the upper and lower sites would produce short-term, minor, adverse effects on visitors.

Cumulative effects to visitor experience would be long-term, moderate, and beneficial.

### **Impacts of Alternative D – Retain the Exhibit Hall and Reconstruct Wings Similar to Existing Facility**

Under Alternative D, the Exhibit Hall and Serpentine Entry Ramp would be retained while the Administrative and South Wings would be demolished and replaced with similar structures. The quarry wall would be retained as the centerpiece of the facility and visitors would continue to have the opportunity to touch fossils *in situ*. The rehabilitation work, as well as the new construction, would better allow the NPS to meet the monument's purpose by protecting the resource, allowing visitor access to the fossil wall, improving interpretation, and providing climate controlled and safe facilities. Implementation of Alternative D would result in long-term, major benefits to visitor use and experience.

Although the rehabilitation of the Exhibit Hall would not dramatically improve the flow of visitor circulation, the use of space would be optimized while working within the constraints of the historic floorplan. The relocation of the paleontology laboratory and library would create more room for interpretation. This alternative would result in an improved, comfortable facility with expanded opportunities for interpretation. However, the space and circulation restrictions of the original floorplan would limit the size of the exhibit area and



bookstore compared to other action alternatives. However, when compared to the No Action Alternative, the overall benefits of Alternative D on visitor use and experience would be long-term and major.

The rehabilitated facility would improve visitor comfort in the Exhibit Hall through the same means and with the same effects as described in Alternative B.

The improved preservation and placement of interpretive exhibits at the Quarry Visitor Center would be the same as described in Alternative B.

The anticipated duration of construction work and protective measures for the quarry wall during construction would be the same as described in Alternative C.

**Cumulative Effects.** Cumulative effects would be similar as described for Alternative B. The overall long-term, major, beneficial effects of Alternative D would contribute to the long-term benefits of other actions to produce overall cumulative long-term, major, beneficial effects on the visitor experience.

**Conclusion.** Rehabilitation of the Exhibit Hall, reconstructing the wings and entry ramp similar to the historic structure would protect the park's primary resource, provide visitors an *in situ* viewing of fossils, and enhance interpretation in a climate controlled safe environment would result in long-term, major, beneficial effects under Alternative D. During demolition and reconstruction, noise, delays, and access restrictions at the upper and lower sites would produce short-term, minor, adverse effects on visitors.

Cumulative effects to visitor experience would be short-term, major, and adverse and long-term, moderate, and beneficial.

### **Impacts of Alternative E – Demolish the Entire Facility and Construct a New Facility at the Quarry Visitor Center Site**

Under Alternative E, the entire Quarry Visitor Center would be demolished and replaced with a new 13,000-square-foot visitor center that would allow the NPS to better protect the resource and maximize its interpretation on-site. The quality of the visitor experience within the new facility would improve the flow of visitor circulation, eliminate adverse environmental factors, and improve interpretation of the resource. This alternative would result in a new arrangement of space, provision of new interpretive areas, improved circulation patterns, clear direction for interpretive progression, and integration of the exhibit area and bookstore. The construction of a new Quarry Visitor Center would allow the monument's staff to provide access to the fossil wall and meet the park's purpose, producing long-term, major, beneficial effects on the visitor experience.

The new facility would improve visitor comfort through the same means and with the same effects as described in Alternative B.

The improved preservation and placement of interpretive exhibits at the visitor center would be the same as described in Alternative B.

## ENVIRONMENTAL CONSEQUENCES

The length of the construction period and protection of the resource during demolition work would be the same as described in Alternatives C, approximately 2 years.

**Cumulative Effects.** Cumulative effects would be similar as described for Alternatives B. The long-term, major, beneficial effects of Alternative E would contribute to the long-term benefits of other actions to produce overall cumulative long-term, major, beneficial effects on the visitor experience.

**Conclusion.** Construction of a new Quarry Visitor Center to protect park's primary resource, provide visitors an *in situ* viewing of fossils, and enhanced interpretation in a climate controlled safe environment would result in long-term, major, beneficial effects under Alternative E. During demolition and reconstruction, noise, delays, and access restrictions at the upper and lower sites would produce short-term, minor, adverse effects on visitors.

Cumulative effects to visitor experience would be long-term, major, and beneficial.

## SOCIOECONOMICS

### Guiding Regulations and Policies

The National Environmental Policy Act requires analysis of social and economic impacts resulting from proposed major federal actions in an environmental impact statement. From this requirement, the NPS has identified conditions that it wants to achieve in association with its management of national parks. These conditions are described in *Management Policies 2006* (NPS 2006b).

Park activities often involve impacts that extend beyond park boundaries. In planning for the management of park resources, *Management Policies 2006* (NPS 2006b) directs the NPS to “work cooperatively with others to anticipate, avoid, and resolve potential conflicts; protect park resources and values; provide for visitor enjoyment; and address mutual interests in the quality of life of community residents, including matters such as compatible economic development and resource and environmental protection (section 1.5).” Such local and regional collaboration might include other federal agencies, tribal, state, and local governments, neighboring landowners, and non-governmental organizations.

Furthermore, section 2.3.1.5 of *Management Policies 2006* (NPS 2006b) requires that decisions documented in planning products, such as environmental analyses, will be based upon current scientific understanding of park ecosystems, the cultural context, and the socioeconomic environment.

### Methodology and Assumptions

#### Geographic Area Evaluated for Impacts

The geographic area evaluated for impacts on socioeconomics consisted of Dinosaur National Monument, the cities of Vernal, Utah, Dinosaur, Colorado, and Uintah County, Utah and Moffat County, Colorado.

#### Impact Criteria and Methodology

Effects of the alternatives on the businesses and economies of the locations listed above are considered both quantitatively and qualitatively. Cumulative effects that would occur within this area were determined based on the “Cumulative Effects Analysis Method” section.

Socioeconomic issues identified during internal and public scoping and addressed in the impact analysis included:

- The closure of the Quarry Visitor Center may affect local tourism and the bookstore cooperating association.

Potential impacts to socioeconomics are assessed based on the degree to which local economic activities would change compared to existing conditions. Impacts on

socioeconomics were evaluated using the process described in the “General Analysis Methods” section. Information on current socioeconomics and anticipated effects were obtained through interviews with park staff and the cooperating association, as well as local and regional economic data that is publicly available. The primary steps for assessing impacts included: 1) identifying existing economic conditions and factors that contribute to the economic profile of the area, and determining which elements of the economy may be affected by temporary closures of the Quarry Visitor Center, 2) determining the potential changes in economic variables that would occur, based on actions under each alternative, and 3) identifying the impacts of these changes in economic variables, including any economic hardship that the alternative actions would cause.

### **Definition of Adverse and Beneficial Effects**

Adverse effects would cause local or regional loss of income, sales, tax revenue, and/or employment, either directly or indirectly. Beneficial effects would cause local or regional growth in income, sales, tax revenue, and/or employment, either directly or indirectly.

### **Impact Threshold Definitions**

Impacts were evaluated using these threshold definitions:

**Negligible:** Socioeconomic conditions would not be affected, or effects would not be measurable. Effects to cooperating association income or operations would not be detectable.

**Minor:** The effects on socioeconomic conditions would be small but measurable, and would affect a small portion of the population. Few effects could be discerned in Uintah and Moffat Counties. Effects to cooperating association income would be measurable, but no changes in staffing or operations would result.

**Moderate:** The effects on socioeconomic conditions would be readily apparent and widespread within and throughout Uintah and Moffat Counties. Effects on cooperating association income would be readily apparent and changes in operations and/or staffing at the bookstore would result.

**Major:** The effects on socioeconomic conditions would be readily apparent and would substantially change the economy or services throughout Uintah and Moffat Counties. Effects to cooperating association income would substantially alter the available services and staffing requirements at the bookstore. Other operations of the cooperating association corporation, beyond the Quarry Visitor Center, would also be affected.

### **Duration**

Short-term: Effects occur only during project implementation activities.

Long-term: Effects persist beyond project implementation activities.

## **Impacts of Alternative A – the No Action Alternative**

Under the No Action Alternative, the Quarry Visitor Center would remain closed. However, the presence of the monument would continue to benefit the local economy, through both visitor spending and NPS employee living expenditures in the area.

The estimated \$10.8 million annual contribution of the monument to visitor spending in the area would continue to provide economic benefits, for as long as it persists. However, approximately 53 percent of monument visitors go to the Quarry Visitor Center to view the fossil wall (NPS 2005f). The continued closure could result in loss of this portion of park visitation. If this decline were to occur, the park's contribution to local economic activity could be reduced to approximately \$6.35 million dollars. This loss of sales receipts and revenues could result in loss of a portion of the estimated 203 jobs associated with visitation. This would produce long-term, minor adverse economic effects to local businesses and communities.

## **Cooperating Association**

The Quarry Visitor Center bookstore provided approximately two-thirds of the annual income for the Intermountain Natural History Association. Under Alternative A, continued closure would retain the bookstore operations in or near the shuttle staging area.

Since relocating, the INHA has generated approximately 75 to 80 percent less in sales revenue than at the Quarry Visitor Center (from over \$400,000 in annual sales to approximately \$100,000). In September 2006, INHA was forced to lay off 6 employees, reducing their staff from 8 to 2 and two-thirds employees (Millet 2007).

Placing the modular housing unit to serve as a sales and administrative center would likely improve INHA operations over the use of a bookmobile and utility trailer. However, if visitation rates continue to decline, INHA sales may not rebound to a sustainable level (Millet 2007).

Thus, closure of the Quarry Visitor Center bookstore would continue to produce major, long-term, adverse economic effects on the park's cooperating association.

**Cumulative Effects.** The new Utah State Field House of Natural History in Vernal is likely to improve the experience of local visitors interested in dinosaurs and the geology of the region. It may enhance local tourism to a limited degree, resulting in negligible to minor, long-term beneficial effects to socioeconomics. These benefits would be offset by the minor, adverse effects of closure of the Quarry Visitor Center. This would result in cumulative long-term, negligible beneficial effects to the local economy.

The retail outlet at the Utah State Field House in Vernal offers customers a variety of products for purchase related to dinosaurs and natural history. The selection of products at the Vernal site is markedly different from those available at the INHA bookstore, where materials focus on education, science, and natural history. At the Field House, the focus is on souvenirs, with a limited selection of educational and science-oriented materials.

However, the availability of these materials combined with the relocation of the paleontological, curatorial, and collections functions from the Quarry Visitor Center to the Vernal facility may have a long-term, negligible to minor, adverse effect on the cooperating association because some sales would move to the Field House. In combination with the major adverse effects on INHA, from the continued closure, the cumulative effects to cooperating associations would be long-term, adverse, and major.

**Conclusion.** Continued closure of the Quarry Visitor Center would reduce visitation to the monument over the long-term, producing minor, adverse economic effects in the gateway communities and counties. Relocating the cooperating association (bookstore operator) to the shuttle staging area would continue to dramatically limit revenues, resulting in long-term, major adverse economic effects to INHA.

There would be cumulative long-term, negligible benefits to the local economy. Cumulative effects to the cooperating association would be long-term, adverse, and major.

### **Impacts of Alternative B, the Preferred Alternative – Rehabilitate or Replace the Exhibit Hall and Construct a New Facility Off-Site**

Under Alternative B, the Exhibit Hall would be replaced or rehabilitated, and the wings and ramp would be demolished. The visitor, administrative, and support functions formerly housed at the Quarry Visitor Center would be relocated to a new structure at the shuttle staging area site.

The economic activity resulting from construction and materials for this, or any other action alternative, cannot be estimated. The open bidding process for the project would allow broad competition, and there is no guarantee that contractors and suppliers would be locally-based.

Because the fossil wall, the primary resource if the monument, would be accessible to visitors, it is anticipated that the new visitor center configuration would support overall visitation rates similar to pre-closure levels. Over the long-term, local economic activity would likely increase in response, and would be anticipated to approach or reach the \$12.7 million annual contribution of the past. This would result in localized, long-term, minor economic benefits.

During the 18-month construction period, adverse economic effects on the gateway communities would be as described for the closure under Alternative A. However, the defined timeframe of the closure would reduce the duration of the effects. Thus, local economic effects during construction and continued closure of the Quarry Visitor Center would be short-term, adverse and minor.

### **Cooperating Association**

INHA, or other cooperating association, would have dedicated space in the new visitor center for bookstore operations. The operator would continue to support the park's educational and interpretive mission. The configuration of the sales area would increase the

square footage that was available to the cooperating association under Alternative A. This would contribute to better circulation and display. At this location, however, the income generating potential is not known. Because the site is physically separate from the quarry face, sales may not reach the levels of the Quarry Visitor Center bookstore. But, in comparison to the existing condition using temporary facilities, INHA would have increased sales and would likely need to replace one or more of the employees recently laid-off. This would result in long-term minor to moderate benefits for the cooperating association.

During the 18-month construction period, adverse economic effects on the cooperating association would be as described for the closure under Alternative A. However, the defined timeframe of the closure would reduce the duration of the effects. Thus, adverse economic effects to the bookstore during project implementation would be short-term and major.

**Cumulative Effects.** The local, long-term, negligible to minor economic effects of the new Utah State Field House of Natural History in Vernal are described for Alternative A. These benefits would be enhanced by the localized, minor benefits of developing the new visitor center. This would result in cumulative long-term, minor benefits for the local economy.

The long-term, negligible to minor, adverse effects of the Utah State Field House in Vernal on the cooperating association is described for Alternative A. In combination with the minor to moderate beneficial effects of Alternative B, cumulative effects to the cooperating association would be long-term, beneficial and minor to moderate.

**Conclusion.** Exhibit Hall improvements and development of the new visitor center would likely restore park visitation to near historic levels, and therefore traditional local economic activity associated with park visitation. This would produce long-term, minor economic effects. Relocating the bookstore to the visitor center would likely restore a portion of cooperating association revenue, producing long-term, minor to moderate economic benefits for INHA.

There would be cumulative long-term, minor benefits to the local economy. Cumulative effects to the cooperating association would be long-term, beneficial and minor.

### **Impacts of Alternative C – Retain the Exhibit Hall and Construct a New Facility at the Quarry Visitor Center Site**

Under Alternative C, the Exhibit Hall would be retained and rehabilitated, and the wings and ramp would be demolished and replaced with modern structures. As described for Alternative B, the economic activity resulting from construction and materials for these activities cannot be estimated as there is no guarantee that contractors and suppliers would be locally-based.

It is anticipated that the new Quarry Visitor Center configuration would support overall visitation rates similar to pre-closure levels. Because the primary resource of the park, the fossil wall, would again be accessible to visitors, long-term, local economic activity would likely rebound, and would be anticipated to approach or reach the \$12.7 million annual contribution of the past. This would result in localized, long-term, minor economic benefits.

During the 2-year construction period, adverse economic effects on the gateway communities would be as described for the closure under Alternative A. However, the defined timeframe of the closure would reduce the duration of the effects. Thus, local economic effects during construction of the new Quarry Visitor Center would be short-term, adverse and minor.

### **Cooperating Association**

INHA would have dedicated space in the new Quarry Visitor Center for bookstore operations. The operator would continue to support the park's educational and interpretive mission. Reinstating operations in the traditional location near the quarry face would likely generate sales and revenues near historic levels (approximately \$400,000 per year). Some or all of the staff recently laid-off would likely be replaced. This would result in long-term, major, economic benefits for the cooperating association.

During the 2-year construction period, adverse economic effects on the cooperating association would be as described for the closure under Alternative A. However, the defined timeframe of the closure would reduce the duration of the effects. Thus, adverse economic effects to the bookstore during project implementation would be short-term and major.

**Cumulative Effects.** The local, long-term, negligible to minor economic effects of the new Utah State Field House of Natural History in Vernal are described for Alternative A. These benefits would be enhanced by the localized, minor benefits of opening a new Quarry Visitor Center. This would result in cumulative long-term, minor benefits for the local economy.

The long-term, negligible to minor, adverse effects of the Utah State Field House in Vernal on the cooperating association are described for Alternative A. In combination with the major beneficial effects of Alternative C, cumulative effects to the cooperating association would be long-term, beneficial and moderate.

**Conclusion.** Opening a new Quarry Visitor Center would likely restore park visitation to near historic levels, and therefore traditional local economic activity associated with park visitation. This would produce long-term, minor economic effects. Providing a bookstore location adjacent to the quarry face would likely restore the majority of cooperating association revenue, producing long-term major economic benefits for INHA.

There would be cumulative long-term, minor benefits to the local economy. Cumulative effects to the cooperating association would be long-term, beneficial and moderate.

### **Impacts of Alternative D – Retain the Exhibit Hall and Reconstruct Wings Similar to Existing Facility**

It anticipated that the replicated Quarry Visitor Center would support overall visitation rates similar to pre-closure levels. As described for Alternative B, long-term, local economic activity would likely rebound, and would be anticipated to reach the \$12.7 million annual contribution of the past. This would result in localized, long-term, minor economic benefits.



During the 2-year construction period, adverse economic effects on the gateway communities would be as described for the closure under Alternative B, short-term, adverse and minor.

### **Cooperating Association**

The reconstructed wings would be configured as they were in the original structure. The bookstore would re-open at or near its traditional size and layout. Thus, pre-closure sales levels would likely be established, resulting in major, long-term economic benefits for the cooperating association. Over the short-term, effects to INHA income and operations would be as described for Alternative A, adverse and major.

**Cumulative Effects.** The local, long-term, negligible to minor economic effects of the new Utah State Field House of Natural History in Vernal are described for Alternative A. These benefits would be enhanced by the localized, minor benefits of opening a new Quarry Visitor Center. This would result in cumulative long-term, minor benefits for the local economy.

The long-term, negligible to minor, adverse effects of the Utah State Field House in Vernal on the cooperating association are described for Alternative A. In combination with the major beneficial effects of Alternative D, cumulative effects to the cooperating association would be long-term, beneficial and moderate.

**Conclusion.** Re-opening a replicated Quarry Visitor Center would likely restore park visitation to historic levels, and therefore local economic activity associated with park visitation. This would produce long-term, minor economic effects. Providing a bookstore at the traditional site near the quarry face would likely restore the majority of cooperating association revenue, producing long-term major economic benefits for INHA.

There would be cumulative long-term, minor benefits to the local economy. Cumulative effects to the cooperating association would be long-term, beneficial and moderate.

### **Impacts of Alternative E – Demolish the Entire Facility and Construct a New Facility at the Quarry Visitor Center Site**

Under Alternative E, a modern facility would replace the entire Quarry Visitor Center. The duration of the construction work would be 2 years. The effects on local economic activities would be the same as those described for Alternatives C and D.

### **Cooperating Association**

Along with restored visitation levels, the new facility would provide the potential for expanding bookstore space and operations. This expansion could provide opportunities for increased revenues. In combination, these conditions could result in long-term, major, beneficial effects for the bookstore operator. Over the short-term, demolition and construction activities would produce effects on the cooperating association as described for Alternatives C and D, short-term, major, and adverse.

## ENVIRONMENTAL CONSEQUENCES

**Cumulative Effects.** The local, long-term, negligible to minor economic effects of the new Utah State Field House of Natural History in Vernal are described for above. These benefits would be enhanced by the localized, minor benefits of opening a new Quarry Visitor Center. This would result in cumulative long-term, minor benefits for the local economy.

The long-term, negligible to minor, adverse effects of the Utah State Field House in Vernal on the cooperating association are described for Alternative A. In combination with the major beneficial effects of Alternative E, cumulative effects to the cooperating association would be long-term, beneficial and moderate to major.

**Conclusion.** Developing a modern Quarry Visitor Center would likely restore park visitation to near historic levels, and therefore local economic activity associated with park visitation. This would produce long-term, minor economic effects. Providing an expanded bookstore facility near the quarry face would restore and possibly increase historic cooperating association revenue, producing long-term major economic benefits for INHA.

There would be cumulative long-term, minor benefits to the local economy. Cumulative effects to the cooperating association would be long-term, beneficial and moderate to major.

## PUBLIC HEALTH AND SAFETY

### Guiding Regulations and Policies

*Management Policies 2006* (NPS 2006b) requires that parks:

- Provide a safe and healthful environment for visitors and employees. Management actions strive to protect human life and provide injury-free visits, and
- Reduce or remove known hazards and apply other appropriate measures, including closures, guarding, signing, or other forms of education.

In addition, *Management Policies 2006* specifies that park visitors assume a substantial degree of risk and responsibility for their own safety when visiting areas that are managed and maintained as natural, cultural, or recreational environments (NPS 2006b).

Based on the principles and policies outlined in *Management Policies 2006*, tempered by the Organic Act's requirement that the NPS conserve and protect natural and cultural resources, the NPS has set forth additional supplemental operational policies and procedures necessary to establish and implement public risk, structural fire, and public and occupational safety management programs throughout the national park system. The objective of the NPS public risk management program under *Director's Order 50C* (NPS no date b) is to establish and implement a continuously improving and measurable process that minimizes the occurrence of visitor injury, illness, and property loss without negative impacts to park resources. Additionally, the NPS under *Director's Order 50B* focuses on the occupational safety and health of NPS employees, contractors, and volunteers while protecting federal and private property from accidental damage or loss associated with NPS operations (NPS 1999). Finally, under *Director's Order 83* (NPS 2004b), it is the policy of the NPS to protect the health and well being of NPS employees and park visitors through the elimination or control of disease agents and the various modes of their transmission to man.

To further public health and safety and to protect park resources, the NPS has also developed a structural fire policy as outlined in *Director's Order 58* to implement structural fire management programs throughout the national park system. Structural fire management is the protection of people, contents, structures, resources, and the landscape surrounding a structure from the effects of fire (NPS 2004c). Life safety is at all times the first priority in all fire management activities. Structural fire prevention involves a variety of topics and issues, including but not limited to, the incorporation of fire prevention and suppression measures into building design, rehabilitation, and construction and installation and maintenance of fire detection, alarm and suppression systems.

In order to develop and implement the above-mentioned director's orders and associated reference manuals, the NPS complies with all applicable federal, state, and local codes and regulations. Where conflicts between codes and standards exist, the more stringent requirement(s) are used. Where codes, standards, procedures, and guidelines do not exist or those that exist are not adequate, appropriate requirements are developed.

The structural fire management program, at a minimum, should comply with the requirements of the National Fire Protection Association and its family of codes and standards, including the Uniform Fire and Life Safety Codes, regarding new and existing construction, rehabilitation or renovation, fire suppression, fire prevention, and any other areas in which structural fire or life safety are involved (NPS 2004c). Supplemental codes and regulations should comply with the Utah Fire Code and Utah Fire Prevention Law, the Utah Uniform Building Standards Act, and allied local codes and regulations. This includes, but is not limited to, such items as the number and locations of fire egresses, fire alarms, and fire suppression units. Similarly, the public risk and public and occupational safety management programs should comply with applicable sections of the Occupational Safety and Health Act of 1970, Executive Order 12196 (Occupational Safety and Health Programs for Federal Employees, Title 29 of the Code of Federal Regulations (CFR), and Part 1960 (Elements for Federal Employee Occupational Safety and Health Programs). This includes items such as, but is not limited to, fall and trip hazards, work place ergonomics, biological hazards, falling window panes, and heat stress.

### **Methodology and Assumptions**

#### **Geographic Area Evaluated for Impacts**

The geographic area that was evaluated for public health and safety included the Quarry Visitor Center and immediate vicinity within the boundary of Dinosaur National Monument.

#### **Impact Criteria and Methodology**

Issues related to public health and safety identified during public and internal scoping are related to visitor and staff use of the Quarry Visitor Center prior to closure and include:

- The Quarry Visitor Center does not meet building codes for safe egress or accessibility.
- Hazards in the Quarry Visitor Center include uneven floors, high summer temperatures in the Exhibit Hall, and the potential for glass failure in the window walls.
- The prolonged structural movement over the years caused by expansive soils under the building foundation caused openings to exist in the building envelope where rodents and bats can enter the building. This poses sanitation concerns and associated health risks.

For public health and safety, impacts on the resource were evaluated and determined qualitatively based on the best professional judgment of NPS staff and consultants. The primary sources of information used in this analysis include existing park management documents, NPS policy documents, and unpublished observations and insights from knowledgeable park staff.

## **Definitions of Adverse and Beneficial Effects**

Adverse effects would increase the potential for accidents or expose park staff and visitors to additional hazards. Beneficial effects would reduce the potential for accidents and limit hazard exposure.

## **Impact Threshold Definitions**

Impact threshold definitions for public health and safety are as follows.

**Negligible:** Health and safety would not be affected; effects on employee and visitor health or safety would not be appreciable or measurable.

**Minor:** Effects on employee and/or visitor health and safety would be detectable; however, they would not produce an appreciable change in public health or safety.

**Moderate:** The effects would be readily apparent, and would result in noticeable effects on employee and/or visitor health and safety. Changes in rates or severity of injury could be measured.

**Major:** The effects would be swiftly apparent and would result in substantial, noticeable effects on employee and/or visitor health and safety, and changes in rates or severity of injury could be substantial.

## **Duration**

Short-term – Effects occur only during the duration of the project.

Long-term – Effects persist beyond the duration of the project.

## **Impacts of Alternative A – the No Action Alternative**

Under the No Action Alternative the Quarry Visitor Center would remain closed with only essential park staff entering the facility to implement the required structural monitoring program and performing critical maintenance and repair to protect the fossil wall and maintain the structural integrity of the building. During these monitoring and maintenance tasks, staff would potentially be exposed to falling and breaking windows, droppings from rodents and bats, trips and falls from broken and uneven floor surfaces, waste water from breached plumbing, handling of hazardous building components like lead and asbestos-based putty and asbestos-covered piping, performance of maintenance activities like changing/repairing elevated windows, and potential heat-related illness due to the radiant heat energy build-up in the viewing gallery during the summer months. Staff entering would adhere to applicable OSHA guidance and precautions for entry and work in the failing structure. These conditions would result in long-term negligible to minor adverse effects on staff health and safety. Additionally, Long-term, negligible to minor adverse effects to health and safety would also continue due to the presence of a non-code compliant fire egress and fire alarm system.

**Cumulative Effects.** There are no past, present, or reasonably foreseeable future projects that would have effects on public health and safety in the vicinity of the Quarry Visitor Center; therefore, there are no cumulative effects.

**Conclusion.** Alternative A would produce long-term, negligible to minor, adverse effects on maintenance personnel health and safety due to the hazards of entering and working in the failing structure.

There are no other projects or actions that would contribute to cumulative effects on public health and safety.

### **Impacts of Alternative B, the Preferred Alternative – Rehabilitate or Replace Exhibit Hall and Construct a New Facility Off-Site**

Implementation of Alternative B would result in localized benefits to public health and safety. Rehabilitation or rebuilding of the Exhibit Hall, demolition and removal of the wings and entry ramp, and building a new visitor center at the shuttle staging area site would produce long-term, minor, beneficial effects to public health and safety. These effects would be due to the elimination of hazards including the falling and breaking glass, rodent and bat entry, fall hazards to maintenance staff fixing/replacing windows, and heat stress to park staff. Benefits realized by constructing the new building to include components would result from protecting public and employee health, safety, and welfare by meeting Occupational Safety and Health Administration standards, the Architectural Barriers Act Accessibility Standard, and Uniform Building and National Fire Codes.

The structural monitoring program implemented by the NPS in Alternative A would be reviewed and applied as appropriate to meet the future needs of the facilities due to its siting on expansive bentonite-bearing soil. Implementation of this program would have long-term, minor, beneficial effects on public health and safety in that through this program, the new and replaced/rehabilitated facilities would be monitored to identify potential defects, caused by the underlying bedrock and soil conditions, that may affect public and employee health, safety, and welfare and corrective actions would be implemented to mitigate those defects.

Construction activities would produce low levels of risk to visitors and staff during project implementation. The use of construction equipment and materials and increased traffic by workers could present potential hazards. Risks would be reduced by providing information to visitors so they do not inadvertently enter the construction area, implementing a contractor safety plan, using barriers around construction units, controlling traffic, and increasing ranger presence. These measures would be taken in all action alternatives. In addition, lead and asbestos abatement measures would be implemented. (See Table 2 for a list of mitigation measures.) Overall, project implementation and construction would produce short-term, minor, adverse effects on public health and safety.

**Cumulative Effects.** There are no past, present, or reasonably foreseeable future projects that would have effects on public health and safety in the vicinity of the Quarry Visitor Center; therefore, there are no cumulative effects.

**Conclusion.** There would be long-term, minor, beneficial effects over those conditions that existed prior to closure of the Quarry Visitor Center to health and safety by eliminating or reducing hazards related to the structural deficiencies caused by the underlying bentonite-bearing soil and by implementing fire and life code standards into new construction. Implementation of the revised structural monitoring program would have long-term, minor, beneficial effects. Construction activities would produce short-term adverse effects of minor intensity.

There are no other projects or actions that would contribute to cumulative effects on public health and safety.

### **Impacts of Alternative C – Retain the Exhibit Hall and Construct a New Facility at the Quarry Visitor Center Site**

Implementation of Alternative C would result in localized benefits to health and safety. Rehabilitation of the Exhibit Hall and demolition and replacement of the Administrative and South Wings and entry ramp with a new 6,400 square foot structure would produce long-term, minor, beneficial effects to public health and safety over that of conditions experienced prior to closure of the Quarry Visitor Center. These effects would be due to the elimination, through the effective application of design and engineering principles, of hazards related to the falling and breaking of glass panels, rodent and bat entry, fall hazards to maintenance staff fixing/replacing windows, and heat stress to the viewing public and park staff caused by the radiant heat produced by the glass superstructure. Similarly, benefits realized by constructing the new building to include components that would protect public and employee health, safety, and welfare by meeting Occupational Safety and Health Administration standards, the Architectural Barriers Act Accessibility Standard, and Uniform Building and National Fire Codes.

The structural monitoring program implemented by the NPS in Alternative A would be reviewed and applied as appropriate to meet the future needs of the facility due to its siting on expansive bentonite-bearing soil. Implementation of this program would have long-term, minor, beneficial effects on public health and safety in that through this program, the facility would be monitored to identify potential defects, caused by the underlying bedrock and soil conditions, that may affect public and employee health, safety, and welfare and corrective actions would be implemented to mitigate those defects.

As in Alternative B, construction activities would produce low levels of risk to visitors and staff during project implementation. The use of construction equipment and materials and increased traffic by workers could present potential hazards. Risks would be reduced by providing information to visitors so they do not inadvertently enter the construction area, implementing a contractor safety plan, using barriers around construction units, controlling traffic, and increasing ranger presence. These measures would be taken in all action alternatives. In addition, lead and asbestos abatement measures would be implemented. (See Table 2 for a list of mitigation measures.) Overall, project implementation and construction would produce short-term, minor, adverse effects on public health and safety.

**Cumulative Effects.** There are no past, present, or reasonably foreseeable future projects that would have effects on public health and safety in the vicinity of the Quarry Visitor Center; therefore, there are no cumulative effects.

**Conclusion.** There would be long-term, minor, beneficial effects to public health and safety, over those conditions that existed prior to closure of the Quarry Visitor Center, by eliminating or reducing, through the application of engineering and design principles, hazards related to the structural deficiencies caused by the underlying bentonite-bearing soil and by implementing fire and life code standards into new construction. Implementation of the revised structural monitoring program would have long-term, minor, beneficial effects. Construction activities would produce short-term adverse effects of minor intensity.

There are no other projects or actions that would contribute to cumulative effects on public health and safety.

### **Impacts of Alternative D – Retain the Exhibit Hall and Reconstruct Wings Similar to Existing Facility**

The effects on public health and safety would be the same as those described in Alternative C.

**Cumulative Effects.** There are no past, present, or reasonably foreseeable future projects that would have effects on public health and safety in the vicinity of the Quarry Visitor Center; therefore, there are no cumulative effects.

**Conclusion.** Similar to Alternative C, there would be long-term, minor, beneficial effects, over those conditions that existed prior to closure of the Quarry Visitor Center, to public health and safety by reducing or eliminating structural and building hazards related to the movement of the underlying bentonite-bearing soil and implementing fire and life safety code standards into new construction and rehabilitation activities. Implementation of the revised structural monitoring program would have long-term, minor, beneficial effects. Construction activities would produce short-term, adverse effects of minor intensity.

There are no other projects or actions that would contribute to cumulative effects on public health and safety.

### **Impacts of Alternative E – Demolish the Entire Facility and Construct a New Facility at the Quarry Visitor Center Site**

The effects on public health and safety would be the same as those described in Alternatives C and D.

**Cumulative Effects.** There are no past, present, or reasonably foreseeable future projects that would have effects on public health and safety in the vicinity of the Quarry Visitor Center; therefore, there are no cumulative effects.



**Conclusion.** Similar to Alternatives B, C, and D there would be long-term, minor, beneficial effects, over those that existed prior to closure of the Quarry Visitor Center, to public health and safety by reducing or eliminating structural and building hazards related to the movement of the underlying bentonite-bearing soils and implementing fire and life safety code standards into new construction. Implementation of the revised structural monitoring program would have long-term, minor, beneficial effects. Construction activities would produce short-term, adverse effects of minor intensity.

There are no other projects or actions that would contribute to cumulative effects on public health and safety.

## PARK MANAGEMENT AND OPERATIONS

### Guiding Regulations and Policies

*Management Policies 2006* (NPS 2006b) guide maintenance activities in park units. Section 9.1.4.1 states that

“The Service will conduct a program of preventive and rehabilitative maintenance and preservation to (1) provide a safe, sanitary, environmentally protective, and esthetically pleasing environment for park visitors and employees; (2) protect the physical integrity of facilities; and (3) preserve or maintain facilities in their optimum sustainable condition to the greatest extent possible. Preventive and rehabilitative maintenance programs will incorporate sustainable design elements and practices to ensure that water and energy efficiency, pollution prevention, and waste prevention and reduction are standard practice.”

In addition, *Management Policies 2006* requires that “park facilities and operations will demonstrate environmental leadership by incorporating sustainable practices to the maximum extent practicable in planning, design, siting, construction, and maintenance” (NPS 2006b).

### Methodology and Assumptions

#### Geographic Area Evaluated for Impacts

The entire park was included in the geographic area evaluated for impacts on park management and operations.

#### Impact Criteria and Methodology

Issues related to park operations and management identified during internal and public scoping related to management of the Quarry Visitor Center after closure include:

- Closure of the Quarry Visitor Center has resulted in loss of office space and relocation of personnel to other work stations.
- The need for maintenance and repair of the Quarry Visitor Center (such as patching cracking walls, repairing or replacing glass windows, and realigning plumbing) is extensive due to ongoing building movement.

For this impact topic, impacts on monument operations were evaluated and determined qualitatively based on the best professional judgment of NPS staff and consultants. The primary sources of information used in this analysis include existing park management documents, NPS policy documents, and unpublished observations and insights from knowledgeable park staff.

## **Definition of Adverse and Beneficial Effects**

Adverse effects would create additional disruptions to park management or operations, increase maintenance of the Quarry Visitor Center, or increase workload from emergency repairs. Beneficial effects would reduce disruptions to park management or operations, reduce the need for facility maintenance, or reduce workload from emergency repairs.

## **Impact Threshold Definitions**

Impacts were evaluated using these threshold definitions:

**Negligible:** Park management or operations would not be affected, or effects would be at or below levels of detection and would not have an appreciable effect on park operations.

**Minor:** Effects would be detectable but would not be of a magnitude that would appreciably change park management or operations. Effects might be noticed by park and partner staff, but probably would not be noted by visitors.

**Moderate:** The effects would be readily apparent and would result in a substantial change in park management or operations in a manner noticeable to staff and visitors.

**Major:** The effects would be readily apparent and would result in a substantial change in park management or operations in a manner noticeable to staff and visitors as markedly different from existing operations.

## **Duration**

Short-term – Effects occur only during duration of the project.

Long-term – Effects persist beyond the duration of the project.

## **Impacts of Alternative A – the No Action Alternative**

As the Quarry Visitor Center is no longer occupied, only essential maintenance staff enter the building to continue weekly and monthly inspections and perform critical maintenance and repair activities. Park staff previously assigned to offices and workspaces in the Quarry Visitor Center have been relocated to alternate work areas within and outside the monument. Continuation of these conditions would result in office crowding, loss of centralized management, and potentially inefficient administrative and management activities, a long-term, moderate, adverse effect.

Standard management of other park facilities and areas would remain unchanged. Ongoing maintenance and grounds keeping would continue. Essential maintenance of the Quarry Visitor Center to protect the fossil wall and structural integrity of the building would include such actions as repairing roof leaks, repairing or replacing glass windows, and realigning plumbing, without addressing the critical design flaws inherent in the structure. Seasonal monitoring of backfill and utility system testing and inspection and monthly groundwater monitoring would also continue. These ongoing activities would result in long-term,

negligible adverse effects to park management and operations because these activities are already part of the baseline maintenance burden placed on staff.

**Cumulative Effects.** A road improvement project rehabilitated several miles of park roads and the access road and parking lot at the Quarry Visitor Center in 2006. This has long-term, negligible, beneficial effects on park operations by reducing the need for road maintenance. The No Action Alternative would contribute long-term, moderate, adverse effects to park operations. Overall, cumulative effects to park operations would be long-term, minor to moderate, and adverse.

**Conclusion.** The No Action Alternative would have long-term, moderate, adverse effects on park management and operations resulting from the relocation of park staff functions to other locations. The continued activities related to structural monitoring and maintenance of the building movement caused by expansive soils, monitoring of site monitoring wells, and seasonal inspection of the underground utilities along with standard park-wide maintenance and management activities would result in long-term, negligible, adverse effects to park operations.

Cumulative effects to park operations would be long-term, minor to moderate, and adverse.

### **Impacts of Alternative B, the Preferred Alternative – Rehabilitate or Replace Exhibit Hall and Construct a New Facility Off-Site**

The replacement structure(s) would be built to accommodate the current needs of park staff and operations. Space within the new structure(s) would be organized to improve staff operational efficiency. The uneven flooring and associated ergonomic issues facing park staff prior to closure of the Quarry Visitor Center would be eliminated. These improvements would lead to long-term, moderate, beneficial effects to park management and operations as they would improve workplace conditions and operational efficiency.

As described for Alternative A, the structural monitoring program would continue and would be reviewed and revised as appropriate to meet the future needs of the rehabilitated/replaced Exhibit Hall and new, relocated administrative offices. This would continue because stresses from the underlying bentonite soils, wind, temperature changes, and moisture would continue. Implementation of the monitoring program would include routine inspections and specific protocols depending upon the nature and location of building components. Performance of seasonal monitoring of backfill and utility system testing and monthly groundwater monitoring at the Quarry Visitor Center would also continue. The continuation of these activities would result in long-term, negligible, adverse effects to park management and operations.

Ongoing standard park-wide maintenance operations for other park facilities and locations as described in Alternative A would also continue, and the adverse effects to park operations resulting from these tasks would be the same as those listed under Alternative A. Implementation of Alternative B would have long-term, localized, moderate, beneficial effects on park management and operations. These effects would be due to the reduction of repair activities related to the mitigation of stress effects on the Quarry Visitor Center caused

by the underlying swelling soils. These effects may also spread park-wide due to the potential increased ability of maintenance staff to focus on work elsewhere in the monument.

The Quarry Visitor Center would still remain closed to the public with pertinent services relocated else where for the construction period of approximately 18 months. Short-term, minor, adverse effects to park management and operations would result during construction from the added need for park staff to monitor construction activities, inform and direct park visitors away from the Quarry Visitor Center to suitable alternate interpretive experiences, and ensure protection of park resources.

**Cumulative Effects.** Effects of other projects and plans would be the same as described in Alternative A, long-term, negligible, and beneficial. Over the long-term, Alternative B would contribute benefits to park operations that would range from minor to moderate. Overall, cumulative effects to park operations would be long-term, beneficial, and minor to moderate in intensity.

**Conclusion.** There would be long-term, moderate, beneficial effects to park management and operations under Alternative B. Rehabilitating/rebuilding the Exhibit Hall and constructing a new visitor center and administrative offices at the shuttle staging area would reduce maintenance burden and provide a comfortable and ergonomic workplace. Long-term, negligible adverse effects would be associated with continuation of the structural and groundwater monitoring programs utility system and backfill inspections, and continuation of standard park-wide maintenance operations. Short-term, minor, adverse effects would result from monitoring construction activities.

Cumulative effects to park operations would be long-term, beneficial, and minor to moderate in intensity.

### **Impacts of Alternative C – Retain the Exhibit Hall and Construct a New Facility at the Quarry Visitor Center Site**

The replacement structure would be built to accommodate the current needs of park staff and operations. Space within the new structure would be organized to improve staff operational efficiency. The uneven flooring and associated ergonomic issues facing park staff prior to closure of the Quarry Visitor Center would be eliminated. These improvements would lead to long-term, negligible to moderate, beneficial effects to park management and operations as they would improve workplace conditions and operational efficiency.

Ongoing standard park-wide maintenance operations for other park facilities and locations as described in Alternative A would also continue, and the adverse effects to park operations resulting from these tasks would be the same as those listed under Alternative A.

Implementation of Alternative C would have long-term, localized, moderate, beneficial effects on park management and operations. These effects would be due to the reduction of repair activities related to the mitigation of stress effects on the Quarry Visitor Center caused by the underlying swelling soils. These effects may also spread park-wide due to the

## ENVIRONMENTAL CONSEQUENCES

potential increased ability of maintenance staff to focus on work elsewhere in the monument.

As described for Alternative A, the ongoing structural monitoring program would continue and would be reviewed and revised as appropriate to meet the future needs of the rehabilitated Exhibit Hall and new components of the visitor center. This would continue because stresses from the underlying bentonite soils, wind, temperature changes, and moisture would continue. Implementation of the monitoring program would include routine inspections and specific protocols depending upon the nature and location of building components. Performance of seasonal monitoring of backfill and utility system testing and monthly groundwater monitoring would also continue. The continuation of these activities would result in long-term, negligible, adverse effects to park management and operations.

The Quarry Visitor Center would continue to remain closed to the public for the construction period of approximately 2 years. Short-term, minor, adverse effects to park management and operations would result during construction from the added need for park staff to monitor construction activities, inform and direct park visitors away from the Quarry Visitor to suitable alternate interpretive experiences, and ensure protection of park resources.

**Cumulative Effects.** Effects of other projects and plans would be the same as described in Alternative A, long-term, negligible, and beneficial. Over the long term, Alternative C would contribute benefits to park operations that would range from negligible to moderate. Overall, cumulative effects to park operations would be long-term, beneficial, and minor to moderate in intensity.

**Conclusion.** There would be long-term, moderate, beneficial effects to park management and operations by rehabilitating and rebuilding the visitor center thereby reducing operations and maintenance in response to the building movement caused by expansive soils. These long-term benefits however would be moderated by the long-term, negligible adverse effects associated with continuation of the structural monitoring program, seasonal groundwater monitoring and utility system and backfill inspections, and continuation of standard park-wide maintenance operations. Short-term, minor, adverse effects would result from monitoring construction activities.

Cumulative effects to park operations would be long-term, beneficial, and minor to moderate in intensity.

### **Impacts of Alternative D – Retain the Exhibit Hall and Reconstruct Wings Similar to Existing Facility**

The effects to park management and operations through implementation of Alternative D would be the same as described in Alternative C, with the exception that reorganization of space within the new structure would be done within the limitations of the historic floor plan. This improvement, as well as solving ergonomic issues related to uneven floor and workspaces would lead to long-term, moderate, beneficial effects to park operations.

Effects from ongoing standard maintenance and monitoring operations would be the same as Alternative C, long-term, negligible, and adverse. Effects during project construction would also be the same as Alternative C, short-term, minor, and adverse.

**Cumulative Effects.** Cumulative effects would be the same as those described in Alternative C, which would be long-term, beneficial, and minor to moderate in intensity.

**Conclusion.** There would be the same long-term, moderate beneficial and negligible adverse effects on park operations as described in Alternative C. Short-term effects on park management and operations related to construction activities would be the same as in Alternative C, minor and adverse.

Cumulative effects to park operations would be long-term, beneficial, and minor to moderate.

### **Impacts of Alternative E – Demolish the Entire Facility and Construct a New Facility at the Quarry Visitor Center Site**

The effects on park-wide operations from standard maintenance and management operations described in Alternative A would be similar in Alternative E. Long-term, moderate, beneficial effects to park operations and management associated with the new facility would include the reduction of stop-gap and emergency repairs resulting from the actions of swelling soil on the former visitor center. Additional long-term, moderate, beneficial effects would result from the enhanced accommodation of operational and park staff needs and function in the design and organization of staff facilities within the new visitor center. These beneficial effects to park operations would be moderated, however, by the continuation of a revised version of the structural monitoring program described in Alternative A, and by seasonal groundwater monitoring and utility system and backfill inspections.

As in the other Alternatives the Quarry Visitor Center would remain closed to the public for the construction period of approximately 2 years. Short-term, minor, adverse effects to park management and operations would result during construction from the added need for park staff to monitor construction activities, inform and direct park visitors away from the Quarry Visitor to suitable alternate interpretive experiences, and ensure protection of park resources.

**Cumulative Effects.** Cumulative effects would be the same as those described in Alternatives B, C, and D which would be long-term, beneficial, and minor to moderate in intensity.

**Conclusion.** There would be the same long-term, moderate, beneficial and minor, adverse effects on park operations as described in Alternative C and carried through in D. Short-term effects on park management and operations related to construction activities would be the same as described in the other Alternatives, minor and adverse.

Cumulative effects to park operations would be long-term, beneficial, and minor to moderate in intensity.

## SUSTAINABILITY AND LONG-TERM MANAGEMENT

The NPS has adopted the concept of sustainable design as a guiding principle of facility planning and development. The objectives of sustainability are to design park facilities to minimize adverse effects on natural and cultural values, to reflect their environmental setting, and to maintain and encourage biodiversity; to construct and retrofit facilities using energy-efficient materials and building techniques; to operate and maintain facilities to promote their sustainability; and to illustrate and promote conservation principles and practices through the sustainable design and ecologically sensitive use. Essentially, sustainability is living within the environment with the least impact on the environment.

Each of the action alternatives would subscribe to and support the practice of sustainable planning, design, and use. Construction of the new wings, rehabilitation of the Exhibit Hall, or construction of a new visitor center would utilize energy-efficient designs, materials, and technologies, to the maximum extent possible, to best promote energy efficiency and sustainability. To the maximum extent possible, reusable materials from the Quarry Visitor Center would be retained for use in other park areas, used in the rehabilitation of the site, reused, or recycled by the contractor.

### Unavoidable Adverse Impacts

Unavoidable adverse impacts are those environmental consequences of an action that cannot be avoided, either by changing the nature of the action or through mitigation if the action is taken. Therefore, they would remain throughout the duration of the action.

All of the action alternatives involve some extent of demolition, rehabilitation, and construction to the National Historic Landmark Quarry (NHL) Visitor Center, which would cause unavoidable adverse impacts to this historic structure because of extensive changes to structural components and features of the building. The type and magnitude of work that would be done under all of the action alternatives to adequately address the structural stability concerns would remove or alter original structural elements and materials to the extent that the National Historic Landmark status of the Quarry Visitor Center would be lost, causing a long-term, major, adverse effect to the historic structure. Similar unavoidable adverse impacts would also occur under the No Action Alternative as damage and emergency repairs would contribute to further incremental losses of integrity of this NHL structure. These impacts would range from moderate to major, and vary by alternative.

Rehabilitation and stabilization of the Exhibit Hall under Alternatives B and C would represent a long-term, minor benefit to the monument's collection because this structural component protects and showcases the *in situ* fossil bones. All of the action alternatives also involve demolition as well as drilling of structural piers to approximately 65 to 85 feet below grade. These actions would cause unavoidable adverse impacts, ranging from minor to moderate, to Morrison-derived soil and rock debris or fossils contained in the Morrison Formation, if they are encountered during foundation and pier installation. Although several mitigation measures would be implemented to reduce the level of effect during demolition and construction (see Table 2, Mitigation Measures in the "Alternatives" chapter), methods



may be altered appropriately if any fossils are encountered, adverse effects would not be totally avoided. However, the newly constructed wings or new visitor center (depending on the alternative) and the modification of utility and drainage systems would provide long-term protection of these geologic resources from weathering and erosional processes.

Aboveground demolition activities and rehabilitation work would pose some level of risks to the fossils in the quarry wall, with the greater potential for risks occurring under Alternative E because of the extent of demolition. This would be true also for Alternative B if it is found that the Exhibit Hall would be demolished and rebuilt. Mitigation and monitoring measures would be implemented before and during any construction activities to avoid or minimize the level of adverse effect. Such activities would include special demolition and excavation techniques, covering the quarry wall, and closely monitoring ground vibrations in the area. Adverse effects would range from negligible to moderate, depending on which alternative is implemented; however, there would also be moderate benefits to the quarry wall from increased long-term protection from the elements and vermin (which would continue to be a concern under the No Action Alternative), and elimination of future potential risks of higher intensity by stabilizing or replacing the structure.

There would be unavoidable adverse impacts, ranging from moderate to major, to visitor experience and interpretation during project implementation under all of the alternatives. Construction noise would be generated. There would be no visitor access to the Quarry Visitor Center and the fossil wall. This would also occur under the No Action Alternative. These effects would be somewhat offset by park efforts to accommodate visitors during construction and provide interpretive opportunities at alternate locations. Closure of the Quarry Visitor Center would also have short-term unavoidable adverse impacts of minor intensity to the local economy and moderate to major effects to the bookstore concessioner.

### **Relationship between Local Short-term Uses of the Environment and the Maintenance and Enhancement of Long-term Productivity**

The NPS must consider if the effects of project alternatives involve trade-offs of the long-term production and sustainability of park resources for the immediate short-term use of those resources. It must also consider if the effects of the alternatives are sustainable over the long-term without causing adverse environmental effects for future generations (National Environmental Policy Act Section 102(c)[IV]).

The action alternatives were developed primarily for the reason of ensuring the long-term protection of the *in situ* fossil wall, the principal resource for which the monument was established. Therefore, there are some trade-offs between long-term effects to the historic structure and natural resources for the long-term protection of the paleontological and geological resources of the quarry. Each of the alternatives would adversely affect the National Historic Landmark status of the Quarry Visitor Center; however, these actions would provide a stable protective shelter above the fossil wall, and would help eliminate drainage into expansive soils to better protect geologic resources and ensure sustainability of the structure. Because site conditions would not change regardless of the alternative selected, a structural monitoring program would be instituted to evaluate stability and

identify any future issues that may arise so that they can be appropriately managed which will further ensure the sustainability of resources.

### **Irreversible or Irretrievable Commitments of Resources**

The intent of this determination is to identify whether the alternatives would result in effects or impacts that could not be changed over the long term or would be permanent. An effect on a resource would be irreversible if the resource could not be reclaimed, restored, or otherwise returned to conditions that existed before the disturbance. An irretrievable commitment of resources involves the effects on resources that, once gone, cannot be replaced or recovered (NPS 2001).

The removal or modification of structural elements of the NHL-status Quarry Visitor Center for the long-term protection of paleontological resources and public safety would represent an irreversible and irretrievable action for the loss of these elements. Any adverse effects to geologic resources or undiscovered paleontological resources would be irreversible and irretrievable. Although several mitigation measures would be implemented to reduce or avoid effects during demolition and construction, the risk for potential damage still exists.

## CONSULTATION AND COORDINATION

### SCOPING PROCESS AND PUBLIC INVOLVEMENT

The scoping process for this final EIS began in March 2004 with completion of the environmental screening form, which initially identified potential resource effects. On June 28, 2004, the NPS notified the public of the intent to prepare an environmental impact statement to address the structural problems posed by the Quarry Visitor Center in an announcement in the *Federal Register*.

A public scoping newsletter was published and made available to the public in August 2004, requesting the public to convey concerns and issues related to the future of the Quarry Visitor Center. Respondents were free to comment by letter, e-mail, or telephone.

A total of seven comments were received. Topics of concern included the following:

- Respondents consistently expressed the value of the Quarry Visitor Center to the local tourism economy and the nation, and requested that all necessary steps be taken to upgrade the facility.
- There was concern about retaining the fossils intact without any damage, regardless of the action taken with the facility upgrade.
- While some expressed a desire for the NPS to retain the character of the historic structure, others asked for the facility to be replaced with a modern structure that would be fully capable of long-term protection for the fossil wall and effectively accommodating visitor needs. One respondent requested that the new facility replicate the existing structure's shape and form.
- Several ideas were proposed for ways to improve interpretation in and around the facility.
- Concern was expressed over visitors being able to make contact with fossilized bones during the construction, and the potential for completely losing the hands-on experience with dinosaur bones.
- One respondent expressed concern for the potential loss of revenue to the bookstore adjacent to the quarry wall.

In February 2005, the NPS published another newsletter, presenting information about the project alternatives and soliciting public input on the adequacy of the range of alternatives, any additional alternatives the public would like to see considered, and any other pertinent issues or concerns to be included in the analysis. Respondents were free to comment by letter, e-mail, or telephone until March 28, 2005.

A total of 31 comments were received. While many respondents expressed wishes for the appearance of the visitor center (and not necessarily the actual structure itself) to be preserved (while upgrading safety elements), many others supported replacing the structure completely or in part (and not replicating the original architecture). However, both types of

## CONSULTATION AND COORDINATION

respondents emphasized the paramount importance of the preservation of the fossil resources in the quarry wall. Recurring comments included the following:

- Respondents consistently expressed the desire for enhanced protection of the fossils, while still in the wall and once extracted and stored.
- Several comments anticipated the benefits of improved visitor flow and utilization of space, if a new facility were to be built.
- The fossils are the primary resource, not the building.
- Some respondents offered suggestions for improved interpretation in the new visitor center (e.g., interpreting Douglass' homestead, displaying the *Diplodocus* skeleton).
- Some commenters emphasized the importance of structural integrity and safety as deciding factors for considering retention of the existing facility.
- Two respondents requested that special attention be given to the local economic impacts of closing the visitor center for several years. One person noted the importance of broadly publicizing the re-opening, so business can swiftly return as before.

## CULTURAL RESOURCES CONSULTATION

Staff from the Utah State Historic Preservation Office are aware of the project and were participants in the January 2005 Alternatives Workshop held at the monument. As part of the formal Section 106 process, the NPS also sent letters to the Utah State Historic Preservation Officer and the Advisory Council on Historic Preservation on June 22, 2005 (Appendix A). The letters invited them to participate in the planning process and informed them that the NPS plans to use this final EIS to fulfill the requirements of Section 106 of the National Historic Preservation Act as well as comply with provisions of the National Environmental Policy Act. The Utah State Historic Preservation Officer responded on March 9, 2006 (Appendix A).

Following closure of the Quarry Visitor Center in July 2006, additional cultural resources consultation was conducted. An architect from the Utah State Historic Preservation Office met with park staff on December 13, 2006 to view conditions at the Quarry Visitor Center and to discuss alternatives for mitigation.

As provided for in the implementing regulations for Section 106 (36 CFR 800) of the National Historic Preservation Act, the NPS has also complied with the requirements for using the National Environmental Policy Act process to achieve Section 106 compliance. Concerned American Indian tribes, the Utah and Colorado state historic preservation officers (SHPO), and the Advisory Council on Historic Preservation (ACHP) have been formally notified about the project, and a variety of public involvement activities have been undertaken. A draft EIS was forwarded to these groups for their review and comment.

The NPS has determined that implementation of any of the alternatives described in this Final EIS would have an adverse effect on the Quarry Visitor Center, a National Historic Landmark. Once the NPS makes its decision as to which alternative presented in this final EIS would be implemented, a memorandum of agreement would be developed among the NPS, the Utah State Historic Preservation Officer, the Advisory Council on Historic

Preservation, and, as appropriate, Tribal Historic Preservation Officer(s)(THPO). This agreement will outline measures to ensure best possible treatments for the Quarry Visitor Center and will include additional mitigative measures. The Memorandum of Agreement would be completed and signed prior to completion and signature of the Record of Decision.

Dinosaur National Monument also sent a letter to the Ute Indian Tribe at Fort Duchesne, Utah on July 7, 2005, informing them of the proposed plan and requesting their comments. To date, no comments have been received.

## ENDANGERED OR THREATENED SPECIES CONSULTATION

In accordance with section 7 of the Endangered Species Act (16 *United States Code* 1531 *et seq.*), the NPS contacted the U.S. Fish and Wildlife Service by letter on November 23, 2005 to initiate informal consultation (see Appendix A). To date, no response has been received.

Please see “Rationale for Dismissal” in “Purpose of and Need for Action” for a complete discussion of the exclusion of this impact topic.

## PUBLIC AND AGENCY COMMENTS ON THE DRAFT EIS AND NPS RESPONSES

In June 2007, 263 copies of the draft Environmental Impact Statement were distributed for a 60-day review period as follows:

<u>Category</u>	<u>Number of Recipients</u>
Federal Agencies	21
State and Local Agencies	21
Federal, State, and Local Elected Officials	16
Tribes or Tribal Councils	3
Organizations, Associations, and Museums	59
Schools, Libraries, and Institutions	59
Businesses	37
Interested Individuals	47

The draft EIS was also made available at two local libraries – Moffat County Public Library in Craig, CO and the Uintah Public Library in Vernal, UT – and on the NPS planning website at <http://parkplanning.nps.gov/parkHome.cfm?parkId=50>. The draft EIS was available for comment from June 10, 2007 through August 10, 2007.

During the review period, the NPS received 12 comment documents. Of these, six were substantive. The remaining comments either voiced support for or opposition to an alternative (three), voiced opinions that were outside the scope of the project (two), supported the monument’s efforts or requested additional information (one).

The Council on Environmental Quality (1978) guidelines for implementing the National Environmental Policy Act require the NPS to respond to “substantive comments”. A comment is substantive if it meets any of the following criteria from Director’s Order 12, “Conservation Planning, Environmental Impact Analysis, and Decision-Making” (NPS 2001).

- It questions, with reasonable basis, the accuracy of information.
- It questions, with reasonable basis, the adequacy of environmental analysis.
- It presents reasonable alternatives other than those proposed in the plan.
- It causes changes or revisions in the preferred alternative.

The substantive comments received on the draft EIS, and the NPS responses, are included below.

### Agency Comments

Comment: “The U.S. Environmental Protection Agency determination is: Lack of Objections. However, the draft EIS does not indicate whether the scope of January 24, 2007 Executive Order (EO) will be pursued. Comment by the U.S. EPA recommends that the NPS evaluate and summarize compliance with the EO.”

Response: *The NPS will, during the final design phase of the structure(s), incorporate reduction of energy intensities; reduction of green house gas emissions through energy savings; and will construct or renovate buildings in accordance with sustainability strategies, including resource conservation, reduction, and use as specified in the Executive Order dated January 24, 2007. However, actual savings and levels would be determined upon actual operation and use.*

### Public Comments

Two comments were received questioning the status and/or funding of the project to construct the Vernal fossil repository and paleontology lab. One commenter stated “The inclusion of the proposed Uintah Research and Curatorial Center in Vernal as part of this DEIS is not valid until it has been approved and fully funded. Since the stated curatorial facility does not exist, a comprehensive plan needs to be developed for proper storage of the materials until a permanent facility is available. This will be necessary for all alternatives.”

Response: *NPS guidelines and policies provide for the management, preservation and protection of paleontological resources for public education and interpretation as well as scientific research. Current planning calls for most of the monument’s collection and research functions, including the laboratory, paleontological offices, and extensive library, to be shifted to a new museum facility in Vernal.*

*The project to construct the Uintah Research and Curatorial Center in Vernal is a separate NPS action, which has already been approved. The environmental assessment for this project was completed in 2005 with the Finding of No Significant Impact (FONSI) signed in September 2005. Currently construction for the curatorial facility is funded and scheduled for fiscal year 2010. The effects of the Vernal facility relative to Quarry Visitor Center EIS were addressed as “Cumulative Effects” throughout the Environmental Consequences chapter.*

Two comments raised questions about the local economic effects of continued closure of the Quarry Visitor Center and the timing for opening of the new facility. One commenter stated: “How long before it is a functioning facility? We are losing so many of our tourist dollars by the closure of the facility...missing out on a once in a life time opportunity.”

*Response: The impacts to the local economy and the park’s cooperating association (bookstore operator), Intermountain Natural History Association, are addressed in the Socioeconomics section of Chapter 4 in the draft EIS. The current closure of the Quarry Visitor Center has resulted in decreased visitation and minor adverse effects to the local economy. However, the bookstore operator is experiencing major adverse effects from dramatically reduced sales and relocation to the parking area at the shuttle stop.*

*Under the action alternatives, adverse effects to the local economy and the bookstore operator would continue throughout the closure and construction period. When complete, the new visitor center would likely restore park visitation to near historic levels and the economic activity associated with this rate of visitation. The benefits of the facilities to the local economy and bookstore operator would be long-term and minor.*

*The project is scheduled to begin in 2011, with a construction period of approximately 18 months.*

One comment questioned components of the Preferred Alternative. The commenter wrote: “Keep the structures together;... if the quarry is separate from the other offices and structures, it will remain closed all winter and much of the spring and fall due to lack of manpower to supervise it.” By having all the various functions and buildings together, you make better use of energy efficiencies for heating, cooling, lighting and such. It is more energy efficient to have one large building with many functions, than several in different locations.”

*Response: Because the Quarry Visitor Center is no longer habitable, park staff have relocated to alternate work locations. This has resulted in moderate adverse effects to park management and operations. Without implementation of one of the action alternatives, this condition would continue into the future. All of the action alternatives provide new park facilities and modern office design that would better accommodate needs of park staff, producing moderate, long-term benefits to park operations and management (see “Park Management and Operations” in the Environmental Consequences chapter).*

*The final design of the structure(s) would incorporate better use of energy efficiencies as discussed in the response to the EPA’s comment, above.*

One comment questioned the actions within the Preferred Alternative and the analysis of impacts to the *in situ* fossil wall under continued current management. The commenter wrote: “The Preferred Alternative needs to be separated into two distinct alternatives, one with rehabilitation of the Exhibit Hall as the option and one with demolition and reconstruction of the Exhibit Hall as the option. Creating an alternative that leaves sole discretion to the NPS about whether to demolish a National Historic Landmark without further public input defeats the purpose of NEPA and the Section 106 process. I would strongly recommend that the NPS conduct an in-depth evaluation of the feasibility of demolishing and rebuilding the exhibit Hall. If the Exhibit Hall can be rehabilitated, then we need to know that information before the decision is made through the NEPA process. If the

structural integrity is truly a health and safety issue, then under Alternative A the potential structural failure could also cause severe damage to the collections and the "in situ" paleontological resources on the quarry face. This concept is not really addressed in the environmental consequences section."

*Response: Legislation and policy direct the NPS to protect and preserve the resource for which Dinosaur National Monument was established – the in situ fossil wall. The draft EIS cites this mandate and the need for pursuing the project in the Purpose of and Need for Action section of the document.*

*Because the structural issues at the Quarry Visitor Center have been long-term and ongoing, the NPS has undertaken several studies that record a variety of structural issues and problems for the structure. In 2003, the Quarry Visitor Center Historic Structure Report cataloged many structural issues at the QVC. Again in 2004, the Dinosaur National Monument Quarry Visitor Center Structural Evaluation Report cited many of the same problems. In 2006, as part of the decision-making process for this project, the park implemented a structural monitoring program. The May 2006 Life Safety Monitoring Report from this effort revealed significant risk to public health and safety, primarily in the Administrative Wing of the facility. These investigations indicate that the options for preserving the historic structure while providing long-term solutions to structural instability are limited and have low potential for success. In fact, it is estimated that only about 10 percent of the historic fabric could be reused. The results of these investigations outline the need for the project and are cited in the Purpose of and Need for Action chapter (as well as in other locations) of the EIS.*

*The type and magnitude of work that would be done under all of the action alternatives to adequately address the structural stability concerns at the QVC would remove or alter original structural elements and material to the extent that the National Historic Landmark status of the building would be lost, resulting in a long-term, major adverse, effect to the historic structure (see the "Historic Structures" impact analyses in the Environmental Consequences chapter). As discussed in "Cultural Resources Consultation" above, the requirements of Section 106 compliance have been met, and the NPS plans to execute a Memorandum of Agreement with the Utah SHPO prior to completion and signature of the Record of Decision.*

*The potential for the in situ fossil wall to be impacted by continued structural instability is addressed as Impacts of Alternative A, the No Action Alternative under the "Collections" impact topic. Analysis revealed that the greatest threat to the collection was from deterioration of the Exhibit Hall that could lead to failure of structural elements. Adverse effects under continued current management could result from glass or metal components falling onto the fossil wall, increased exposure to moisture and the elements, and any structural repairs that might be necessary to stabilize the structure. Impacts from these occurrences would be long-term and minor to major in intensity.*

The documents containing the comments referenced above, and the NPS responses, are included in the table below.



## Comment

## Response



### UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 8  
1595 Wynkoop Street  
DENVER, CO 80202-1129  
Phone 800-227-8917  
<http://www.epa.gov/region08>

JUL -5 2007

Ref: SEPR-N

Ms. Mary Risser  
Superintendent, Dinosaur National Monument  
U.S. Department of the Interior  
National Park Service  
Dinosaur National Monument  
4545 East Highway 40  
Dinosaur, Colorado 81610-9724

RE: Quarry Visitors Center, Dinosaur National Monument  
Draft Environmental Impact Statement: CEQ# 20070242

Dear Ms. Risser:

In accordance with our responsibilities under the National Environmental Policy Act (NEPA) 42 U.S.C Section 4331 et. seq., and Section 309 of the Clean Air Act 42 U.S.C Section 7609, the U.S. Environmental Protection Agency Region 8 (EPA) has reviewed the Draft Environmental Impact Statement of the Quarry Visitors Center, Dinosaur National Monument in Dinosaur, Colorado.

EPA appreciates the difficult decisions the National Park Service (NPS) must face in meeting the purpose and need of this project and of losing designation as a National Historic Landmark through destruction of the deteriorating building. The role of the NPS at this site is protection, preservation and management of paleontologic resources as part of geological features. In addition, the NPS must reduce hazards that threaten the safety of park visitors and staff and long term viability of park infrastructure. The issues of protection, preservation and physical hazards appear to override any decisions in favor of the National Landmark designation and justify the rehabilitation and construction proposed. The Visitor Center protects and showcases the dinosaur fossils in a unique way through viewing the fossils exposed in the rock face. In addition, project objectives outlined in the DEIS ensure that this personal experience with the fossils through education, viewing and touching can continue.

Section 106 consultations were thorough and EPA concurs with the approach of developing a Memorandum of Understanding with the historic preservation consulting agencies to assure thorough development of mitigation measures.

1. The NPS will, during the final design phase of the structure(s), incorporate reduction of energy intensities; reduction of green house gas emissions through energy savings; and will construct or renovate buildings in accordance with sustainability strategies, including resource conservation, reduction, and use as specified in the Executive Order dated January 24, 2007. However, actual savings and levels would be determined upon actual operation and use.

Comment

Response

The Office of the Federal Environmental Executive released a new Executive Order on January 24, 2007, "Strengthening Federal Environmental, Energy, and Transportation Management" (EO 13423) which requires all federal agencies to:

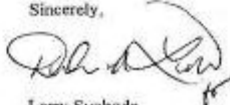
- Reduce energy intensity 30% by 2015
- Reduce Green House Gas Emissions through energy savings by 3% annually or 30% by 2105
- Build Performance: Construct or renovate buildings in accordance with sustainability strategies, including resource conservation, reduction, and use; citing; and indoor environmental quality

This DEIS mentions several commendable "green" practices that will be employed during construction (e.g. recycling of materials, green toilets, low flush toilets, windows etc.); however, it does not indicate whether the scope of this EO, as stated above, will be pursued. We recommend that the NPS evaluate and summarize compliance with this EO for this project. These practices will reduce the environmental footprint of the park and provide energy savings as well.

Pursuant to EPA policy and guidance, EPA rates the environmental impact of an action and the adequacy of the NEPA analysis. EPA has rated the preferred alternative "LO" (Lack of Objections). This "LO" rating means that the review has not identified any potential environmental impacts requiring substantive changes to the preferred alternative. An explanation of the rating criteria is enclosed.

We appreciate the opportunity to review this project. If you have any questions or would like to discuss our comments, please contact me (303) 312-6004 or Robin Coursen (303)312-6695 of my staff.

Sincerely,



Larry Svoboda  
Director, NEPA Program  
Office of Ecosystems Protection and Remediation

Enclosure

## Comment

## Response

PEPC - Correspondence

Page 1 of 3

**PEPC**  
Planning, Environment and Public Comment

Project Horse: QVHC - Quarry Visitor Center (16847) - Public Comments - Draft Environmental Impact Statement Assessment of Effect for the Quarry Visitor Center Institutional Project - Correspondence

1 Project Setup Correspondence (7) Edit Enter More

2 Funding Author Information

3 Internal Scoping / IDT Tasks Keep Private: No Name: Dale E. Gray Organization: Organization Type: 1 - Unaffiliated Individual Address: 434 South 3500 West Vernal, UT 84078 USA E-mail: daleegr@sim.com

4 Natural/Cultural Compliance

5 Internal Documents

6 Public Communication

7 Public Documents & Comment Analysis

Documents

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Correspondence

Public Requests

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Concepts

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Index By Code Report

Concern Response Report

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Entire Project Code Analysis Report

Demographics Report

8 Close Project

Correspondence Information

Status: New Park Correspondence Log: Date Sent: 08/05/2007 Date Received: 08/06/2007 Number of Signatures: 1 Form Letter: No Contains Request(s): No Type: Web Form Notes:

Correspondence Text

The inclusion of the proposed Uintah Research and Curatorial Center in Vernal as part of this DEIS is not valid until it has been approved and fully funded. The Curatorial facility was originally due for construction funding in 2004. The National Park Service and particularly Canyon National Monument management has not shown support for funding this facility for over 5 years. Based on analysis and picking a preferred alternative that relies on a new, self-sufficient, unfunded facility that would be necessary to house valuable collections and major park functions is not acceptable.

The Uintah Research and Curatorial Center in Vernal is sited in the following sections:

Page 34 ALTERNATIVE B, THE PREFERRED ALTERNATIVE

The functional spaces currently located in the Administrative Wing and South Wing (other than the paleontology laboratory and library collections and curatorial functions being relocated to the Vernal facility) would be replaced by construction of a new 8,000 to 10,000-square-foot visitor center structure designed to meet park safety, interpretation, operation, and maintenance needs.

Page 65 AFFECTED ENVIRONMENT, Collections

Current planning calls for most of the monument's collection and research functions, including the laboratory, paleontological offices, and the extensive library to be shifted to a new museum facility in Vernal, Utah.

Page 146 Alternative A, Cooperating Association Cumulative Effects

However, the availability of these materials combined with the relocation of the paleontological, curatorial, and collections functions from the Quarry Visitor Center to the Vernal facility may have a long-term, negligible to minor, adverse effect on the cooperating association because some sales would move to the Field House.

The above statement is also referred to in the other alternatives addressed in the Cooperating Association Cumulative Effects section.

Page 111 Methodology for Museum Collections

- Two comments were received questioning the status and/or funding of the project to construct the Vernal fossil repository and paleontology lab.

NPS guidelines and policies provide for the management, preservation and protection of paleontological resources for public education and interpretation as well as scientific research. Current planning calls for most of the monument's collection and research functions, including the laboratory, paleontological offices, and extensive library, to be shifted to a new museum facility in Vernal.

The project to construct the Uintah Research and Curatorial Center in Vernal is a separate NPS action, which has already been approved. The environmental assessment for this project was completed in 2005 with the Finding of No Significant Impact (FONSI) signed in September 2005. Currently construction for the curatorial facility is scheduled for fiscal year 2010. The effects of the Vernal facility relative to Quarry Visitor Center EIS were addressed as "Cumulative Effects" throughout the Environmental Consequences chapter.

## Comment

## Response

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The rest of the monument's collections, including archival materials such as photographs, manuscripts, topical publications, archeological resources, and natural resource and paleontological specimens removed from their original context will be relocated to the curatorial facility in Vernal under a separate action. These items would be moved prior to implementation of this project and would not be affected by any of the alternatives.

In reference to the section above:

The movement of the listed materials has a very significant impact on the materials, researchers and park staff. Since the stated curatorial facility does not exist, a comprehensive plan needs to be developed for proper storage of the materials until a permanent facility is available. This will be necessary for all alternatives.

2

Considering the uncertainties of the proposed curatorial facility I support Alternatives C or E. Either of these would provide a modern efficient facility capable of handling current and future needs of Dinosaur National Monument.

Add Comment

Comment Text:

Add Comment

Comments

ID	First 40 Characters	Status	Assigned Code(s)	Code
No comments have been identified in this correspondence.				

Request Text:

No Request Text Found.

Add Public Request

Request Type:

Request Text:

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ID	First 30 Characters	Type	Status	Edit
No public requests have been identified in this correspondence.				

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DINO - Quarry Visitor Center (10847) > Public Documents > Draft Environmental Impact Statement (Assessment of Effect for the Quarry Visitor Center Treatment Project) > Correspondence

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Correspondence (1)

Author Information

Keep Private: Yes

Name: [REDACTED]

Organization: [REDACTED]

Organization Type: [REDACTED]

Address: [REDACTED]

E-mail: [REDACTED]

Correspondence Information

Status: New Park Correspondence Log

Date Sent: 06/05/2007 Date Received: 05/06/2007

Number of Signatures: 1 Form Letter: No

Contains Request(s): No Type: Web Form

Notes:

Correspondence Text

Why is this project taking so long to get under way? I am frustrated to see so many tourists and visitors to Vernal and North Western Colorado not be able to see the Dinosaur National Quarry. This is part of our Dinosaur Land attraction to Vernal and surrounding areas. It is such a great educational arena for Dinosaur Lovers among anyone else who has an interest in learning more about our area. Most children get so excited and can't wait to see the Dinosaur National Quarry, along with most adults.

How long before it is a functioning facility? We are losing so many of our tourist dollars by the closure of this facility and also the people that pass through this part of the United States is missing out on a once in a life time situation in viewing the dinosaur bones.

I grew up in Vernal and this is one of the main places that we took out of town guests. Whether it was Miss Rodeo America or someone involved with the oil field or a relative from out of state. We miss The Dinosaur National Quarry and would love to see it back in operation as soon as possible.

Best regards,

[REDACTED]

Add Comment

Comment Text:

Add Comment

Comments

ID	First 40 Characters	Status	Assigned Code(s)	Code
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3

- The impacts to the local economy and the park's cooperating association (bookstore operator), Intermountain Natural History Association, are addressed in the Socioeconomics section of Chapter 4 in the draft EIS. The current closure of the Quarry Visitor Center has resulted in decreased visitation and minor adverse effects to the local economy. However, the bookstore operator is experiencing major adverse effects from dramatically reduced sales and relocation to the parking area at the shuttle stop.

Under the action alternatives, adverse effects to the local economy and the bookstore operator would continue throughout the closure and construction period. When complete, the new visitor center would likely restore park visitation to near historic levels and the economic activity associated with this rate of visitation. The benefits of the facilities to the local economy and bookstore operator would be long-term and minor.

The project is scheduled to begin in 2011, with a construction period of approximately 18 months.

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Planning, Environment and Public Comment

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1 Project Setup

Correspondence (3)

2 Funding

Author Information

Keep Private: No

Name: Stephen Barton

Organization:

Organization Type: Individual

Address: 644 East 3050 South

Vernal, UT 84078

USA

3 Internal Scoping / IDT Tasks

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Correspondence Information

Status: New

Date Sent: 07/13/2007

Number of Signatures: 1

Contains Request(s): No

Notes:

Correspondence Text

My first choice would be to support Alternative E, to demolish the current buildings at the Quarry site and build all new structures to protect the fossil wall, for interpretation and exhibits, a gift shop, plus staff offices and curatorial space. All of the new structures would go on the current site where the present buildings currently are. I say this for several reasons:

1) By replacing the existing structures with new on the current site, you recognize the historic importance of the quarry.

2) By having all of these functions in one place, you make better use of human resources. By being able to have people running the gift shop or doing other duties, also keep tabs on the quarry, you make better use of the staff. This is especially important in the off seasons, when staffing is limited. I fear that if the quarry is separate from the other offices and structures, it will remain closed all winter and much of the spring and fall due to lack of manpower to supervise it. If the quarry is closed, you are missing the point of having this Monument in the first place. So keep the structures together.

3) By having all the various functions and buildings together in one place, you make better use of energy efficiencies when it comes to heating, cooling, lighting and such. It is just more energy efficient to have one large building with many functions, than several different buildings in different locations.

4) Park Staff need to be working close to the Quarry, so that they can be there to help visitors, so that they can deal with visitor problems, and so that they are informed of what is going on. The Park Staff should be out meeting with the public at least part of the time, not hiding in distant offices doing paperwork all the time. Parks exist to serve the public. In the case of Dinosaur Monument, this should also mean that Park staff are doing curatorial and interpretive functions. The public coming to Dinosaur Monument wants to see and know that paleontological work is going on now. Dinosaur Monument needs to be actively involved in fossil collection and preservation. It should not be a "history museum", but rather a place of active research and discovery. Visitors want to see fossils being worked on before their very eyes.

Alternatives C and D would also be acceptable to me, for many of the above reasons. Still my preferred alternative is E.

One matter not adequately addressed in the planning document is the fate of the Fossil Repository that DNM was going to build in Vernal, adjoining the Field House. It is vital that this project still go ahead and not be cancelled due to the Quarry Project. Both are needed and

- Because the Quarry Visitor Center is no longer habitable, park staff have relocated to alternate work locations. This has resulted in moderate adverse effects to park management and operations. Without implementation of one of the action alternatives, this condition would continue into the future. All of the action alternatives provide new park facilities and modern office design that would better accommodate needs of park staff, producing moderate, long-term benefits to park operations and management (see "Park Management and Operations" in the Environmental Consequences chapter).

The final design of the structure(s) would incorporate better use of energy efficiencies as discussed above in the response to the EPA's comment, above.

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**1 Project Setup** Correspondence (5) Edit  
Enter More

**2 Funding** Author Information

**3 Internal Scoping / IDT Tasks** Keep Private: Yes

**4 Natural/Cultural Compliance** Name: [REDACTED]  
Organization: [REDACTED]  
Organization Type: [REDACTED]  
Address: [REDACTED]

**5 Internal Documents** E-mail: [REDACTED]

**6 Public Communication** Correspondence Information

**7 Public Documents & Comment Analysis** Status: New Park Correspondence Log:  
Date Sent: 09/08/2007 Date Received: 09/08/2007  
Number of Signatures: 1 Form Letter: No  
Contains Request(s): No Type: Web Form  
Notes:

**Documents** View | Edit

**Correspondence** Correspondence Text

**Public Requests** I have two comments on the Draft Environmental Impact Statement / Assessment of Effect for the Quarry Visitor Center Treatment Project.

**Comments** My first comment addresses a significant problem in the Proposed Alternative (B).  
Alternative B, the NPS preferred alternative states that "the Exhibit Hall's steel and glass superstructure would either be stabilized and rehabilitated or demolished and rebuilt."

**Content Analysis Report** There are fundamental differences between "stabilizing" the Exhibit Hall and "demolishing" the Exhibit Hall. Putting both of these options, which are significantly different, into the same alternative is not appropriate and defeats the purpose of NEPA.

**Concerns** The preferred Alternative (B) needs to be separated into two distinct Alternatives, one with rehabilitation of the Exhibit Hall as the option and one with demolition and reconstruction of the Exhibit Hall as the option.

**Responses** The general text of the DEIS does indicate that the NPS would prefer to rehabilitate the Exhibit Hall but will demolish it if structural repairs are not possible or feasible based on in-depth evaluation. Unfortunately, this statement is insufficient and somewhat inappropriate because fact finding and data gathering need to be completed before the EIS is released, not after the EIS has been finalized. As part of the DEIS preparation process, the NPS needs to conduct in-depth investigations to determine if the Exhibit Hall can be successfully rehabilitated before creating the alternative. Creating an alternative that leaves sole discretion to the NPS about whether they will demolish a National Historic Landmark without further public input defeats the purpose of NEPA and the Section 106 process.

**Sub/Non-Sub Report** I would strongly recommend that the NPS conduct an in-depth evaluation of the feasibility (including cost, long term effects, etc.) of rehabilitating the Exhibit Hall in comparison to the feasibility of demolishing and rebuilding the Exhibit Hall (including cost, effects to the paleontological resources (including stipulated bone bed)). If the Exhibit Hall cannot successfully be rehabilitated (when this document lists it as a real possibility) then we (the public) need to know that information before the decision is made through the NEPA process. If the rehabilitation is possible, but will be extremely costly, then we need to know that also so we can provide our input into the decision making process (rather than letting the NPS make a

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5. Legislation and policy direct the NPS to protect and preserve the resource for which Dinosaur National Monument was established – the *in situ* fossil wall. The draft EIS cites this mandate and the need for pursuing the project in the Purpose of and Need for Action section of the document.

Because the structural issues at the Quarry Visitor Center have been long-term and ongoing, the NPS has undertaken several studies that record a variety of structural issues and problems for the structure. In 2003, the Quarry Visitor Center Historic Structure Report cataloged many structural issues at the QVC. Again in 2004, the Dinosaur National Monument Quarry Visitor Center Structural Evaluation Report cited many of the same problems. In 2006, as part of the decision-making process for this project, the park implemented a structural monitoring program. The May 2006 Life Safety Monitoring Report from this effort revealed significant risk to public health and safety, primarily in the Administrative Wing of the facility. These investigations indicate that the options for preserving the historic structure while providing long-term solutions to structural instability are limited and have low potential for success. In fact, it is estimated that only about 10 percent of the historic fabric could be reused. The results of these investigations outline the need for the project and are cited in the Purpose of and Need for Action chapter (as well as in other locations) of the EIS. The type and magnitude of work that would be done under all of the action alternatives to adequately address the

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## Comment

## Response

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decision which might be based solely on cost factors).

I think the alternative of moving the administration and visitor service functions away from the quarry site and to the current shuttle staging area is a very smart idea because you are removing many distractions from the resource itself. But the NPS needs to be clearer and more forthcoming about whether they will rehabilitate the Exhibit Hall or Replace it.

My second comment is concerning the environmental consequences of the collections and paleontological resources under Alternative A.

If the structural integrity of the Quarry Visitor center is truly a health and human safety issue because of potential structural failure, then under Alternative A the potential structural failure could also cause severe damage to the collections and the "in situ" paleontological resources on the quarry cliff face. This concept is not really addressed in the environmental consequence section and would help strengthen the NPS's argument that Alternative A is not the best alternative.

Add Comment

Comment Text:

Add Comment

Comments

ID	First 48 Characters	Status	Assigned Code(s)	Code
No comments have been identified in this correspondence.				

No comments have been identified in this correspondence.

Request Text

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Add Public Request

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No public requests have been identified in this correspondence.				

No public requests have been identified in this correspondence.

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structural stability concerns at the QVC would remove or alter original structural elements and material to the extent that the National Historic Landmark status of the building would be lost, resulting in a permanent, major adverse, effect to the historic structure (see the "Historic Structures" impact analyses in the Environmental Consequences chapter). As discussed in "Cultural Resources Consultation" above, the requirements of Section 106 compliance have been met, and the NPS plans to execute a Memorandum of Agreement with the Utah SHPO prior to completion and signature of the Record of Decision.

The potential for the *in situ* fossil wall to be impacted by continued structural instability is addressed as Impacts of Alternative A, the No Action Alternative under the "Collections" impact topic. Analysis revealed that the greatest threat to the collection was from deterioration of the Exhibit Hall that could lead to failure of structural elements. Adverse effects under continued current management could result from glass or metal components falling onto the fossil wall, increased exposure to moisture and the elements, and any structural repairs that might be necessary to stabilize the structure. Impacts from these occurrences would be long-term and minor to major in intensity.

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**LIST OF PREPARERS AND CONTRIBUTORS**

<u>Name</u>	<u>Title</u>	<u>Education</u>	<u>Experience</u>
<b>Parsons</b>			
Timberley Belish	Environmental Scientist and Technical Director	B.S. Biology and M.S. Ecology and Evolution.  Responsible for technical direction and NPS/National Environmental Policy Act requirement assurance.	16 years
Janice Biletnikoff	Environmental Planner	B.A. Psychology and M.C.R.P. Natural Resources & Environmental Planning.  Responsible for visitor use and experience, socioeconomics, accessibility with individuals with impaired mobility, and consultation and coordination.	5 years
Jacklyn Bryant	Environmental Scientist, Project Manager	B.S. Natural Resource Management and M.S. Watershed Sciences.  Responsible for team coordination and performance.	13 years
Lee Monnens	Geologist	B.A. and M.S. in Geology.  Responsible for geologic resources, public health and safety, and park operations.	25 years
Diane Rhodes	Cultural Resource Specialist	M.A. Anthropology/Archeology.  Responsible for cultural resource sections of the document.	30 years
Nicole Winterton	Environmental Scientist	B.S. and M.S. Environmental Science.  Responsible for EIS team coordination, document assembly and review, assuring conformance with NPS requirements, and general document composition.	7 years
Bart Young	Environmental Planner	B.S. Forestry and M.S. Forestry and Environmental Studies  Responsible for facilitating the interdisciplinary team during the alternatives development workshop.	33 years

**National Park Service**

<u>Name</u>	<u>Location</u>	<u>Title</u>
Mary Risser	Dinosaur National Monument	Superintendent
Christopher Moos	Dinosaur National Monument	Administrative Officer
Dan Chure	Dinosaur National Monument	Paleontologist
Bill Dye	Dinosaur National Monument	Maint. Oper. Foreman
Scott Madsen	Dinosaur National Monument	Geologist
Pam Rosal	Dinosaur National Monument	HR Assistant
Mike Haubert	Dinosaur National Monument	Park Ranger
Mike Weinstein	Dinosaur National Monument	Green River Dist. Interpreter
Gary Mott	Dinosaur National Monument	Gen. Maint. Oper. Supv.
Ann Elder	Dinosaur National Monument	Museum Curator
Carla Beasley	Dinosaur National Monument	Chief of Interpretation
Sue Walter	Dinosaur National Monument	Assistant Chief of Interpretation
Ron Shields	Denver Service Center	Project Manager
Dave Snow	Denver Service Center	Historic Architect
Elaine Rideout	Denver Service Center	NEPA Specialist
Tom Thomas	Denver Service Center	Cultural Resource Specialist

**Intermountain Natural History Association**

Richard Millet    Executive Director

## LIST OF RECIPIENTS

The following federal, state, and local government agencies; elected officials; tribes; and libraries have been sent a copy of the final EIS. In addition, individuals, businesses, organizations, media outlets, and other groups that have expressed interest in Dinosaur National Monument in the past have been sent letters stating that the final EIS was available for review and comment.

### Federal Agencies

Advisory Council on Historic Preservation	Bureau of Indian Affairs
Bureau of Land Management, Vernal Field Office	Bureau of Land Management, White River Field Office
Bureau of Land Management, Little Snake Area Office	Bureau of Reclamation, Provo Area Office
Bureau of Reclamation, Dutch John UT	NPS, Intermountain Region
NPS, Washington DC	National Resource Conservation Service, Vernal UT
U.S. Army Corps of Engineers	U.S. Department of Agriculture, Steamboat Springs CO
U.S. Department of Agriculture, Craig CO	U.S. Fish and Wildlife Service , Grand Junction CO
U.S. Fish and Wildlife Service, Vernal UT	U.S. Fish and Wildlife Service, Meeker CO
U.S. Forest Service – Ashley National Forest	U.S. Fish and Wildlife Service, West Valley City UT
U.S. Forest Service – Routt National Forest	U.S. Forest Service – Medicine Bow-Routt National Forest

### State Agencies

Colorado State Historic Preservation Officer	Colorado Department of Water Resources
Utah State Historic Preservation Office	Colorado Division of Wildlife
Utah Field House of Natural History State Park Museum	Utah Department of Natural Resources
Utah Geological Survey	Utah Department of Natural Resources, Division of Water Resources
Utah State Parks and Recreation	Yampa River Legacy State Park
Utah Department of Wildlife Resources	School and Trust Lands Administration

**Local Agencies**

Craig Chamber of Commerce  
UBAOG  
Vernal Chamber of Commerce

Rangely Area Chamber of Commerce  
Uintah County Farm Service Agency

**Elected Officials**

*State and Federal Elected Officials*

Colorado Governor Bill Ritter

Colorado State Senator Jack Taylor,  
District 8

Colorado State Representative Albert C.  
White, District 57

Congressman Mark Udall, Colorado  
District 2

Congressman John T. Salazar, Colorado  
District 3

Congressman Jim Matheson, Utah District  
2

Senator Bob Bennett (Utah)

Senator Ken Salazar (Colorado)

Senator Orrin Hatch (Utah)

Senator Wayne Allard (Colorado)

Utah Governor Jon M. Huntsman Jr.

Utah Representative John G. Mathis,  
District 55

Utah State Senator Kevin VanTassell,  
District 26

*County and Local Elected Officials*

Daggett County Commissioners

Mayor, City of Craig

Mayor, City of Vernal

Mayor, Town of Dinosaur

Mayor, Town of Rangely

Moffat County Commissioners

Uintah County Commissioners

**Tribes**

Shoshone - Bannoca Tribes

Shoshone Business Council

Uintah and Ouray Tribe

**Local Libraries**

Moffat County Public Library (Craig)

Uintah County Public Library (Vernal)

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### **Cowardin, Lewis M., Virginia Carter, Francis C. Golet, and Edward T. LaRoe**

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### **Dean Runyan Associates**

- 2004      *The Economic Impact of Travel in Colorado, 1996-2003.* Prepared for the Colorado Tourism Office, Office of Economic Development and International Trade.

### **Dilsaver, Diana**

- 2005      Personal communication between Diana Dilsaver, Dinosaur National Monument Safety Chairperson and Lee Monnens, Parsons, on November 14, 2005.

### **Dye, Bill**

- 2005a      Personal communication between Bill Dye, General Operations and Maintenance Foreman, Dinosaur National Monument, and Nicole Winterton, Parsons, on August 8, 2005.
- 2007      Personal communication between Bill Dye, General Operations and Maintenance Foreman, Dinosaur National Monument, and Lee Monnens, Parsons, on January, 3, 2007.

### **Hagood, Allen and West, Linda**

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### **Intermountain Natural History Association (INHA)**

- 2005      About INHA. Accessed on the Internet at <http://www.inhaweb.com/about.html>.

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### Madsen, Scott

2006 Personal communication between Scott Madsen, Geologist, Dinosaur National Monument and Lee Monnens (Parsons) on December 19, 2006

### McCormick, Kaitlin

2003 Lithostratigraphic Column of Dinosaur National Monument and Vicinity, Utah and Colorado. Accessed on the Internet at <http://www.eiu.edu/~cfrbi/parks/dino/dinostratco/final2.doc>.

### Millet, Richard

2005 Personal communication between Richard Millett, Executive Director of Intermountain Natural History Association, and interdisciplinary team during January 19 to 20, 2005 Alternatives Workshop.

2007 Personal communication between Richard Millett, Executive Director of Intermountain Natural History Association, and Jacklyn Bryant (Parsons) during telephone conversation regarding conditions at IHNA, January 22, 2007.

### Moos, Christopher

2005 Personal communication between Chris Moos, Administrative Officer, Dinosaur National Monument, and Nicole Winterton, Parsons, on August 12, 2005.

### National Park Service (NPS), U.S. Department of the Interior

No date a Dinosaur National Monument park brochure

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- 2004c *Director's Order 58: Structural Fire Management*
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## **APPENDIX A: CONSULTATION CORRESPONDENCE**

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L7617 (DINO-R&RM)

November 23, 2005

Henry Maddux  
Fish and Wildlife Service  
2369 W. Orton Circle  
Suite 59  
West Valley City, Utah 84119

Reference: Stabilize Quarry Visitor Center; Dinosaur National Monument

Dear Mr. Maddux:

The National Park Service (NPS) and Dinosaur National Monument are beginning to prepare an environmental impact statement (EIS) that analyzes the impacts of a broad range of design alternatives to stabilize, rehabilitate, reconstruct or replace the historic Quarry Visitor Center at Dinosaur National Monument. Since 1957, the Quarry Visitor Center has protected and provided visitor access and interpretation of "the greatest quarry of Jurassic dinosaurs in the world." The building has been designated a National Historic Landmark as an outstanding example of Mission 66 "Park Service Modern" architectural design.

Unfortunately, the building has experienced problems with movement resulting from moisture penetrating the expansive clay underlying the foundation since its construction. The visitor center has suffered extensive structural damage due to this movement. Attempts to stabilize the building have been ongoing for 40 years with major projects undertaken in 1967 and during the 1980s. Despite these efforts, the building continues to deteriorate and presents safety concerns and costly ongoing maintenance issues.

As part of the scoping for this project, we are requesting any information regarding listed or proposed threatened or endangered species or critical habitats that might occur in the project vicinity and any special management considerations for such species. We also welcome any comments you may have regarding the project. Our intent is to address any agency concerns and incorporate recommendations into the planning process at the earliest possible time.

If you have any questions, please contact Wayne Prokopetz of my staff at the above address or by telephone at (435) 781-7721. Your participation in the scoping process for this project is important to us and we look forward to hearing from you.

Sincerely,

/s/

Superintendent, Dinosaur National Monument

cc:

DINO – Wayne Prokopetz  
DINO – central files  
DINO – reading files  
DINO - Superintendent  
DSC-DC – Elaine Rideout

## APPENDICES

L76 (DINO-R&RM)  
H30

June 22, 2005

### **Certified Mail, Return Receipt Requested**

Mr. Wilson Martin  
State Historic Preservation Officer  
Utah State Historical Society  
300 Rio Grande  
Salt Lake City, Utah 84101

Reference: Dinosaur National Monument, Draft Environmental Impact Statement for  
Rehabilitation of the Quarry Visitor Center

Subject: Section 106 Review

Dear Mr. Martin:

As you know, the National Park Service is beginning to draft an environmental impact statement (DEIS) for stabilization, rehabilitation, or replacement of the historic Quarry Visitor Center at Dinosaur National Monument. The purpose of this letter is to provide your office formal notice of the planning process.

The Quarry Visitor Center was constructed in 1957-1958 and protects and allows interpretation of the "greatest quarry of Jurassic dinosaurs in the world." The building is a National Historic Landmark due to its unique Park Service Modern design and relationship to the resource. The Quarry Visitor Center (QVC) was erected specifically to protect and showcase the dinosaur fossils exposed in the rock face that now make up one wall of the visitor facility. The structure protects the fossils from vandalism and theft, and from erosion by rain and snow, which would quickly degrade the fossils if they were left exposed. The building and quarry provide a personal experience with the fossils through education, viewing, and even touching.

The Quarry Visitor Center has experienced problems with foundation movements since its construction. The building suffers extensive structural distress due to differential movements between foundation elements that bear on moisture sensitive expansive clay strata. Attempts to stabilize the building have been ongoing for 40 years with major projects undertaken in 1967 and during the 1980s. Despite these efforts, the building continues to deteriorate and present safety concerns to both staff and visitors.

The draft environmental impact statement (DEIS) for the Quarry Visitor Center will analyze the impacts of a broad range of alternatives to address the structural, safety, and accessibility shortcomings of the existing structure. The DEIS will provide detailed descriptions of alternative methods to deal with these concerns, and, as required by law, a no-action alternative. The DEIS also will analyze the potential impacts associated with possible implementation of each alternative and will describe the rationale for choosing the preferred alternative. These details will be reiterated in a Section 106 Summary in the DEIS. Also contained in the DEIS will be measures that would help avoid adverse effects on cultural resources.

Although information gathering for this project has just begun, we acknowledge that its eventual implementation may affect the Quarry Visitor Center, a National Historic landmark and a property that is included in the National Register of Historic Places. Therefore, we would like to invite your office to continue to participate in the development of this planning effort in accordance with 36 CFR 800, and with the 1995 Servicewide Programmatic Agreement among your office, the National Conference of State Historic Preservation Officers, and the National Park Service.

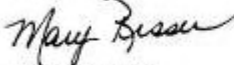
This letter also is to notify your office that we plan to use the environmental impact statement process to accomplish compliance for both Section 106, in accordance with the National Historic Preservation Act, as amended, and the National Environmental Policy Act (as described in 36 CFR 800.8 (a-c)) to analyze potential effects from the proposed project. (A similar notification letter has been sent to the Advisory Council on Historic Preservation).

The National Park Service is aware that American Indians and other traditional groups may have concerns related to cultural sites, so contacts have been made with tribes that have expressed an interest in the park. This consultation is intended to ensure that mutually held goals for management of important natural and cultural resources are met.

As soon as the DEIS is completed, we will send it to you for your review and comment. We look forward to your participation and input on the planning process. We believe that your ongoing participation will continue to result in better planning for cultural resources management, and will help ensure that cultural resources are adequately considered during preparation of the DEIS. Consultation and coordination with other governmental agencies and with interested publics also has been undertaken.

As soon as the draft environmental impact statement is completed, we will send it to you for your review and comment. Should you have any questions or desire additional information, please contact me at (970) 374-3001.

Sincerely,



Mary Risser  
Acting Superintendent

Similar Letter sent to:

Mr. Don Klima  
Advisory Council on Historic Preservation  
12136 West Bayaud Avenue, Suite 330  
Lakewood, Colorado 80228

bcc:

NPS-DSC-Shields  
Parsons-Denver-J. Bryant, D. Rhodes  
Chief, Research & Resources Management  
central files

## APPENDICES

L76 (DINO-R&RM)  
H30

June 22, 2005

### **Certified Mail, Return Receipt Requested**

Mr. Don Klima  
Advisory Council on Historic Preservation  
12136 West Bayaud Avenue, Suite 330  
Lakewood, Colorado 80228

Reference: Dinosaur National Monument, Draft Environmental Impact Statement for  
Stabilization, Rehabilitation, or Replacement of the Quarry Visitor Center

Subject: Section 106 Review

Dear Mr. Klima:

The National Park Service (NPS) is beginning to draft an environmental impact statement for stabilization, rehabilitation, or replacement of the historic Quarry Visitor Center at Dinosaur National Monument. The Quarry Visitor Center was constructed in 1957-1958 and protects and allows interpretation of the "greatest quarry of Jurassic dinosaurs in the world." The building is a National Historic Landmark due to its unique Park Service Modern design and relationship to the resource.

The Quarry Visitor Center (QVC) was erected specifically to protect and showcase the dinosaur fossils exposed in the rock face that now make up one wall of the visitor facility. The structure protects the fossils from vandalism and theft, and from erosion by rain and snow, which would quickly degrade the fossils if they were left exposed. The building and quarry provide a personal experience with the fossils through education, viewing, and even touching.

The building has experienced problems with foundation movements since its construction. The building suffers extensive structural distress due to differential movements between foundation elements that bear on moisture sensitive expansive clay strata. Attempts to stabilize the building have been ongoing for 40 years with major projects undertaken in 1967 and during the 1980s. Despite these efforts, the building continues to deteriorate and present safety concerns to both staff and visitors.

The draft environmental impact statement (DEIS) for the Quarry Visitor Center will analyze the impacts of a broad range of alternatives to address the structural, safety, and accessibility shortcomings of the existing structure. The DEIS will provide detailed descriptions of alternative



methods to deal with these concerns, and, as required by law, a no-action alternative. The DEIS also will analyze the potential impacts associated with possible implementation of each alternative and will describe the rationale for choosing the preferred alternative. These details will be reiterated in a Section 106 Summary in the DEIS. Also contained in the DEIS will be measures that would help avoid adverse effects on cultural resources.

Although information gathering for this project has just begun, we acknowledge that its eventual implementation may affect a National Historic landmark and a property that is included in the National Register of Historic Places. Therefore, we would like to invite your office to participate in the development of this planning effort in accordance with 36 CFR 800, and with the 1995 Servicewide Programmatic Agreement among your office, the National Conference of State Historic Preservation Officers, and the National Park Service.

This letter also is to notify your office that we plan to use the environmental impact statement process to accomplish compliance for both Section 106, in accordance with the National Historic Preservation Act, as amended, and the National Environmental Policy Act (as described in 36 CFR 800.8 (a-c)) to analyze potential effects from the proposed project.

The National Park Service is aware that American Indians and other traditional groups may have concerns related to cultural sites, so contacts have been made with tribes that have expressed an interest in the park. This consultation is intended to ensure that mutually held goals for management of important natural and cultural resources are met.

As soon as the draft environmental impact statement is completed, we will send it to you for your review and comment. We look forward to your participation in the planning process. We believe that it will ensure that cultural resources are adequately considered during the planning process while meeting management needs and objectives.

Should you have any questions or desire additional information, please contact me at 970 374-3001.

Sincerely,



Mary Risser  
Acting Superintendent

bcc:  
Chief, Research and Resources Management  
central files  
NPS-DSC-Shields  
Parsons-Denver-J. Bryant, D. Rhodes

APPENDICES

L76 (DINO-R&RM)  
H30

July 5, 2005

CERTIFIED MAIL – Return Receipt Requested

Chairman Maxine Natchees  
Ute Indian Tribe  
Fort Duchesne, Utah 84026

Dear Chairman Natchees:

This letter is to inquire if you desire to undertake government-to-government consultation in conjunction with a proposed environmental assessment. The National Park Service is beginning to draft an environmental impact statement (DEIS) for stabilization, rehabilitation, or replacement of the historic Quarry Visitor Center at Dinosaur National Monument.

The Quarry Visitor Center was constructed in 1957-1958 and protects and allows interpretation of the "greatest quarry of Jurassic dinosaurs in the world." The building is a National Historic Landmark due to its unique Park Service Modern design and relationship to the resource. The Quarry Visitor Center (QVC) was erected specifically to protect and showcase the dinosaur fossils exposed in the rock face that now make up one wall of the visitor facility. The structure protects the fossils from vandalism and theft, and from erosion by rain and snow, which would quickly degrade the fossils if they were left exposed.

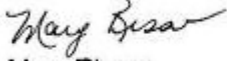
The Quarry Visitor Center has experienced problems with foundation movements since its construction. The building suffers extensive structural distress due to differential movements between foundation elements that bear on moisture sensitive expansive clay strata. Attempts to stabilize the building have been ongoing for 40 years with major projects undertaken in 1967 and during the 1980s. Despite these efforts, the building continues to deteriorate and present safety concerns to both staff and visitors.

The draft environmental impact statement (DEIS) for the Quarry Visitor Center will analyze the impacts of a broad range of alternatives to address the structural, safety, and accessibility shortcomings of the existing structure. The DEIS will provide detailed descriptions of alternative methods to deal with these concerns, and, as required by law, a no-action alternative. The DEIS also will analyze the potential impacts associated with possible implementation of each alternative and will describe the rationale for choosing the preferred alternative.

*Appendix A: Consultation Correspondence*

Please contact me at your earliest convenience if you wish to undertake government-to-government consultation. Even if you do not wish to engage in formal consultation, I would welcome any thoughts and recommendations you might have about this project. Please call me at (970) 374-3001.

Sincerely,



Mary Risser  
Acting Superintendent

bcc:  
NPS-DSC-Shields  
Parsons-Denver-J. Bryant, D. Rhodes  
Chief, Research & Resource Management  
central files

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**APPENDIX B: CHRONOLOGY OF USE AND DEVELOPMENT  
AT QUARRY VISITOR CENTER**

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Information in this appendix was excerpted from the park's historic structure report (NPS 2003a).

### **Chronology of Development and Use**

Note: The following information has been obtained from NPS files and compiled by a number of different sources within the service.

- 11/01/55 "Quarry Area Utilities, Part of the Master Plan, Dinosaur National Monument", Drawing Number NM-DIN/3122A. Landscape Architectural Branch, Western Office Division of Design and Construction.
- 08/31/56 "Visitor Center – Quarry Site, Preliminary Drawings", NM:DIN/3102-D. Anshen and Allen Architects. Signed by Conrad Wirth, Director of the National Park Service, and father of the NPS Mission 66 program.
- 11/01/56 Dames and Moore Building Foundation Soils Investigation. (See 05/17/66 "Proposal, Investigative Studies, Adverse Settlement, Visitor Center Building, Dinosaur National Monument. - Previous Investigation").
  - A somewhat limited (preliminary) foundation investigation.
  - Four shallow test pits.
  - "Under undisturbed non-weathered conditions, both the shale and sandstone are rock-like in character. When subjected to water, the shale loses strength. Water present in the shale at the time of freezing will cause expansion of the shale. Movement of sandstone or freezing will be limited largely to ice action in joints and cracks".
  - "The need for protection of the foundation from moisture infiltration was stressed prior to construction."
- 12/29/56 "Visitor Center – Quarry Site, Construction Drawings", NM:DIN/3102-E & 3112A. Anshen and Allen Architects of San Francisco, California.  
See "Mission 66 Visitor Centers" by Sarah Allaback for construction narrative.
- 04/05/57 Contract No. 14-10-232-196, Visitor Center, Quarry Area Dinosaur National Monument, was awarded to R. K. McCullough Construction Co. of Salt Lake City, Utah. The contractor moved on the site and began construction on May 1, 1957.
- 11/15/57 "Visitor Center – Quarry Site, Construction Drawings", NM:DIN/3102-G. Anshen and Allen Architects.
- 05/09/58 Quarry Visitor Center was completed and accepted. Total Floor Area = 18,060 SF at a cost of \$366,154. (1960 Completion Report.)
- 06/01/58 Quarry Visitor Center was dedicated.
- 03/20/59 Exhibit Layout – Visitor Center – Quarry Site, Construction Drawings, NM:DIN/3102-F. Anshen and Allen Architects.

## APPENDICES

- 04/28/59      Completion Report of Construction Report for Visitor Center – Quarry Area. Superintendent, Dinosaur NM.
- 08/22/60      Contract to Repair and Remodel the Visitor Center Roof and Completion Report, Maintenance Supervisor, Dinosaur NM.
- Circular Admin. Wing roof rehabilitated with one center drain, insulation, flashing, and roofing replacing 3 original perimeter roof drains. (One perimeter roof drain not disconnected from high roof drain. Condition problem found at a later date.)
  - Circular Admin. Wing roof connection to Exhibit Hall wall reworked for better drainage.
  - Exhibit Hall excess asphalt deposits removed and roofing partially reinforced with metal batten strips for wind protection. (Wind damage in 1959.)
  - Exhibit Hall copper roof expansion joint cleaned and sealed.
  - Exhibit Hall built-up asphalt roofing replaced.
- 02/14/62      Memorandum - Damage...Circular Element...Roof, Maintenance Supervisor, Dinosaur NM.
- Severe roof leak poured 75 to 100 gallons of water through upper and lower lobby of the Administrative Wing of the Visitor Center on February 8, 1962.
  - Roof drainage work done on the Administrative Wing in 1960 was not properly completed. Exhibit Hall roof water drained to grade by a 4" diameter pipe located just inside the east wall. One of the original three perimeter Admin. Wing drains was still connected to the Exhibit Hall roof drain.
  - A new site French drain line under construction for both roofs on the building east side had frozen and backed up through connected drain pipes to the Admin. Wing roof.
  - The consequently plugged and rerouted high roof drainage then drained out the west valley of the Exhibit Hall roof on to the ground next to the main column B1 foundations for a number of months.
- 05/14/62      Memorandum – Inspection of damage and proposed repairs, Supervising Structural Engineer, RMR.
- The damage to the building was caused by wetting of the bentonite soils under the footing of Column B-10, the north jamb of the driveway doors at the east end, the footing under the west wall of the mechanical equipment room and under the gallery slab at the lower level and near the east end of the building.
  - The wetting of the soils was caused variously by washing down the lower gallery, frozen roof drains at east end causing water to collect at east end of building and the unfinished paving job started last September.



- 08/16/62 Visitor Center Plaza Reconstruction, Construction Drawings, NM:DIN/3149C, Western Office Design and Construction, NPS.
- Installed ramp metal handrails.
  - Replaced ramp steps with paved walk and ramp extension.
  - Installed cobble stone concrete slab around ramp to facilitate site drainage.
  - Installed paved walk, curb, drive, and service road to facilitate site drainage.
  - Installed subsurface site open joint French drain lines with catch basins on three sides (E, W, and S) of the building exterior.
  - Installed parking lot metal pipe guardrail.
  - Exhibit Hall roof drainage system continues to drain to building east.
- 11/21/62 Memorandum – Report of Interview with Asst. Dir. Baggley, Museum Geologist, Dinosaur NM.
- Original hoist was hand operated. Geologist suggests electrified hoist.
  - Gaps between the cliff exhibit and foundation wall. Suggested laid up masonry to fill the gaps.
  - Puddles of snow melt against the north side of the building. No suggested remedies.
- 02/15/66 Memorandum– Emergency Repairs of Sub-floor Waterlines..., Chief of Area Services, Western Office Design and Construction, NPS.
- Recommendations made for repair of problems investigated.
  - East wall ¾" water line broken and leaking over long period of time noted.
  - Repair.
  - Crack in Lobby floor slab is expanding. Excavate and replace slab.
  - Replace 3 cast iron water gate valve boxes on the 8" water main in the Exhibit Hall driveway with larger boxes.
  - Repair and replace Mechanical Room inoperative floor drains.
  - Repair roof leaks with tar.
  - Ground surface around ramp piers bulging upward causing pavement to crack, piers to rise, and ramp cracks. Replace broken cobble pavement with bituminous pavement, chip, and seal.
  - Seal ramp structure cracks.
  - Seal upper ramp drainage scupper and pipe lower drainage scupper to the east drain line.
  - Water appears at quarry wall cracks. Re-grade north hill away from building.
  - Vitrified clay pipe roof drainage line at east end of building cracked. Replace

## APPENDICES

clay pipe drain with steel pipe.

- Concrete parking lot curbs are disintegrating. Correct later.
- Paved entrance road is very unstable. Cracking a constant problem.

03/18/66 Memorandum – Visitor Center Damage Inspection, Chief Engineer, D&C, SSC, NPS.

- East wall water line break caused east wall movement and exterior paved surfaces to heave.
- Suggestion made to re-level or realign paving slabs with injected oil into soil below slabs and drive heavy equipment over the slabs. Environmental degradation?
- Suggestion to re-align underground drains to south side of building under service drive or parking lot.
- Suggestion to replace the mechanical room floor slab because of heaving and inoperative floor drain.

04/27/66 Memorandum – Quarry Center Problem Analysis, Civil Engineer, D&C, SSC, NPS.

- Proceed with emergency repair work proposed in the construction drawings and specifications prepared previous to this memo.
- Water supply at Quarry shows signs of minerals in the water which clog and corrode heaters, piping, and appurtenances. Talk to manufacturers for suggested solutions.
- Extreme summer and winter temperatures coupled with lack of ventilation affect workmen on the face of the quarry wall. Experiment with evaporative coolers and infra-red unit heaters mounted on the traveling crane suggested. The existing Quarry water supply tank in its present location constitutes an intrusion on the landscape. Location survey and estimate needed.
- New lower roof mounted fire siren suggested.

05/17/66 “Proposal, Investigative Studies, Adverse Settlement, Visitor Center Building Dinosaur National Monument” – Dames and Moore, Consultants in Applied Earth Sciences.

- A proposal for investigative studies of apparent settlement problems at the Visitor Center Building.
- The damaged area of the building is generally limited to...the lower portion of the east end wall.
- A number of large glass windows have broken each year.
- Separation in the lower portion of the wall approximately two inches wide.
- Necessary to shorten doors to make them function properly.

- Several structural members are severely strained and show evidence of buckling.
- Sidewalks adjacent to building have been replaced at least once and now are offset at the joints by as much as three to four inches.
- Cobblestone area beneath the spiral walkway and adjacent to the building has sheared and is offset vertically approximately five to six inches.
- Support piers for walkway appear to have settled slightly.
- Walkway has moved at the joint where it connects to the building.
- Slight cracking of internal non-bearing walls.
- Floor slab shows evidence of cracking in building but does not appear serious.
- Boiler room floor slab shows evidence of more serious cracking.
- North wall, on sandstone, at upper level has a few hairline cracks but nothing serious.
- South wall does not appear to be damaged.
- Traveling crane appears to be functioning satisfactorily but has slight distortion at the center of the track.
- We understand that the building has never performed according to design expectations.
- Settlement and stress in the east end wall was noted soon after construction.
- The area immediately adjacent to the spiral walkway on east end was not paved until after some distress appeared.
- Roof drainage downspout on the west end was originally allowed to empty adjacent to the foundations. Downspout moved after minor distress appeared.
- East end wall, tile drainage line from roof, recently uncovered, shattered and ineffective.

06/03/66 Memorandum – Quarry Visitor Center Repair, Superintendent, Dinosaur NM.

- Temporary repairs under contract M. Rasmussen, Vernal, Utah, will begin.
- Smooth up the entrance walk area for safety.
- Replace broken windows
- Repair leaky roof drains

06/24/66 Repair Buildings – Dinosaur Quarry Area, Construction Drawings, NM-DIN/2046-A, Maintenance Division, Midwest Regional Office, NPS.

- Re-graded ground on north & south side of building for better site drainage.

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- Realigned the pavement slab surface at east plaza.
- Changed Exhibit Hall roof drainage system to drain to driveway south of the building by connecting upper Exhibit Hall roof drains to lower Lab Wing south roof drainage system.
- Installed galvanized steel pipe for roof drainage across site from building and into south driveway, east down the driveway, to catch basin #2.
- Built drain inlet #1 on said pipeline.
- Cut French drain from west into said inlet.
- Installed drainage inlet #2 beneath lower ramp scupper and plugged upper scupper.
- Extended galvanized steel pipeline to drain inlet #2.
- Repaired Boiler Room floor drain.
- Re-glazed 13 damaged windows.

07/01/66 “Results of Pressure Test on Water System at Visitor Center” , M. Rasmussen, Consultant General Contractor, Vernal, Utah.

- Cold water system leaks approx. ½ gallon per hour.
- Sewer from upper lobby restroom leaks 14 gallons per hour.
- 8” site water line on west side of building leaks 6 gallons per hour.
- Building supply valve dripping water.

07/14/66 “Report of Investigative Studies, Adverse Movement”, Dames & Moore, Consultants in Applied Earth Sciences, Job No. 2050-014-06.

- Seven test borings in and around the building area.
- Laboratory test results on test borings to depths ranging from 5 to 60 feet below existing ground surface.
- “...building is founded upon the Morrison formation which consists of alternate layers of shales and sandstones with some limestone....The stratification dips to the south at an angle of approximately 65 degrees with the horizontal. The strike of the formation corresponds approximately with the alignment of the longitudinal axis of the building. The upper foundations for the north wall of the building are supported on a layer of sandstone. However, at the lower levels of the building, the sandstone is overlain by shale.”
- “In general, the sandstone layers are quite hard and resist weathering. The shale formation is quite firm to very hard with few fractures. However, when exposed to air or moisture the shale loses strength and slakes.”
- “Bentonitic shales were noted in the shale strata. Bentonitic shales are moisture sensitive; that is they exhibit large changes in volume with changes in moisture content...”

- “A layer of limestone was found.... This corresponds with the approximate location of “sinkholes “ observed ... at the time of construction.”
  - Opinions of the cause of adverse movement.
  - Recommendations for damage correction and damage cause elimination methods.
  - Note: The traveling crane seems to be functioning satisfactorily.
- 08/31/66      Memorandum - “Emergency Repair...”, Superintendent, Dinosaur NM.
- The east wall of the Quarry Visitor Center has shown distress.
  - Vertical steel columns have deflected.
  - A concrete wall has been pulled free of the column.
  - 15 panes of the window wall have broken.
  - Double entrance doors and interior doors have repeatedly jammed shut.
  - Temporary repairs to provide minimal public safety...were made during late May and June. Repairs have begun to fail in portions of the entrance walk.
  - We urge plans and specifications be expedited...
- 12/13/66      Memorandum - “...Proposed Emergency Repairs, Quarry Visitor Center..., Chief of Maintenance, MWR.
- The eastern most main column is being tilted and bent by upward forces exerted against it by expanding foundation material.
  - The roof has developed leaks.
  - The concrete slab at the eastern extremity of the lower observation gallery is buckled and fractured by the up-thrust that tilts the column.
  - Floor covering on the upper gallery, has been damaged by the roof drainage.
  - Water lines located under the floor were broken by the said upthrust.
  - The front plaza concrete sidewalks and the cobble surfaced concrete pavement on the plaza were fractured by the movements of the sub-grade materials.
  - Clay pipe lying beneath the pavement for disposal of roof drainage was fractured...
  - Snow melt and storm runoff from the inclined ramp and adjacent paved surfaces entered beneath pavement...through fractures in the slab...
  - Imperative to keep service driveway surface impervious to moisture. Surface has been cut for installation of the new roof drain line. Possible water penetration.
- 07/27/67      Memorandum – Study proposed repairs...to Visitor Center...to facilitate issuance of bids..., Civil Engineer, D&C, SSC, NPS.

## APPENDICES

- Extend only the lower lobby. Clear glass to be used in east end wall panels rather than opaque plastic. Ventilators to replace fixed glass shown on Drawing No. NM-DIN-3330.
- Construct the column foundation stabilization and doorway foundations as shown on Drawing No. NM-DIN-3330.
- Do not remove or relocate the water lines.
- Repair main collection sewer line under lower lobby floor.
- Install dresser coupling on roof drain line at center point.
- Repair main roof by installing metal strips and apply 3-ply built-up roof.

09/06/67

Repairs to Visitor Center, Quarry Site, Construction Drawings, NM-DIN/3330-A, Revised 04/68, D&C, SSC, NPS.

- Stabilized column Bio by replacement of existing footings with 40' caissons, grade, and tie beams.
- Stabilized east and west driveway door columns by replacement of existing footings with 20' caissons and grade beams.
- Horizontal and vertical building elements aligned with hydraulic jacks. Doors replaced.
- Repaired Exhibit Hall roof by installing additional metal strips and new 3ply built-up roofing.
- Extended the lower level Lobby to the north with metal window wall and lower east wall of opaque window wall panels into the Visitor's Gallery. Improved visitor circulation. Included replacement of the concrete floor slab in the new lobby extension and replacement of floor finishes in the existing lobby.
- Extended the upper level Visitor's Gallery floor with handrail to the east window wall. Improved visitor circulation.
- Restored east driveway doors and lobby doors to working condition.
- Replaced several fixed sash windows on the east and west wall elevations with operable sash for better Exhibit Hall ventilation.
- Removed hose hydrant at base of column Bio.
- Repaired main collection sewer line under lower Admin wing floor.
- Removed and rerouted fire hose cabinet 2-inch water line in first floor lobby.
- Repaired Exhibit Hall roof horizontal drain line with slip coupling.
- Note: The hot water radiant heat pipes in the floors of the quarry galleries are no longer being used.

*Appendix B: Chronology of Use and Development  
at Quarry Visitor Center*

- 03/25/68 Change Order No. 1 to Contract No. 14-10-7-971-116 dated 01/22/68, Construction of Repairs to Visitor Center, Chief Contract Administration and Construction, SSC, NPS.
- Remove and replace vinyl asbestos floor tile in existing lower floor lobby, approximate area 1,100 sq. ft.
  - Remove and replace the concrete floor slab in the new lobby extension, including the portion extending beyond and supporting the handrail. Approximate area 280 sq. ft.
  - Disconnect and remove hose hydrant located at base of column B-10. Provide drain at low point and access door in plywood paneling...
  - Substitute "Mirawall" opaque panels in lieu of plate glass in the areas below the horizontal mullions placed at handrail height in the lower lobby.
  - Remove and reroute the 2-inch water line to the fire hose cabinet in the first floor lobby.
  - In lieu of replacing all of the 4-inch sewer line beneath the floor, expose and test the line beneath the floor and repair and replace with ductile iron pipe, using dresser couplings, the broken section of pipe found outside the foundation wall. Also provide a sleeve of 8-inch pipe through the foundation wall...
- 02/01/69 Reconstruction Plaza & Entry Walks, Quarry Area, Construction Drawing Number 122/41,001, D&C, SSC, NPS.
- Replaced existing concrete cobble surface near ramp with gravel over asphalt.
  - Replaced existing concrete walk near ramp with bituminous walk with chips.
  - Installed inlet sump near ramp, repaired drains, and extended a parking lot drain pipe.
- 06/15/72 "Painting Exterior, and Partial Painting of Interior, Quarry Visitor Center", Specification, Bid Material, Superintendent, Dinosaur NM.
- Painted complete exterior and partial interior of the Exhibit Hall portion of the building.
- 09/01/76 "Report on Survey of Environmental Health Facilities", J. McCutchen, NPS Consultant, Public Health Service.
- Sewage Disposal. Sewage from the VC is discharged to a 3,380 gallon concrete septic tank located in the parking lot, and the effluent flows by gravity to dual dosing siphons and trench beds located near residence #46 in the residential area. A new sewage system is under construction at the present time.
  - Solid Waste. Solid waste from the quarry area is hauled to Vernal, Utah for disposal in the City landfill.
  - Water Supply. Water for the VC is supplied by a 6-inch drilled, encased well and submersible pump, 900 feet deep, located about 500 feet north of the

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parking area. The water is metered, chlorinated, and pumped to a 50,000 gallon steel reservoir located about ¼ mile northwest of the well, from where it is distributed to the system. A new water line has been installed from the Jensen, Utah water supply. After the present construction is finished all water will be supplied by this line, the well will be used as a standby.

05/01/78 “Reconditioning Road, Parking Areas and Resurfacing Visitor Center Road Plan”, Construction Drawing Number 122/41,024A, Denver Service Center.

- Quarry Visitor Center 4” bituminous concrete parking lot and bituminous peripheral walk installed.
- Service road is indicated as bituminous.
- Wood handrails, timber curb, wood benches installed east of Quarry Center.

06/14/78 Memorandum - ...Review of Roads..., Chief of Division of Maintenance, RMR.

- The quarry building is undergoing additional movement this year that appears to be different from that previously experienced. The southerly footing wall is being pushed away from the building proper causing ½ inch gaps in concrete block and in wallboard on the interior. There appears to be a very large sized fault visible outside of the building in the driveway extending on up the hillside and under this portion of the building...
- The Chief of Maintenance needs to re-roof and insulate the quarry area buildings.

01/13/83 Memorandum – ...technical assistance for correcting water line breaks beneath the Quarry Visitor Center, Environmental Engineer, Branch of Buildings and Utilities, RMR.

- In 1982 and early 1983, the 8-inch waterline broke three times; twice approximately 25-30 feet from the west door and the latest break 10 feet from the east door.
- The latest break sheared the pipe in two. The other breaks consisted of one shear and one puncture type.
- Water from the latest break caused extensive damage and severe soil deformation problems: (1) Large crack in pedestrian access ramp to visitor center; (2) separation of access ramp from visitor center; (3) crack and heave in first floor of visitor center; (4) severe deformation of west service door frame; (5) numerous windows popped out; (6) one-half inch wide crack in asphalt outside of east pedestrian door.

03/21/83 Memorandum - Building inspection to evaluate damage caused by recent shifting, General Engineer, Branch of Buildings and Utilities. RMR.

- “After the repair and modification (1967), the building was relatively stable with some constant shifting causing windows to shift and crack and doors to bind creating constant repair work.”
- In 1982 and early January 1983, several breaks occurred in the 8-inch diameter water line which ran underground just north of the lower observation area



and at the foot of the quarry. When this break occurred it saturated the gravel bedding below the concrete floor quickly reaching all areas below the floor. This allowed the bentonite to become saturated and to expand causing considerable movement and damage to the building.

- (Trip Report by Ann Hitchcock, Chief Curator, October 15, 1985, states that the water pipe breaks happened once in 1983 and twice in 1984. The amount of water released was approximately 400,000 gallons.)
- Immediate 8" diameter pipeline repair included placing the waterline in an accessible, drainable, and below ground, pre-cast concrete, insulated pipe chase with pressure-reducing and shut off valves.
- Water from the latest break caused extensive damage and severe soil deformation problems including:
- Access ramp separated from the visitor center.
- Column Bro lifted and in turn lifted the entire east glass window wall creating a crack between the bottom of the window wall and the concrete foundation wall.
- Severe deformation of east and west service door frames caused the doors to bind.
- Numerous windows popped out of the stressed window walls.
- Concrete floor slabs in the lower lobby, library, and work rooms cracked and raised unevenly causing shear cracks in the interior walls and doors to bind.
- The asphalt surface has cracked outside the east pedestrian door.

10/15/85

Memorandum - Chief Curator, NPS.

- Several actions have been taken to improve collection preservation.
- Fire detection and suppression, and security systems have been installed.
- Halon 1301, in the park library and Paleontological Library.
- Fire sprinkler system in the laboratory.
- An intrusion (motion) detection system has been installed throughout the Quarry Visitor Center and is tied into the telephone dialing alarm system.

11/11/85

"Conduct fieldwork for the National Historic...Landmark Theme Study...", Arch Historian, SWRO.

- Fieldwork for National Historic Landmark Theme Study on "Architecture in the Parks". Quarry Visitor Center does not qualify. Possible qualification for National Register of Historic Places.
- Building changes over time noted include installation of a 1984 fire suppression system.

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- Steel posts are separated from their concrete footings.
- Cleveland tram rail crane and hoist no longer function as intended.
- Wood platform addition on the first floor of the quarry.
- Partition changes in office spaces.
- A fiberglass Stegosaurus by the entrance ramp.
- Replacement of east metal service doors with T-III wood partition wall.
- Removal of concrete cobble surface below ramp and removal of ramp steps (1962).
- Realignment of vertical and horizontal structural members and addition of
- Concrete pilings under critical support areas (1968).
- Extension of upper and lower viewing galleries (1968).
- The building's architectural and structural integrity have been slightly compromised by some of those changes making it of less than national significance at the present time.

05/21/86 Memorandum - Structural Integrity of Quarry VC..., Facility Manager, Dinosaur NM.

- Mention of 1985 installation of a fire/intrusion system in the Visitor Center.
- Building continues to move. Floor cracks have widened, new cracks have appeared, doorways have moved several degrees out of plumb, broken structural beam welds, and the ramp is still cracking and moving away from the building.
- Facilities Manager requests an evaluation by a structural engineer.

03/20/87 Memorandum – Quarry Repair and Stabilization Work, Facility Manager, Dinosaur NM.

- ...obligated \$6,000 to the DINO Maintenance Division for the emergency repair of the Quarry VC roof.

05/04/87 Memorandum - ...visually inspect the structural distress in the Quarry Visitor Center..., Bruce Keller, SE, DSC.

- For the past 30 years, stabilization and maintenance efforts have concentrated on trying to preclude moisture from getting to the underlying expansive strata...Although these efforts have slowed the rate of movement, they have not eliminated movement...it may not be possible to prevent further deterioration of the expansive shales...altering the building to adapt to the site geology will require some reconstruction...
- Public entry ramp is in very bad condition...provide temporary shoring support at its junction with the main building to ensure its stability.
- Elevated visitor gallery is currently safe but in jeopardy of losing support unless current conditions are altered to prevent continued uplift of the

building's south wall.

Appendix A: Structural Inspection of the Quarry Visitor Center – May 1987

- In depth study of entire structure and its problems. Bruce Keller, DSC. New adverse conditions include the following.
- Condition of Exhibit Area. Structural distress.
- Condition of Entrance Ramp. Structural distress.
- Condition of Employee/Laboratory Area. Other distress seen in the building is caused by the uplift of the south wall of the employee/lab area and the adjacent visitor contact unit. The uplift of the south wall has lifted the south end of the roof beams which bear on masonry pilasters built into the south wall. Two masonry roof/floor beam support pilasters are cracked.
- Condition of Employee/Laboratory Area. The roof over the south portion of the building was originally constructed to drain to the south wall at a slope of 7 inches in the 20-foot width of the roof. The roof presently slopes to the north and ponds water on the roof adjacent to the south wall of the exhibit area.
- Condition of Employee/Laboratory Area. Every wall along a north-south axis in the south portion of the building displays diagonal shear cracking.
- Condition of the Visitor Contact Portion. It has experienced uplift similar to that of the south wall. The building is very rigid due to its well reinforced perimeter wall. Therefore, cracks are well distributed.
- Condition of the Visitor Contact Portion. The roof now ponds water against the exhibit unit south wall.
- Surrounding Site Conditions. Both north and south building site drainage of the site is suspect. Continued soil expansion should be expected despite additional control of site moisture.
- Because the building's continued movement may soon jeopardize the safety of the visitor gallery, a program for stabilizing the building needs to be developed as soon as possible. ...the entry ramp must be temporarily shored immediately and monitored closely until it can be repaired or replaced.

09/26/88

Memorandum – Park Briefing on Quarry Center Problems..., Chief (SE), General Engineering Section, DSC.

- A third masonry pilaster has cracked to the extent that beam support is jeopardized....This indicates the south wall is still unstable and the structural strength of the visitor gallery support system is being reduced.
- The concrete entrance ramp broke from its support at the building entrance threshold several years ago....The supports the park staff installed (since the 1987 trip) looked very adequate...(provides) support for the upper end of the ramp...

## APPENDICES

- The ramp slab is still lifted off the top of the second lowest support pedestal. The ramp sags between the lowest and third lowest supports but does not bear on the broken pedestal at all. The fracture of the pedestal exposed several steel reinforcing bars and spalled some concrete around the fracture area.
- On the south side of the lab building, two French drain systems connect into the same storm sewer system as the roof drains.
- The existing 2-3 foot wide concrete walk/splash pad adjacent to the lab building addition has shifted and currently directs water toward the structure.
- The maintenance personnel indicated that they were unable to rod more than 10 feet of the sanitary sewer service line on the south side of the lab addition before encountering an obstruction.

03/07/89

Memorandum – Briefing for RMR SE on Building Condition, Structural Engineer, DSC.

- A fourth cracked pilaster discovered indicates south wall is still heaving and that all 16 anchorages are likely near cracking stress.
- Buckling of second floor ceiling gypsum board panel in cylindrical two story visitor contact space indicates differential foundation movement.
- Formation of two new diagonal shear cracks in the exterior masonry wall at the southwest edge of the cylinder indicates differential foundation movement.
- The safety of the visitor entrance ramp is again questionable as the result of newly developed sinkholes at the site and further structural damage to the ramp supports.
- The roof over the employee/lab rooms does not drain water toward the exterior wall due to uplift of wall.
- Site French drains are contiguous with the roof drain system allowing water to drain to the soil near the building.
- A concrete walk/splash pad adjacent to the south wall of the lab wing drains water to the building foundations.
- Maintenance road at south side of building does not adequately drain the site away from the building.
- Sanitary sewer adjacent to the south wall suspect.

03/30/89

Memorandum – Integrity of water, sewer, and drain piping..., Chief Div. of Construction and Maintenance, RMR-ME.

- Parking area in the vicinity of the east entrance is settling.
- Vicinity of the entrance ramp shortest pier is settling.
- Pedestrian ramp's shortest pier has spalled more concrete.

*Appendix B: Chronology of Use and Development  
at Quarry Visitor Center*

- Five glass panes in the wall south of the elevated visitor's gallery have cracked.
- 04/27/89      Memorandum – Ramp Closure, Superintendent, Dinosaur NM.
- The ramp has been closed.
  - The ramp must be investigated and shored up to allow use, even if temporary, by May 20, 1989.
- 05/01/89      Memorandum – Ramp Closure, Regional Director, RMR.
- Concurrence of closure of Quarry Visitor Center's entrance ramp structure to visitor traffic.
- 05/03/89      Memorandum – Foundation Exploration of Quarry VC, CE, Branch of Roads and Architecture, RMR.
- Excavation of ramp pier 3 area with backhoe. No conclusions.
  - Circular roof center drain flows to the sanitary sewer.
  - Circular roof east drain daylights at ground level.
  - Circular roof other drains flow to storm sewer system.
  - Water ponds on top of the circular roof over an area against the quarry building.
  - Excavation at circular building footing revealed supersaturated state soil and void approximately 12 inches deep.
  - Excavation at southwest corner of the quarry lab exterior revealed paving, and below that French drain, granular fill, and interceding plastic film barrier between drain and south wall.
- 05/07/89      Memorandum – Quarry VC Inspection, Structural Engineer, DSC.
- ...a fourth masonry pilaster with a crack that compromises the anchorage of the fastened steel roof/visitor deck framing beams.
- 05/10/89      Memorandum – Stabilization and Repair of Three Structures..., Asst. Mgr., Central Team, DSC.
- Repair to Quarry VC visitor gallery deck and south roof is necessary because the roof currently slopes toward the south glazing wall of the quarry exhibit space.
  - Structural solution for cracking south wall pilasters is necessary to anchor the visitor gallery deck beams. Three alternative schemes included from DSC.
- 05/11/89      Memorandum – Closure of Quarry Visitor Center Ramp, Asst. Mgr., DSC.
- The ramp is expected to be opened on 05/19/89 after temporary remedial work has been done.
  - Rehabilitate grading and drainage at south wall of Quarry Visitor Center.

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- 05/25/89 Memorandum – Details for Monitoring Relative Elevations of South Wall of Quarry Visitor Center, South Wall of Lab and Conference Room.
- Bolts and Whitimore Points to be installed for future measurements.
- 05/23/89 Memorandum – Selection of Recommended Alternative for the repair of the Quarry visitor gallery deck support/south roof...Assoc. Regional Director, RMR.
- Regional recommendation is Alternative D rather than the park's choice of Alternative A (05/31/89).
  - Alternative D involves installing supplemental anchorages to anchor the existing steel roof/visitor gallery deck beams to the masonry pilasters along the south wall.
- 05/25/89 Memorandum – Removal of asphaltic concrete paving and concrete splash block adjacent to and south of the Quarry Visitor Center south wall - ARD, RMR.
- Remove the surface splash block and paving at the south and west walls of the Quarry Visitor Center along the maintenance access road...to dry foundation soils.
  - A minimum three percent grade away from the building shall be constructed.
  - Project DINO So2, Stabilization/Rehabilitation of the Visitor Center....
- 06/07/89 Report – Mitigation of Drainage and Utility Deficiencies – DSC, Park, and Martin & Martin.
- Drawing Details (8-1/2" x 11") are included. Recommendations include:
  - Replace existing under ground drain lines on south & west side of building.
  - Remove and replace concrete splash pad on the south side of the building.
  - Excavate sanitary service outfall line and replace from the building line outward.
  - Re-grade service drive and ditch.
- 07/24/89 Memorandum – Visitor Gallery Deck Anchorage Repair – Structural Engineer, DSC.
- Details and cost estimates for 2 temporary ballasting solutions submitted.
- 08/31/89 Memorandum – Water and Wastewater Field Evaluations - Chief of Professional Support Division, DSC.
- Work has been completed on portions of the water lines either by abandoning unneeded water lines or placing water lines in utility chases (pre-cast concrete). Water lines that remain need attention.
  - The fire hydrant located east of the building has been reported as not closing properly. Currently, the hydrant has been turned off via a gate valve located in the quarry building. The occupied portion of the quarry building has recently had a sprinkler system installed.

- The 2-inch galvanized steel pipe that is buried beneath the concrete floor of the book sales area of the visitor center has the potential for a major leak due to corrosiveness of the soil on metal pipe and the slight aggressiveness of the water on metal pipe (heaving of the existing concrete floor may indicate water seeps may now be present). Recommend that this water service be abandoned and a new 2-inch, above grade water service be installed so that all piping can be easily accessed for observation and leak detection.
- The recently installed fire sprinkler system has a connection to the main water line that is rigid and does not provide for observation for leak detection purposes. Recommend that this connection be rehabilitated to incorporate flexibility and leak detection capability.
- Recommend installation of flow monitoring devices on the water system serving the visitor center. There are none now. Will aid in leak detection.
- On July 12 and 13, 1989, excavations were made along the south wall of the quarry building to locate sewer lines at west end and center of the south wall.
- $\frac{3}{4}$ " hole in west end pipe (1) at concrete stem wall. No sleeve through wall. Based on the condition of the exposed pipe, corrosive soils, and vertical movement of the stem wall, the sewer lines beneath the floor slab in this area can not be expected to maintain water tight integrity.
- Center line (2) is sleeved through wall. The cast iron soil pipe beneath the floor slab is leaking in a severe manner.
- East end of piping at south wall was not excavated. Cast iron pipe under floor was replaced in 1967 by ductile iron pipe and sleeved. Exterior cast iron pipe replaced in 1988 by PVC pipe to manhole. Should be tested
- Exterior cast iron sewer lines connecting 1 and 2 to the manhole will be required to be replaced with a flexible piping material such as polyethylene. Replace the existing exterior cleanouts with manholes.
- The 6-inch sewer line connecting the manhole adjacent to the information center to the manhole at the edge of the parking lot will require cleaning and video inspection. The park has replaced one half of the cast iron pipe with PVC. The other one half has not been replaced because it runs under one of the piers supporting the pedestrian ramp.
- The French storm drain located 6 feet from and parallel to the south wall of the building is nonfunctional for several reasons. The pre-cast concrete drainpipe was installed at too shallow a depth to intercept groundwater impacting the foundation soils.
- Drain pipe and surrounding 1-inch diameter rock were encased in polyethylene membrane on three sides. It is suspected that the original intent of this French drain was to intercept water from the roof as the roof has no gutters.
- The French drain installed beneath the walkway on the east side of the

## APPENDICES

building was plugged at catch basin No.2 with soil material. Manual cleaning of this blockage by the park has not proven to be successful. It is recommended that new subsurface drainage facilities be installed.

- 10/16/89 Memorandum – ...stakeout geo-tech exploration drill holes and assist the contractor and monument personnel during drilling..., Structural Engineer, DSC.
- Inspection of Chen Northern site drilling operations at the Quarry Visitor Center.
  - One boring location inside building deleted because of building impacts.
  - Perforated PVC pipe installed in several borings to allow for ground moisture monitoring in future.
  - The finding of...the fifth masonry support pilaster with a visible crack in the portion of the pilaster that restrains the steel roof/visitor deck support beams.
- 10/26/89 Memorandum – Geotechnical Investigation, Branch of Roads and Architecture, RMR-ME.
- Deep interior and exterior drilling done by Chen-Northern, Inc.
  - Fourteen drill holes from 13' to 44' deep.
- 11/22/89 Memorandum – Metering System for the Quarry Visitor Center Water Supply Line. Tim Windle, ME, RMR.
- Purchase of two meters and installation details.
- 12/08/89 Geotechnical Engineering Study, Distress to Quarry Visitor Center, Dinosaur National Monument, Utah. Job No. 1 659 89. Chen Northern, Inc.
- “It is our opinion that the present distress shown by the building is due to continued uplift from expansive claystone bedrock.
  - Water leaks from utilities within the building and poor drainage around the perimeter of the building appear to have contributed to moistening of the subsoils with subsequent expansion of the claystone.
  - Isolation of utilities from subgrade soils and improvements to exterior drainage of the building may stabilize the structure to some degree.
  - Long-term stability, however, may require the use of straight-shaft drilled piers to underpin the existing foundation.”
- 10/24/89 Report – “Wet Well Monitoring, Quarry Visitor Center, Dinosaur National Monument.” Park staff, Dinosaur National Monument.
- Monitoring continues through 1994.
- 04/25/90 Memorandum – Rehab/Repair Quarry Visitor Center..., Superintendent, Dinosaur NM.
- The gallery stabilization project has been completed using day labor...(There are no “as constructed” drawings)
  - Work included work on dry wall, tie down installation, and reconstruction of



- walls and shelving.
- Memo includes proposals for utility lines that appear to be aggravating expandable soils under the foundation.
- 07/02/91 “Water/Sewer Reconstruction – Quarry Visitor Center”, Construction Drawings, 122/80045, RMR.
- New west side of building manhole at end of existing 8” waterline. Existing 8” diameter water line which runs through the center of building capped, new exterior 6” diameter PVC waterline located on south side of building to relocated fire hydrant near building east side ramp base.
  - New 4” diameter PVC water line from new west side manhole water source to 3” existing diameter fire line in Tool Room.
  - Re-plumb existing and new 1-1/2” diameter waterline service to boiler room, lab, toilets, and Administration wing from 3” diameter fireline.
  - Replace existing sewage service system with new exterior manholes and 6” diameter PVC pipe.
- 07/15/93 Report – “Quarry Visitor Center”. 1992-1993. Unknown author, Dinosaur National Monument.
- 05/92 – Chisel concrete from the top northwest corner of ramp to allow door to open.
  - 07/92 – Eight broken windows replaced.
  - 07/92 – Asphalt cracks sealed in front of the VC and in the parking lot.
  - 07/92 – Dry wall cracks patched in the west book sales area wall.
  - 09/92 – Book sales area door to quarry wall shaved to open and close.
  - 09/92 – Site sewer line replaced and re-routed.
  - 11/92 – Administration roof leaks water. Roof is sloping toward exhibit building wall. Second floor ceiling is damaged in Administration wing.
  - 11/92 - Library west wall is bowed.
  - 12/30 - Window broke and fell out.
  - 12/30 - Urinal drains are slow.
  - 02/93 - Library wall studs cut and interim header installed.
  - 03/93 - Double door at quarry east driveway is warped and buckled.
- 08/23/93 Memorandum – Trip Report, Quarry VC Familiarization. T Windle, CE, RMR.
- Transverse expansion joint at the building middle has opened at the north side and is closing on the south side.
  - Water is present and iron valves are rusting in the 1991 manhole at the west end of the Quarry Visitor Center.

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- Administration Wing has standing water on the roof and leaks are damaging the second floor ceiling. A roof scupper will be installed.
  - Window wall glass pane breakage continues to be a hazard to the visitor.
  - Since my last visit to the park, the partition wall between the library and paleontologist's office has been reconstructed.
- 11/07/94 Report – "Quarry Visitor Center Work 1994". Unknown author, Dinosaur National Monument.
- 01/94 – Maintenance installed suspended ceiling and fluorescent lighting in the upper round gallery of Quarry.
  - 02/94 – Quarry roof is leaking in the upper gallery of the V roof. This is in the areas of the expansion joints and down spouts, and the same area that the membrane fabric was installed last November.
  - 02/94 – Maintenance has patched the cracks in the interior walls of the stair well and is in the process of painting these areas.
  - 04/94 – Routine interior painting...
  - 05/94 - ...building movement between 6AM and 9AM. Doors became misaligned (entry and gallery doors). Carpet gap in sales area widened. Wall cracks opened. Three windows cracked.
  - 05/94 – Jacks under concrete ramp tightened.
  - 06/94 – Quarry Visitor Center roof membrane patched and painted.
  - 09/94 - Quarry Visitor Center roof leak. Asphalt shingle roof in poor condition with wind damage. Repaired. Needs re-shingling.
  - 09/94 – Lab roof leaks. The roof slopes into the wall of the main building.
  - 10/94 – Leaks again
  - 11/94 – Safety film applied to windows.
- 05/01/95 "Pedestrian Bridge Evaluation and Recommendations, Dinosaur National Monument, Utah." Western Bridge Design, Central Federal Lands Highway Division, Federal Highway Administration.
- Following the damage that has occurred to the pedestrian bridge, an analysis was necessary to study the structure in its operational state.
  - The results proved that the capacity of the bridge is adequate to carry the loads in its current condition.
- 07/26/99 Memorandum – Quarry VC Investigation, CR Jones Arch, ISO.
- Historic building color investigation and subsequent color recommendations.
  - 07/26/99 Paint Visitor Center – Quarry Site. Drawing Number 122/80,060.
  - Construction Drawings.
- 01/03/01 National Historic Landmark Nomination
- "We are pleased to inform you that the National Historic Landmark (NHL) nomination form for the Quarry Visitor Center, which was designated by the Secretary of the Interior as a National Historic

*Appendix B: Chronology of Use and Development  
at Quarry Visitor Center*

- Landmark on January 3, 2001, has been finalized.”
- 07/12/06 Quarry Visitor Center closes
- May 11, 2006 - first of four observation trips identify previously unknown conditions that present serious life, safety, and health hazards.



As the nation's principal conservation agency, the Department of the Interior has the responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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March 2008