



National Park Service
U.S. Department of the Interior
Yellowstone National Park
Wyoming, Montana, Idaho

Finding of No Significant Impact Norris to Golden Gate Road Reconstruction

Background

In compliance with the National Environmental Policy Act, the National Park Service prepared an environmental assessment to examine various alternatives and environmental impacts associated with the proposal to reconstruct a 25.6-kilometer (15.9-mile) segment of road from Norris to Golden Gate within Yellowstone National Park. The project would reconstruct the road, associated parking areas and turnouts, and bridges. Construction of the first phase of this project is scheduled to begin in 2014.

Improvement of the road is needed in order to establish a road that meets acceptable engineering safety standards to provide safe and pleasant driving experiences, to facilitate park operations and emergency services, to improve resources protection, and to enable more efficient use of park funds.

The proposed project is part of the Yellowstone National Park road reconstruction program. The source of funding for this program is the Federal Lands Highway Program (FLHP) as a part of the Highway Trust Fund. The Yellowstone National Park road reconstruction program is a partnership effort between the National Park Service (NPS) and the Federal Highway Administration (FHWA) and was initiated at the request of the park. The FHWA is an official cooperator in this project. The *Parkwide Road Improvement Plan* and Environmental Assessment, approved in June 1992, describes the general scope of the entire program.

Selection of the Preferred Alternative

Two alternatives were evaluated in the environmental assessment including alternative A (No Action) and alternative B (Reconstruct the road to a 30-foot paved width). Alternative B is the National Park Service's preferred alternative because it best meets the purpose and need for the project as well as the project objectives to 1) provide an appropriate park-like visual character and visitor experience along this road corridor, 2) provide a balance between reducing resource and visual impacts and provide for visitor safety, transportation, and an appropriate national park experience as well as effective park operations, 3) improve traffic flow on this road segment by addressing increasing traffic volume, inadequate parking, events such as wildlife jams, lack of parking turnouts and accessibility features, and frequent maintenance needs, 4) identify, restore, and rehabilitate impacted riparian or other sensitive resource areas within the project limits wherever feasible.

Under alternative B, a 25.6-kilometer (15.9-mile) segment of the Grand Loop Road will be reconstructed between its intersection with the Norris campground road, and north to a point just north of Swan Lake Flats, in an area known as Golden Gate. The project will reconstruct the road, associated parking areas and turnouts, and bridges. Construction of the first phase of this project is scheduled to begin in 2014.

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Mitigation Measures

- Temporary impacts, such as soil and vegetation disturbance and the possibility of soil erosion, associated with the reconstruction of the Norris to Golden Gate road segment would occur. In an effort to avoid introduction of exotic plant species, no hay bales would be used. Hay often contains seed of undesirable or harmful alien plant species. Therefore, on a case-by-case basis the following materials could be used for any necessary erosion control dams : wood bark mulch, straw, sand bags, coir logs, and silt fences. Wood bark mulch would be used to reduce surface erosion, help retain soil moisture and promote seed generation of native plants. Standard erosion control measures such as silt fences and/or sand bags would be used to minimize any potential soil erosion.
- Silt fencing fabric would be inspected weekly or after every major storm. Accumulated sediments would be removed when the fabric is estimated to be approximately 50% full. Silt removal would be accomplished in such a way as to avoid introduction of fine particle materials into any wetlands or flowing water bodies.
- Mitigation for wetlands destroyed would be done through restoration of disturbed wetlands located within the vicinity of the road reconstruction project, at a minimum 1:1 ratio. Wetland disturbance from the preferred alternative totals approximately 1.7 to 1.9 acres lost, 1.55 to 1.75 acres temporarily impacted, and 2.1 to 2.3 acres of wetlands restored. Locations for wetland mitigation include removal of an abandoned road between the Norris Picnic area and the Gibbon River, and through shifting the alignment of the current road to remove road fill from former wetlands.
- Although soil side-cast during construction would be susceptible to some erosion, such erosion would be minimized by placing silt fencing around the excavated soil. Excavated soil may be used in the construction project; excess soil would be stored in approved areas.
- Construction would take advantage of these previously disturbed areas wherever possible. Soils within the project construction limits would be compacted and trampled by the presence of construction equipment and workers. Soils would be susceptible to erosion until revegetation takes place. Vegetation impacts and potential compaction and erosion of bare soils would be minimized by conserving topsoil in windrows. The use of conserved topsoil would help preserve micro-organisms and seeds of native plants. The topsoil would be re-spread in as near as original location as possible. To reduce construction scars and erosion, mulching, seeding, and/or planting with species native to the immediate area. Scarification of compacted soils would occur as necessary to improve revegetation.
- Excavations to recover archeological data from six precontact sites bisected by the current road alignment would be conducted according to a plan pre-approved by the Wyoming State

Historic Preservation Office prior to any ground disturbance from the reconstruction of the road.

- Should construction activity unearth previously unknown historic or prehistoric cultural remains or artifacts, work would be stopped in the area of the discovery and the park archeologist would be notified. In accordance with the Inadvertent Discovery Procedures of the Road Programmatic Agreement, the cultural remains would be assessed and the Wyoming SHPO notified. If the cultural remains are assessed as significant and retain integrity for the archeological information they may provide, the site would be avoided and protected. If avoidance is not possible, data recovery excavations will be conducted prior to any construction activity resuming in the area. If Yellowstone National Park, with the concurrence of the Wyoming SHPO, determines the archeological remains are not sufficient to meet the definition of a National Register eligible site, or the archeological information with the site is not significant, all cultural remains will be collected and construction activity may commence with the archeological monitoring. The Road Programmatic Agreement also details procedures in the unlikely event that human remains are recovered.
- Attention to identification of Ethnographic Resources within the road corridor would be accomplished through monitoring of construction and continued consultation with the tribes.
- The park would continue to work with tribes to document and evaluate the ethnographic resources within the park ascribe native significance and protective measures for these resources.
- The interpretive wayside exhibit at the Obsidian Cliff pullout would be updated to incorporate native values for this geologic resource and archeological National Historic Landmark.
- Archeologists would monitor road building activities along the face of Obsidian Cliff, in part for the minimal likelihood of discovering portions of an old trail system that may be positioned along the Mammoth to Norris Road.
- The Obsidian Cliff area is a significant area for many tribal people, and is closed to the public. In order to encourage visitors not to cross the highway to the cliff side a boardwalk/trail to a viewing area of meadow and cliff would be constructed.
- The Sheepeater Cliff and Obsidian Cliff areas would be evaluated as Traditional Cultural Properties.
- The sign at Sheepeater Cliff would be updated to inform the public that there are descendants of the Sheepeater people who reside at the Fort Hall and Wind River Reservations, and other information about who they were and are today.
- The Cultural Landscape of the road would be retained by incorporating road designs that lay lightly on the landscape, blend with nature, and harmonize with the historic nature of the road landscape.
- Contractors would coordinate with park staff to reduce disruption in normal park activities (i.e. facilitate emergency traffic, hauling material to avoid quiet hours, allow for visitor use in areas where no conflicts or safety concerns exist).
- Construction workers and supervisors would be informed about the special sensitivity of park values, regulations, and appropriate housekeeping.
- To minimize the amount of ground disturbance, staging and stockpiling areas would be in previously disturbed sites, away from visitor use areas to the extent possible. All staging and stockpiling areas would be returned to pre-construction conditions following construction.

- Sensitive resource areas would be identified and fenced with construction tape, snow fencing, or some similar material prior to any construction activity. Fencing would be used to protect sensitive resource areas. All protection measures would be clearly stated in the construction specifications and workers would be instructed to avoid conducting activities beyond these areas as defined by the fencing or markers.
- Revegetation and recontouring of disturbed areas would take place following construction and would be designed to minimize the visual intrusion of the structure. Revegetation efforts would strive to reconstruct the natural spacing, abundance, and diversity of native plant species using native species. All disturbed areas would be restored as nearly as possible to pre-construction conditions shortly after construction activities are completed. Weed control methods would be implemented to minimize the introduction of noxious weeds. Some trees along the road would be removed to allow for a wider road template, efforts would be made to minimize impacts to existing vegetation along the road to the extent possible.
- Fugitive dust generated by construction would be controlled by spraying water on the construction site, if necessary.
- To reduce noise and emissions, construction equipment would not be permitted to idle for long periods of time in areas near active campgrounds or residential areas.
- To minimize possible petrochemical leaks from construction equipment, the contractor would regularly monitor and check construction equipment to identify and repair any leaks. Hazardous material spill kits would be required on site.
- Equipment would not be serviced or refueled near streams; storage and refueling or construction parking and staging areas, would be at least 46 meters (150 feet) from streams or riparian areas. Fuel would be stored in fuel trucks or aboveground storage tanks, and all fuel storage would be in staging areas. Refueling would take place in staging areas and might occur at material source sites. Some stationary equipment (cranes, trackhoes, pumps), such as needed at bridge reconstruction sites, may require fueling within 150 feet of streams. In these cases, special precautions would be put in place to alleviate the risk of fuel spills.
- Construction workers and supervisors would be informed about special status species. Contract provisions would require the cessation of construction activities if a species were discovered in the project area, until park staff re-evaluates the project. This would allow modification of the contract for any protection measures determined necessary to protect the discovery.
- All project-related employees, such as contract and government construction employees, would be given orientation on how to avoid disturbing or encountering bears and how to minimize unavoidable effects or encounters. Orientation would include information about park regulations regarding food storage, disposal of garbage and other bear attractants, and approaching or harassing wildlife.
- The National Park Service would ensure that all contractors and subcontractors are informed of the penalties for illegally collecting artifacts or intentionally damaging paleontological materials, archeological sites, or historic properties. Contractors and subcontractors would also be instructed on procedures to follow in case previously unknown paleontological or archeological resources are uncovered during construction. Equipment and materials staging areas would also avoid known archeological resources.
- To minimize the potential for impacts to park visitors, variations on construction timing may be considered. One option includes conducting the majority hauling during off-peak times of the day or during shoulder seasons. Another option includes implementing daily construction

activity curfews such as not operating construction equipment near campgrounds during quiet hours (May – September). The National Park Service would determine this in consultation with the contractor.

- According to 2006 *Management Policies*, the National Park Service would strive to construct facilities with sustainable designs and systems to minimize potential environmental impacts. Development would not compete with or dominate the park's features, or interfere with natural processes, such as the seasonal migration of wildlife or hydrologic activity associated with wetlands. To the extent possible, the design and management of facilities would emphasize environmental sensitivity in construction, use of nontoxic materials, resource conservation, recycling, and integration of visitors with natural and cultural settings. The National Park Service also reduces energy costs, eliminates waste, and conserves energy resources by using energy-efficient and cost-effective technology. Energy efficiency is incorporated into the decision-making process during the design and acquisition of buildings, facilities, and transportation systems that emphasize the use of renewable energy sources.

Alternatives Considered

Two alternatives were evaluated in the environmental assessment including the no-action alternative and one action alternative. Under alternative A, No-Action, the road would not be reconstructed. Alternative B, Reconstruct the road to a 30-foot paved width, is the preferred alternative, as described in the previous section.

Environmentally Preferred Alternative

Alternative B is the environmentally preferred alternative. The environmentally preferred alternative is determined by applying the six criteria suggested in §101 the National Environmental Policy Act. According to these criteria, the environmentally preferred alternative should 1) fulfill the responsibilities of each generation as trustee of the environment for succeeding generations; 2) assure for all generations safe, healthful, productive, and esthetically and culturally pleasing surroundings; 3) attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences; 4) preserve important historic, cultural and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice; 5) achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities; and 6) enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

Alternative B is the environmentally preferred alternative because it best addresses these six evaluation factors. Alternative B, *Reconstruct and Rehabilitate Portions of the Grand Loop Road; 30-foot Width*, will provide a road for park visitors and staff that meets health and safety recommendations, while minimizing environmental impacts to the extent possible. The reconstructed road would preserve important historic, cultural and natural aspects along its length, while providing a better functioning road for visitors. The new road would require much less maintenance, and therefore less impacts and delays for its users.

Why the Preferred Alternative Will Not Have a Significant Effect on the Human Environment

As defined in 40 CFR §1508.27, significance is determined by examining the following criteria:

Impacts that may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial.

Implementation of the preferred (selected) alternative will result in some adverse impacts; however, the overall benefit of the project, particularly to park operations, outweighs these negative effects. The adverse effects are summarized as follows. Construction activities will impact approximately 70 acres outside the existing road prism, and approximately 114 acres within the existing road prism that includes existing cuts, fills and drainage ditches. Wetland impacts would include 1.55-1.75 acres of temporary impacts and 1.7-1.9 acres of permanent impacts to wetlands. The project will also reclaim or restore 2.1-2.3 acres of wetlands. Approximately 1.66 acres of road fill would be removed from the floodplain adjacent to the road, enhancing floodplain function. Approximately 0.09 acres of floodplain would be filled to allow road widening. Approximately 70 acres of roadside vegetation would be permanently lost. Wildlife including grizzly bears and wolves could be temporarily displaced due to construction activities. Minor to moderate adverse impacts to archeological resources along the road would occur. Repair and rehabilitation of historic bridges and road features would be done using guidance from the Yellowstone programmatic agreement with the WYSHPO. Improved traffic flow in and near wildlife jams is expected to occur. Safety issues associated with deficiencies of the existing road will be corrected.

The overall benefit of implementing the preferred (selected) alternative is that park operations will be improved to a moderate degree and safety concerns will have been remedied with the reconstruction of the Norris to Golden Gate road. The reconstructed road will also benefit visitors, employees, park concessioners, contractors working in the park by providing improved traffic flow, reduced maintenance needs, improving safety, and addressing maintenance needs for historic structures.

The degree to which the proposed action affects public health or safety

The preferred alternative will have an overall beneficial effect on public health and safety, particularly for the parks visitors and employees that will regularly use this road segment. The reconstructed road will minimize many of the current unsafe conditions associated with the road including structural deficiencies, narrow width, drop-offs at the road edge, bicycle/vehicle safety concerns, and failing bridges and road-related structures.

Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas

The preferred alternative will not impact unique characteristics of the area including park lands, prime farmlands, wild and scenic rivers, or ecologically critical areas in the project area. Portions of wetlands will be affected, though restoration of already impacted wetlands will be done to mitigate these impacts.

The degree to which the effects on the quality of the human environment are likely to be highly controversial

Throughout the environmental process, the proposal to reconstruct the Norris to Golden Gate road was not highly controversial, nor are the effects expected to generate future controversy. There were opinions from both sides, some wanting to reconstruct the road to a wider width, and some wanting to keep the road narrow. The public comment period generated 22 letter being submitted, most were in favor of the project.

The degree to which the possible effects on the quality on the human environment are highly uncertain or involve unique or unknown risks

The effects of reconstructing the Norris to Golden Gate road are fairly straightforward and do not pose uncertainties. The environmental process has not identified any effects that may involve highly unique or unknown risks.

The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration

The preferred alternative is not expected to set a precedent for future actions with significant effects, nor does it represent a decision in principle about a future consideration.

Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.

Cumulative effects were analyzed in the environmental assessment and no significant cumulative impacts were identified.

The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.

Limited data recovery at six sites would leave the major portion of archeological sites intact. Widening the roadway adjacent to Obsidian Cliff NHL will limit direct impact to the site while adding a visitor viewing path and platform increases their awareness of the sites' significance. The road Programmatic Agreement provides guidance for the widening of the road without adverse impact to the road historic features. Increased protection to the Obsidian Cliff NHL will have negligible to minor beneficial impacts. The Wyoming State Historic Preservation Office (WYSHPO) and the Advisory Council for Historic Preservation (ACHP) concurred on August 26, 2011 with the NPS determination of *no adverse effect* on the cultural resources associated with the Norris to Golden Gate road per §106 of the National Historic Preservation Act. The WYSHPO agreed that *no adverse effect* to the historic road or bridges would occur at the current design levels. The Park and WYSHPO agreed to continue ongoing consultation to ensure that *no adverse effect* would occur as design of final construction drawings and specifications are prepared for this project.

The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.

Consultation for this project was completed with the preparation of a Biological Assessment for the *Parkwide Road Program* by Yellowstone National Park and a Biological Opinion prepared by the U.S. Fish and Wildlife Service dated January 21, 2009. The Biological Opinion provided conservation measures which will be followed for the *Parkwide Road Program* of which this project is a part.

Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment

The action will not violate any federal, state, or local laws or environmental protection laws.

Appropriate Use, Unacceptable Impacts, and Impairment

Sections 1.5 and 8.12 of NPS *Management Policies* underscore the fact that not all uses are allowable or appropriate in units of the National Park System. The proposed use was screened to determine consistency with applicable laws, executive orders, regulations, and policies; consistency with existing plans for public use and resource management; actual and potential effects to park resources; total costs to the Park Service; and whether the public interest would be served. A park road is a common and vital asset in most park units. Proper design, location, width, and safety features would ensure that unacceptable impacts to park resources and values would not occur. The proposed road reconstruction is consistent with the park's Parkwide Road Improvement Plan

and other related park plans. With this in mind, the NPS finds that reconstruction and use of this road segment is an acceptable use at Yellowstone National Park.

The impact threshold at which impairment occurs is not always readily apparent. Therefore, the Service applies a standard that offers greater assurance that impairment will not occur. The Service will do this by avoiding impacts that it determines to be unacceptable. These are impacts that fall short of impairment, but are still not acceptable within a particular park's environment. Park managers must not allow uses that will cause unacceptable impacts; they must evaluate existing or proposed uses and determine whether the associated impacts on park resources and values are acceptable. Because the application of mitigating measures is expected to be successful in ensuring that no major adverse impacts would occur and that satisfactory reclamation of the disturbed area is expected to be achievable, implementation of the preferred alternative would not result in any unacceptable impacts.

In analyzing impairments in the NEPA analysis for this project the NPS takes into account the fact that if an impairment were likely to occur, such impacts would be considered to be major or significant under CEQ regulations. This is because the context and intensity of the impact would be sufficient to render what would normally be a minor or moderate impact to be major or significant. Taking this into consideration, NPS guidance documents note that "Not all major or significant impacts under a NEPA analysis are impairments. However, all impairments to NPS resources and values would constitute a major or significant impact under NEPA. If an impact results in impairment, the action should be modified to lessen the impact level. If the impairment cannot be avoided by modifying the proposed action, that action cannot be selected for implementation." "Interim Technical Guidance on Assessing Impacts and Impairment to Natural Resources" National Park Service, Natural Resource Program Center, July 2003.

In addition to reviewing the definition of "significantly" under the NEPA regulations, the NPS has determined that implementation of the preferred alternative would not constitute an impairment to the integrity of Yellowstone National Park's resources or values as described by NPS *Management Policies* (NPS 2006 § 1.4). This conclusion is based on the NPS's analysis of the environmental impacts of the proposed action as described in the EA, the public comments received, relevant scientific studies, and the professional judgment of the decision-maker guided by the direction in 2006 NPS *Management Policies*. The EA identified less than major adverse impacts on topography, geology, and soils; hydrothermal; wetlands and other waters of the U.S.; floodplains; vegetation; wildlife; special status species; archeological resources; historic structures; ethnographic resources; cultural landscapes; social and economic; and park operations. Although the project has some negative impacts, in all cases these adverse impacts are the result of actions taken to preserve and restore other park resources and values. Overall, the plan results in benefits to park resources and values, opportunities for their enjoyment, and it does not result in their impairment.

Public Involvement

The environmental assessment was made available for public review and comment during a 30-day period ending June 13, 2011. To notify the public of this review period, a press release was mailed to stakeholders, affiliated Native American tribes, interested parties, and newspapers. Copies of the document were sent to certain agencies, and interested parties; made available in local repositories; and posted on the NPS Planning, Environment, and Public Comment website. Twenty two letters were received during this review period. Most commenter's were in favor of widening the road and adding turnouts along it route by a margin of nearly three to one compared with those opposed to widening. Comments also included a need to accommodate bicycle traffic, consider alternative modes of transportation in a long term vision for transportation within the

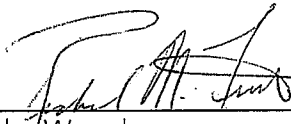
park, and a concern about visual impacts associated with added or relocated parking on Swan Lake Flats. Substantive comments centered on proposed width of the road, adding bicycle lanes, potential wildlife roadkill, providing extra pullouts, looking at alternative modes of transportation, visual concerns, American Association of State Highway and Transportation Officials (AASHTO) standards, and cultural resources. These comments are addressed in the Errata Sheets attached to this FONSI. The FONSI and Errata Sheets will be made available to all commenters.

Conclusion

As described above, the preferred alternative does not constitute an action meeting the criteria that normally require preparation of an environmental impact statement (EIS). The preferred alternative will not have a significant effect on the human environment. Environmental impacts that could occur are limited in context and intensity, with generally adverse impacts that range from localized to widespread, short- to long-term, and negligible to moderate. There are no unmitigated adverse effects on public health, public safety, threatened or endangered species, sites or districts listed in or eligible for listing in the National Register of Historic Places, or other unique characteristics of the region. No highly uncertain or controversial impacts, unique or unknown risks, significant cumulative effects, or elements of precedence were identified. Implementation of the action will not violate any federal, state, or local environmental protection law.

Based on the foregoing, the National Park Service has determined that an EIS is not required for this project and thus will not be prepared.

Approved:



John Wessels

(ACTING)

10/21/11

Date

Director, Intermountain Region, National Park Service

Errata Sheets

Norris to Golden Gate Road Reconstruction

Yellowstone National Park

Of the comments that were received during public review of the EA, the substantive comments and responses are on the following pages. According to NPS policy, substantive comments are those that 1) question the accuracy of the information in the EA, 2) question the adequacy of the environmental analysis, 3) present reasonable alternatives that were not presented in the EA, or 4) cause changes or revisions in the proposal.

Some substantive comments may result in changes to the text of the EA, in which case, they are addressed in the *Text Changes* section of the Errata Sheets. Other substantive comments may require a more thorough explanatory response and are addressed in the *Response to Comments* section. NPS responds to all substantive comments in either or both of these sections.

Substantive comments for this EA centered on the following topics: width of alternatives, bicycle lanes, potential wildlife roadkill, extra pullouts, alternative modes of transportation, visual concerns, American Association of State Highway and Transportation Officials (AASHTO) standards, and cultural resources. These concerns did not result in any changes to the text of the EA and are also explained more thoroughly in the *Response to Comments* section.

Text Changes

No text changes were made to the EA.

Response to Comments

Comment 1: The feel one gets from traveling the recently reconstructed road stretches is not the same positive experience one has when traveling the older, narrower "country lane style" roads in the park.

Response 1: *While there would be a change in the current road paved width, the road would retain the current alignment with the exception of changing the curvature a few dangerous curves, or to avoid specific park resources. Two primary objectives of this project are to provide a park-like visual character and visitor experience along this road corridor, while at the same time, improving traffic flow.*

Comment 2: widening the road will lead to increased speeds.

Response 2: *This road reconstruction project has been designed to meet the goals of the project while keeping impacts to the least possible level. The proposed roadway will follow the existing road alignment as much as possible. There will be some minor changes to improve the geometry of variable radius curves, and very tight curves to improve the safety of driving the road. The proposed road will have a wider footprint and a smoother surface than the existing road. Speeds may increase slightly, though a great increase in speed is not anticipated since the geometry of the curves will remain mostly as they are, thus limiting speed.*

Comment 3: Rebuild the road at its existing width and current configuration.

Response 3: *While the preferred alternative in the Environmental Assessment (EA) proposes to widen Norris to Golden Gate Road segment, the current alignment or configuration of the road generally would not change. However, the Park, with the assistance of the Federal Highway Administration (FHWA), determined that many of the safety, drainage, rockfall, maintenance, and traffic flow problems addressed in the environmental assessment (EA) would not be resolved if the road were to be improved at its current width. Also, based on the traffic volumes, the sizes and*

types of vehicles that will travel this road, the two-way traffic, and the design and travel speed, NPS Park Road Standards (1984) in conjunction with FHWA recommends widening this road to meet minimum safety standards and guidelines.

Comment 4: Increased speed poses a hazard to one of Yellowstone's most valued resources-wildlife. It also poses a hazard on humans-car accidents with wildlife can cause injury and death.

Response 4: Road kills would continue to contribute to wildlife mortalities. However, the numbers of wildlife mortalities on this road are expected to remain low. Maintenance of existing 45 mph posted road speeds and an alignment that follows existing road curvature throughout the alignment that would temper speeds, and the addition of pullouts for slower traffic should minimize the potential for significant increase in road-kills.

Comment 5: we encourage you to consider not just a no action alternative and an alternative that allows for a 30 foot width, but to add an alternative that allows for reconstruction and limited widening as needed to meet traffic needs (as opposed to a 30 foot width throughout).

Response 5: Reconstructing the roadway at a narrower width would not meet the objective of improving traffic flow on this road segment. Reconstruction at any width would require additional disturbance to provide for, or upgrade inadequate or missing drainage ditches, add new and additional base material (increasing height of roadway, thus requiring increased width), and new culverts would need to be installed under the road to accommodate this increased width. The wider width of previously reconstructed roads in the park have vastly improved traffic flow by allowing vehicles to move to the side of the road, thus allowing traffic to flow at greatly reduced speeds through wildlife jams.

Comment 6: Widening the road to 30 foot is essential due to the heavy bicycle traffic mingled with the daily visitor traffic. Much of the visitor traffic consists of wide vehicles with extended mirrors. This has always been a concern for bicycling visitors and for people who drive this section of road nearly every day during busy season.

Response 6: The preferred alternative proposes to widen the road to a 30-foot paved top width. The 30-foot road allows for a 4-foot shoulder to be constructed on each side of the road. This shoulder, while less than an official 6-foot wide bike lane would allow bicycles to travel in a much safer manner than the current condition allows.

Comment 7: The complete lack of northbound pullouts from Norris to Swan Lake Flats absolutely needs to be remedied. There should be equivalent numbers of northbound pullouts as southbound pullouts.

Response 7: The proposed design of the road adds pullouts on both sides of the road, though not equally. New pullouts were designed by taking into account: existing topography, avoiding sensitive resource areas, and common wildlife frequenting/viewing areas.

Comment 8: The area near Roaring Mountain should be examined closely to determine if the major section of pullout can be placed on the east side of the road, rather than the current west side. Northbound vehicles have no view of the road next to Roaring Mountain until they are right on top of the crosswalk.

Response 8: Placing all parking on the east side of the road was considered, though this meant shifting the road alignment to the west, which would entail a long length of roadway being shifted onto thermal ground on the west side of the road to avoid introducing dangerous and sharp curves. The road is still shifted about 15 feet to the west in this area in order to allow for improved parking on the east side of the roadway, and allow for greater separation of traffic and pedestrians on both sides of the road.

Comment 9: The narrow width road is part of the park experience. If there are too many people driving on the road and there are traffic jams, then visitation should be limited.

Response 9: *Park management objectives, at this time, do not include limiting traffic on the Grand Loop Road.*

Comment 10: There should be hundreds of more pull outs and all the roads made wider for safety concerns.

Response 10: *For the planning and design processes for road improvements in Yellowstone, the Park carefully examines and evaluates options that allow visitors to safely pull off the road to view the special sights within the Park, especially the ever-popular wildlife. Pullout areas along Norris to Golden Gate road segment were evaluated for general safety, adequate sight distance, and minimal resource impacts. As a result, the preferred alternative in the environmental assessment proposes to pave a net increase of 20 pullouts and expand and improve many of the other existing pullouts along the road. The existing paved road surface would be widened from its existing 19- to 22-foot width to a 30-foot width.*

Comment 11: the Norris Campground, the road is currently signed to prohibit access by busses. Those who ride busses into Yellowstone, or get on a tour while in Yellowstone, are helping to alleviate traffic congestion on the roads. They should not be thanked for this by denying them access to the Norris Ranger Museum. In fact, it is not very difficult for professional bus drivers to turn around at the area just beyond the museum (up by the Ranger Station). It's a three-point turn, but not one beyond the difficulty of a competent professional.

Response 11: *While this area is outside the scope of this project, this comment has been passed along to park management for consideration.*

Comment 12: Commenter provided information on a historic trail near Obsidian Cliff and feels that this trail should have been designated a National Historic Trail (or similar designation).

Response 12: *This information has been passed along to the Yellowstone National Park Chief, of the Cultural Resources Branch.*

Comment 13: Any construction conducted during the spring months would have an effect on bear use. Straightening the roadway would only encourage and increase the number of speeding cars. Speeding cars between Norris and Swan Lake Flats is already a problem and has resulted in bear deaths and traffic accidents.

Response 13: *As stated in the environmental assessment for this project, bears may be temporarily displaced from roadside habitat by the noise and disturbance of construction activities. Road construction is expected to occur primarily, although not exclusively, during daylight hours, with the majority of construction likely to occur late spring through fall. The Park prepared a biological assessment and received a biological opinion through a formal consultation process with the U.S. Fish and Wildlife Service on the Parkwide Road Improvement Plan, which includes this project.*

Comment 14: I would retain the curves and the general route of the current road.

Response 14: *Minor realignments of the road would occur in the vicinity of Frying Pan Thermal Spring, Semi-Centennial Geyser, and the Grizzly Lake Trailhead, and minor shifts in the roadway along Obsidian Creek. These would be done with the sole purpose of protecting resources and improving safety for those driving the road. The vast majority of the road would retain the existing curvature of the road.*

Comment 15: is there a possibility of establishing a bike lane?

Response 15: *A dedicated bike lane is not proposed as part of this project. The addition of a 4-foot paved shoulder at each side of the road will make it safer to pass bicycles using the road than current conditions allow.*

Comment 16: the fragile and very special Apollinaris Spring 1925 stonework and general area should be carefully conserved, and better parking areas be constructed so that visitors can thoroughly enjoy this area

Response 16: *The proposed work in this area will not disturb the historic stonework of the area. Parking is available in the picnic area adjacent to the Apollinaris Spring area to the west side of the road. It is also likely the existing turnout at this area would be reconstructed.*

Comment 17: adequate visitor parking, boardwalks, and explanatory signing should be supplied at Clearwater Springs, allowing visitors to safely see and enjoy the entire area from Semi-Centennial Geyser north for about 0.4 mile.

Response 17: *A boardwalk would be constructed in this area to provide access for viewing at the edge of the spring. The boardwalk viewing area would be accessed from a trail/boardwalk beginning at the vehicle turnout on the Grand Loop Road in this area.*

Comment 18: Yellowstone needs to create a discussion about the need for a long-term transportation vision that is not solely tied to ever wider and straighter roads.

Response 18: *Yellowstone is always looking for ways to ensure resource protection while providing for visitation by the public. The Park had prepared an Alternative Transportation Study completed in 1994, has worked on a number of projects with the Western Transportation Institute, and has tried a number of pilot study endeavors for local area shuttles, and worked to post current information regarding the park and opportunities to visit on the Internet. This discussion has been ongoing in the past and will continue in the future to help us achieve a proper balance of access and resource protection.*

Comment 19: this EA should assess the tradeoffs of purely structural solutions to transporting visitors such as contained in the action alternative against mass transit alternatives.

Response 19: *An alternative transportation study for Yellowstone National Park was prepared in 1994. This report looked at the feasibility of implementing various types of mass transit systems. Surveys have shown that most visitors to Yellowstone enter and leave through different entrances of the park, of which there are five major ones. Due to the high cost of the proposed transportation systems, the park has opted to try pilot programs to implement local area shuttles to add to the visitors options for travel in the park.*

Comment 20: What has been the independent confirmation of the appropriateness of AASHTO standards, and the consequent analysis of environmental impacts?

Response 20: *Much planning and design effort has been expended in keeping and repairing features along the road segment that are of an historic nature, or that add to the character of the road and enjoyment of the visitors. Features such as masonry headwalls, guardwalls, retaining walls, will be retained as much as possible. If they need to be relocated, they will be reconstructed using as much of the salvaged stone as possible and in the same fashion as the original. The American Association of State Highway and Transportation Officials (AASHTO) is a standards setting body which publishes specifications, test protocols and guidelines used in highway design and construction throughout the United States. The Federal Highways Administration, a partner in this project uses AASHTO Guidelines as the baseline for road reconstruction design here in the park. There have been deviations in this project, as in past projects from these standards in order to protect resources, and provide a road felt appropriate for the park.*

Comment 21: I am concerned over the long term impacts of the newly designed Bunsen Trailhead. Presently, a small physical ridge hides the parking area from views across the valley for northbound traffic.

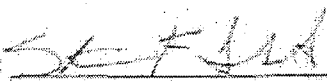
Response 21: *The relocated parking area serving the Bunsen Peak Trail would be visible from the main road at Swan Lake Flat to traffic traveling north, resulting in long term, adverse impacts to views. Widening the access road to this parking area would require some cutting to widen the existing road. This cut would also be visible from this same area.*

(Note to Tammy and Rick: I'm working with the park on a better response to this comment)

STATEMENT OF FINDINGS FOR EXECUTIVE ORDERS 11990 and 11988
(PROTECTION OF WETLANDS and FLOODPLAINS)


Norris to Golden Gate Road Reconstruction Project
Yellowstone National Park

Recommended:


Superintendent, Yellowstone National Park


10/20/2011
Date

Certified for Technical Adequacy and Servicewide Consistency:


Chief, WASO Water Resources Division

10/20/2011
Date

Approved:


Regional Director, Intermountain Region

10/21/11
Date

STATEMENT OF FINDINGS

INTRODUCTION

Executive Order 11990 "Protection of Wetlands" requires Federal agencies to consider alternatives to disturbing waters of the United States including wetlands, in order to avoid, to the extent possible, the long and short-term adverse impacts associated with their destruction or modification. *Director's Order #77-1: Wetland Protection* and its accompanying *Procedural Manual #77-1: Wetland Protection* (NPS 2008) requires the National Park Service to prepare a statement of findings that presents the rationale used to determine that no practical alternatives exist outside the wetland environment to meet the park's management objectives.

In addition, Executive Order 11988 "Floodplain Management" requires Federal agencies "to avoid to the extent possible the long and short term impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative." *Director's Order #77-2: Floodplain Management* and its accompanying *Procedural Manual #77-2: Floodplain Management* (NPS 2002) requires the National Park Service to prepare a statement of findings that presents the rational used to determine that no practical alternatives exist outside the floodplains to meet the park's management objectives.

PROPOSED ACTION

Yellowstone National Park proposes to reconstruct a 15.9-mile (25.6-kilometer) segment of the Grand Loop Road between its intersection with the Norris campground road, and north to a point just north of Swan Lake Flats, in an area known as Golden Gate. The project would reconstruct the road, associated parking areas and turnouts, and bridges. Construction would be done in two phases. The first phase of the project is scheduled to begin in the 2012, and the second phase in 2014 depending upon the availability of funding.

The preferred alternative would reconstruct and widen the existing road to a 30-foot paved width from its existing 19-22 foot width. See Figure 1. Project Location in the Environmental Assessment.

The centerline of the road would be shifted in some areas to accommodate the wider width of the road and to avoid sensitive areas. Centerline shift recommendations are proposed for known sensitive areas at Frying Pan Thermal Spring, near the trailhead to Grizzly Lake, near Semi-Centennial Geyser, and north of Obsidian Cliff.

Two bridges would be rehabilitated/reconstructed as part of this project, the 7-mile bridge located over the Gardner River near the Indian Creek Campground, and the Obsidian Creek Bridge on the access road to the Indian Creek Campground. The Obsidian Creek Bridge would be replaced in its present location. The 7-mile bridge would be reconstructed in its present location while traffic is maintained on a temporary road and bridge to be located directly west of the existing bridge.

Wetlands and “other waters of the US” within 200 feet of either side of the road were delineated and mapped in 2002-2004 (Anderson 2005) and 2010 (Anderson 2010) using “*Classification of Wetland and Deepwater Habitats of the United States* (Cowardin et al. 1979) as the standard for defining, classifying and inventorying wetlands. Wetland determinations were performed as outlined in the January 1987 *Corps of Engineers Wetlands Delineation Manual* with reference to the 1989 *Federal Manual for Identifying and Delineating Jurisdictional Wetlands*. Delineations of wetlands that would be impacted by the proposed project were reviewed and updated in 2010 following the April 2008 *Corps of Engineers’ Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys and Coast Region*.

A total of 231 wetland units were mapped within the survey area and are defined as either “Lacustrine,” “Riverine,” or “Palustrine,” wetlands under the Cowardin et al. (1979) classification system (Anderson 2005, 2010). Detailed maps showing the locations of these wetlands are on file at the Yellowstone Center for Resources. U.S. fish and Wildlife Service National Wetland Inventory maps for this area are available at <http://137.227.242.85/wetland/wetland.html>.

The Lacustrine wetlands include North and South Twin lakes. Both are thermally influenced. Water lily (*Nuphar polysepalum*) and small bur-reed (*Sparganium natans*) are the most common species found growing in the littoral zone (up to 6.6 feet water depth).

The “Riverine” wetlands include Obsidian and Glen creeks, the Gardner and Gibbon rivers, and several small unnamed tributary creeks. All streams within the surveyed area are perennial with substrates of rock, cobbles or gravel with occasional patches of sand. Scattered patches of pondweed (*Potamogeton* spp.) common maretail (*Hippuris vulgaris*) and water-milfoils (*Myriophyllum* spp) are found in some sections of the streams.

Obsidian Creek is thermally influenced and supports the largest known population of warm springs spike-rush (*Eleocharis flavescens* var. *thermalis*) in the central Rockies (Whipple 2005). Warm springs spike rush is a Wyoming plant species of special concern that is known to occur from South America north to the Gulf Coast and along the Eastern Seaboard into Canada. The population in Yellowstone is disjunct from the rest of the occupied habitat by several hundred miles and is restricted to geothermally influenced sites. The only place the species appears in the park is floating on warm water or growing on warm wet ground. The large bright green floating spike-rush mats in Obsidian Creek between Clearwater Springs and the Grizzly Lake trailhead are a popular visitor attraction.

The vegetated “Palustrine” wetlands are the most common type of wetland found in the Norris to Golden Gate road corridor, and include wetlands that are often called marshes, swamps, wet meadows, and fens. Following the standards of the April 2008 *Corps of Engineers’ Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys and Coast Region*, an area is considered to be vegetated if it has 5 percent or more total plant cover at the peak of the growing season. Four Cowardin classes of Palustrine wetlands are present: Palustrine/Forested (PFO),

One Palustrine/Aquatic Bed permanently flooded wetland is located within the survey area. Water buttercup (*Ranunculus aquatilis*) covers 100% of the water surface.

Fens, spring mounds and thermally-influenced wetlands are unusual wetlands deserving special attention. Six wetlands mapped within the road corridor contain peatlands or fens, areas of saturated soils with 16 or more inches of organic soil material. Three are Palustrine Scrub-Shrub wetlands (wetlands 28, 41, and 42). Dominant species vary, but include *Salix boothii*, *Salix wolfii*, *Salix planifolia*, *Betula glandulosa*, *Carex aquatilis*, *Carex utriculata*, *Equisetum arvense*, *Calamagrostis canadensis*, and *Senecio triangularis*.

One fen (wetland 169) can be considered transitional from Scrub-shrub to Forested. Lodgepole pine saplings in the shrub layer have an areal cover of 90% and with time should grow to dominate the tree stratum. Dwarf huckleberry and moss (*Sphagnum* spp.) are also dominants with 60 and 40 % areal cover respectively.

Two fens (wetlands 89 and 112) are Palustrine Forested wetlands dominated by Engelmann spruce with an understory dominated by bluejoint reedgrass, common horsetail and arrowleaf groundsel.

In four locations (wetlands 28, 41, 68, and 118) mounded wetlands have formed over upwelling cold groundwater and are locally called spring mounds. Three of the four are classified as Palustrine Scrub-shrub wetlands with booth willow, planeleaf willow, Wolf willow, bog birch and water sedge dominating. One of the spring mounds is a Palustrine Emergent wetland dominated by beaked sedge and fowl bluegrass (*Poa palustris*). Moss spp and a buildup of organic matter contribute to the mounded topography.

Nineteen wetlands (93, 103, 130, 133, 138d, 139, 159, 162 172, 173, 175, 176, 187, 189, 190s, 200s, 200, 201 and 202) between the south end of the project area and Obsidian Cliff are thermally influenced. The sites vary from sparsely vegetated sinter sheets to well vegetated meadowlike expanses (Palustrine Emergent wetlands) and thermally influenced streams (Riverine wetlands). Typical species occurring around the edges of thermal areas include ticklegrass (*Agrostis scabra*), creeping bentgrass (*Agrostis stolonifera*), tufted hairgrass, Tweedy's rush (*Juncus tweedyi*), baltic rush (*Juncus balticus*), and bluejoint reedgrass (*Calamagrostis canadensis*). Wetter areas often support large stands of *Carex aquatilis*, spike-rushes i.e.. beaked spike-rush (*Eleocharis rostellata*), common spike-rush (*Eleocharis palustris*) and few-flowered spike-rush (*Eleocharis quinqueflora*); three stem bulrush (*Schoenoplectus americanus*), and small bur-reed (*Sparganium natans*). Warm springs spike-rush is found floating on warm water or growing on warm wet ground.

Rare plants known to occur along the Norris to Golden Gate road corridor that are associated with wetlands.

Species	Wetland Indicator Category	Status (G = global rank, S = state rank, T = trinomial rank, Q = taxonomic questions 1 – 5 = least to most abundant)
<i>Botrychium lanceolatum</i> var. <i>lanceolatum</i>	FACW	Wyoming plant species of concern, G5T4/S1; Idaho state sensitive list, G5T4/S3; not tracked in Montana
<i>Carex diandra</i>	OBL	Wyoming plant species of concern, G5/S2; USFS Region 2 Sensitive species; not tracked in Montana; and apparently not reported to occur in Idaho
<i>Carex livida</i>	OBL	Wyoming plant species of concern, G5/S2; USFS Region 2 sensitive; Idaho state sensitive list, G5/S2; not tracked in Montana
<i>Drosera anglica</i>	OBL	Wyoming plant species of concern, G5/S2; Montana plant species of concern, G5/S2S3; USFS Region 2 Sensitive species; not tracked in Idaho
<i>Eleocharis flavescens</i> var. <i>thermalis</i>	OBL	Wyoming plant species of concern, G5T2T3Q/S2; not tracked in Montana or Idaho
<i>Eriophorum chamissonis</i>	OBL	Wyoming plant species of concern, G5/S2; USFS Region 2 sensitive; not tracked in Montana and Idaho
<i>Eriophorum viridicarinatum</i>	OBL	Wyoming plant species of concern, G5/S1S2; Idaho State Priority 1, G5/S2; not tracked in Montana
<i>Geum rivale</i>	FACW	Scattered throughout Rocky Mountain region but known in only one location in YELL, near Glen Creek.
<i>Myriophyllum verticillatum</i>	OBL	G5/S1; Wyoming plant species of concern; not tracked in Montana or Idaho
<i>Schoenoplectus americanus</i>	OBL	Wyoming plant species of concern, G5/S2; not tracked in Montana or Idaho; syn. = <i>Scirpus americanus</i>
<i>Sparganium natans</i>	OBL	Wyoming plant species of concern, G5/S2; not tracked in Montana or Idaho; syn. = <i>Sparganium minimum</i>
<i>Stellaria crispa</i>	FAC+	Wyoming plant species of concern, G5/S1; not tracked by Idaho or Montana

Wetland Indicator Categories are based upon USFWS (1996). OBL = Obligate Wetland, Occurs almost always (estimated probability >99%) under natural conditions in wetlands; FACW = Facultative Wetland, Usually occur in wetlands (estimated probability 67%-99%), but occasionally found in non-wetlands; FAC+ = Facultative, Equally likely to occur in wetlands or non-wetlands (estimated probability 34% - 66%). The positive sign indicated a frequency toward the higher end of the category (more frequently found in wetlands).

Aquatic Resources. Streams and lakes in Yellowstone National Park are designated as Class I, Outstanding Natural Resource Waters, by the state of Wyoming. Class I waters are anti-degradation waters, which means that existing water quality must be maintained. Chemical, physical and biological properties of surface water in the area between Norris and Golden Gate vary considerably. Thermal areas affect water temperature, acidity and contribution of dissolved chemicals. Generally, surface water near Roaring Mountain has a low pH (near 2), high water temperature, and low biological diversity. Conversely, stream surface waters near Swan Lake Flats and Golden Gate have a near neutral pH, cooler water temperatures, and greater biological diversity. Water quality in the project

Adults hibernate in rodent burrows, which may be hundreds of meters from aquatic habitats (Kock and Peterson 1995).

Boreal chorus frogs are also widespread and common throughout much of North America and are widespread and common to abundant in many parts of the park. Within the Norris to Golden Gate road corridor, all sightings were north of Obsidian Cliff. Chorus frogs breed in shallow bodies of water with emergent vegetation. Tadpoles transform into frogs and emerge from the breeding pools during the summer or early fall. Juvenile and adult frogs live in wet moist meadow. They hibernate on land, or near or below the ground surface.

Spotted frogs range throughout the Pacific Northwest and Yellowstone, occurring throughout the Norris to Golden Gate road corridor. Spotted frogs breed in a variety of shallow-water habitats, including temporary pools, ponds and lake edges. Adult and juvenile frogs forage in wet and moist meadows and along the edges of ponds, lakes, and streams. Hibernation occurs in non-freezing water, such as springs and spring-fed streams.

The Western wandering garter snake is common to abundant throughout their range in western North America and is the most widespread and common reptile in Yellowstone. They were found in both the northern and southern portions of the Norris to Golden Gate road corridor. Wandering garter snakes are usually found in the vicinity of water, either still or flowing. Garter snakes forage on land and in water, consuming a large variety of invertebrates, amphibians, and amphibian larvae, small fish and rodents.

Birds Yellowstone's wetlands and riparian areas provide feeding and nesting habitat for numerous birds including sandhill cranes, swans, ducks, geese, snipe, spotted sandpiper and various songbirds such as sparrows and warblers.

Three of Yellowstone's bird species of special management concern, the bald eagle, peregrine falcon, and trumpeter swan also frequent the project area although only the peregrine falcon is known to nest in the area, on large cliffs (Baril 2010).

Mammals The wetlands in the Norris to Golden Gate road corridor are frequented by many species of mammals including elk, bison, moose, mule deer, grizzly and black bear, and gray wolves. The northern section of the Norris to Golden Gate road corridor, especially in the Swan Lake Flats area, with mixed forest and grassland, is ideal habitat for elk. Rutting season occurs during September and October, and bulls tend to seek open meadows to be highly visible and maintain their harems (groups of cows). The meadows of Swan Lake Fat are extensively used for calving mid-May through June.

adjacent to the road edge are filled. (See APPENDIX 2. TABLE OF WETLAND IMPACTS AND COMPENSATORY MITIGATION/WETLAND RESTORATION) Sixteen Palustrine Forested wetlands totaling 0.12 acres, 63 Palustrine Emergent wetlands totaling 1.02 acres, 15 Palustrine Scrub-Shrub wetlands totaling 0.39 acres and 23 Riverine wetlands totaling 0.28 acres would be affected.

Approximately 450 feet south of Apollinaris Spring, 210 linear feet of Obsidian Creek would be re-routed to cross under the road approximately 80-100 feet south of its existing location. See drawing, Appendix IV, page 44. The existing culvert would be moved. Approximately 140 linear feet (2,390 square feet) of new stream channel would be constructed in a Palustrine Forested wetland on the west side of the road in what appears to be an old oxbow to reconnect with the existing stream channel. 1,535 square feet of the de-watered stream channel on the east side of the road would be filled by the widened road and 1,890 square feet would revert to a Palustrine Emergent wetland.

Approximately 1.55 -1.75 acres of wetland would be temporarily impacted in portions of 51 wetlands. See Appendix III.

The largest area of temporary impact (approximately 0.29 acres) would result from the reconstruction of the Gardner River bridge. During construction, traffic would be diverted onto a temporary road to be built immediately west (upstream) of the existing road and bridge. Multiple culverts would be placed in the Gardner River to allow stream flow to continue. Fill would be placed over the culverts and adjacent Palustrine Emergent and Palustrine Scrub-Shrub wetlands to create the temporary road. This detour would be in place for approximately 4-5 months and the fill would be removed and the site restored when the new bridge is complete.

Other temporary impacts would occur during the re-construction of the Gardner River bridge wing walls, the Obsidian Creek bridge abutments, and the reconstruction of 143 historic rock culvert headwalls. Four wetlands located within road ditches would be disturbed by ditch cleaning or subexcavation work.

In some places the edge of the road fill has been sufficiently wet that hydric soils have developed and hydrophytic (wetland) vegetation is present. The road fill from these areas would be removed to restore original grade. The existing topsoil would be stripped, the fill removed and the topsoil replaced. Wetland species would be planted as described below. The Army Corps of Engineers considers this type of action a temporary modification of an existing wetland. These areas would not count as mitigation because there is already existing wetland present.

In all cases, the wetland vegetation and soils would be salvaged and then placed back on site following construction. The sites' hydrology would not be altered. Restoration would follow the steps outlined below on page 16: PROPOSED COMPENSATION

Rare Plants. Portions of four wetland sites containing four rare plant species (*Eleocharis flavescens* var. *thermale*, *Geum rivale*, *Myriophyllum verticillatum*, and *Sparganium natans*) totaling 670 square feet would be impacted by the road reconstruction. Mitigation efforts would include seed collection prior to disturbance and plant salvage during the topsoil conservation phase. The areas would be reseeded or planted after road

The condition of the Norris to Golden Gate Road segment is generally poor. Lack of drainage, frost heaving, infiltration of water into the base and sub-base and poor road building materials all contribute to the continuing deterioration of the road and the need for improvement. The road crosses over or very near thermal features causing impacts to these features from runoff from the road, contamination due to petroleum products, and activities such as snow clearing and road maintenance. Repairs have been made to the road in the past due to hot areas under the road that required venting and steel plates to support traffic loads. Many of the pullouts are not adequately designed for adequate clear space from passing traffic, not enough pullouts exist to allow traffic to pull over to allow others to pass.

The deterioration of the road surface and the lack of proper base material under the road have resulted in increased maintenance costs and a degraded visitor experience. Drainage deficiencies contribute to the rough and rutted surface include ditches and culverts generally clogged or overgrown with vegetation, as a result surface water is not able to move away from the road structure. Culvert headwalls are in need of repair due to age and erosion.

Numerous overlays of asphalt have raised the road surface to a point that dangerous drop-offs exist at the pavement edge of this narrow road. Lack of attention by the driver has caused many accidents due to a wheel dropping of the edge leading to an unrecoverable trip into the ditch or worse.

The lack of parking in the area of Bunsen Peak and Swan Lake Flats, combined with the popularity of the area for horsepacking trips, have led to a dangerous situation where pedestrians, horses, and vehicles are all in close proximity to each other. This same area serves as a backcountry gateway for entering Swan Lake Flats from the north, and the views of snow-capped mountains vie for the attention of the driver increasing the danger in the area. The turnouts and parking areas along this road segment do not accommodate the number and size of vehicles currently visiting the park. Parking numbers and turning radii are insufficient through the area and contribute to congestion during peak seasons, resulting in deteriorated road structure, impacts to surrounding vegetation, pedestrian vs. vehicular conflicts and ineffective traffic flow.

Visitor use areas along this road have a high number of social trails and informal parking areas with erosion problems, revegetation needs, and various repairs that are needed.

Bringing the road up to standard would cause unavoidable impacts to some wetlands because of their close proximity to the existing road and the new increased road width and associated cuts or fills. In six cases, however, the alignment can and would be shifted to allow restoration of wetlands that were impacted/filled in during earlier road projects.

OTHER ALTERNATIVES CONSIDERED

Alternative A – No Action/Continuation of Current Practices

Under this alternative the current alignment would remain unchanged. Periodic maintenance would be performed by the park to maintain the road as much as possible. The road width would remain at its existing 19-22 feet in width. The travel speed would

specifications, would be implemented. Sediment and other pollution would be controlled on site so that it does not enter nearby streams or creeks. During the construction of bridges, barriers and fences would be erected below abutments and drainages to minimize pollutants reaching river waters.

In-stream work would only occur during low water (fall or early spring before snow melt), to minimize sediment and potential for disturbing the spawning (non-native) Brook trout.

Any use of or association with hazardous materials would require contractor compliance with applicable federal, state, and local laws, codes, ordinances, and regulations. In addition, the *Yellowstone National Park Hazardous Materials Response Plan* (NPS 1993) would be followed to mitigate potential hazardous material incidents within the park boundary and similar incidents outside the boundary requiring mutual aid.

The Federal Highway Administration would develop a pollution prevention plan with the Wyoming Department of Environmental Quality under the national pollution discharge and elimination system (NPDES) stormwater management program.

Equipment would not be serviced or refueled near streams; parking and staging areas would be at least 45 meters (150 feet) from streams or riparian areas. Fuel would be stored in fuel trucks or aboveground storage tanks, and all fuel storage would be in staging areas. Refueling would take place in staging areas and might occur at material source sites. No chemicals would be used in dust abatement. Dust abatement would include watering of disturbed areas.

Vehicle traffic would be managed within the construction zone, and contractor hauling of materials, supplies, and equipment would be controlled.

Unavoidable temporary impacts would be minimized by salvaging the wetland vegetation and soils prior to construction and then placing them back on the site(s) following the road work. (See discussion of topsoil conservation and revegetation below.) The sites' hydrology would not be altered.

Minimization of temporary impacts from the construction of the temporary bypass road at the Gardner River Bridge requires special design. The work would be done at low water (fall) to facilitate construction and to minimize release of sediment into the river. The timing also corresponds to the time when the willows and water birch are approaching dormancy. The shrubs would be cut within one inch of the ground surface to minimize crushing or breaking the plants. A one- to two-inch deep layer of washed sand would be placed around and over the pruned plants to further minimize breakage. A water-permeable geotextile fabric would then be installed over the sand layer to separate the shrubs from the road fill and to facilitate later removal of the road fill. The road fill for this detour would be drifted out over the geotextile in one lift, working from the existing road. A temporary base course and asphalt surface would complete the temporary road. The temporary road would be in place 3-4 months and then would be de-constructed in the reverse order of construction. It is expected that the shrubs would sprout the following spring, but if they do not, revegetation would be accomplished by planting willow and water birch stem cuttings and/or rooted stem cuttings collected from the local area. Once the temporary embankment and geotextile are removed, temporary erosion

Topsoil Conservation:

The contractor would salvage wetland topsoil under the supervision of the Federal Highways Project Engineer. The following specifications would be included in the Special Contract Requirements:

1. Carefully salvage all existing wetland topsoil. Windrow the soils and associated wetland vegetation to the edge of construction limits in a manner and using equipment that would preserve the viability of the rhizomes, roots, and seed within the soil. Care shall be taken to avoid causing the windrows to interfere with surface hydrology. Various types of equipment and methods would be used to remove small pockets of topsoil, topsoil layers, and wetland "sod." Sod mats would be kept intact and returned to their approximate original location in a manner that would facilitate re-establishment. The amount of topsoil depth to remove would vary depending on the depth of the rooting zone and seed containing material. The Park Service liaison would advise the FHWA Project Engineer on the recommended depth of the layers and salvaging operations.
2. Do not drive on the wetlands until the topsoil is removed. Do not drive on the stockpiled windrows of topsoil. No clearing or grubbing shall occur before topsoil has been removed.
3. Replace or use the wetland topsoil within three months. Place topsoil in a manner that does not mix soil layers, contaminate the soil, or destroy the seed source or wetland" sod. Extensions beyond three months must be approved by the project Contracting Officer (CO).
4. In areas where topsoil is not available, use topsoil from an adjacent area that has been salvaged. Do not transport wetland topsoil from one area to another area unless they are adjacent areas or unless the CO has authorized approval to do so. Do not add soil amendments. Do not use thermal wetland soils in non-thermal wetlands or use non-thermal wetland soils in thermal wetland areas.
5. Regrade the reclaimed site to match the contours on surrounding land so that original drainage flow is restored.
6. Within wetland restoration areas, fir/cedar shredded bark shall be applied on slopes greater than 10% at a light mulch coverage rate of 10 cu yds/ac.

Revegetation:

Revegetation would entail use of seed, cuttings, and transplanted "plugs" of native wetland plant species collected from the undisturbed portion of the wetlands that are being restored to original size, seedlings grown from seed collected in the local area, and placement of wetland topsoil and associated plant materials salvaged from similar areas being impacted by road widening. The species mix would vary depending upon the species found in the adjacent, undisturbed portion of the wetland being restored:

Palustrine Emergent Wetlands 91, 101, 103, 105, and 119. These are wetlands adjacent to Obsidian Creek. Centerline shifts of the current road would allow removal of road fill

during the projected peak of the hydrograph and/or seasonal high groundwater and once during the low water elevation periods.

3. Soils. The compensation consists of restoration of wetlands that were filled during construction of the road alignment. Excavation of fill to at-or-below original grade would expose the former wetland soils. It is expected that those soils would still retain some of the redoximorphic features that were formed before the wetlands were filled. Presence of redoximorphic features, therefore, would not be a reliable indicator that the mitigation is successful, and soils would not be monitored beyond the initial survey to insure that all of the fill has been removed.

Reporting. The NPS would provide periodic following the completion of the mitigation sites documenting the findings of items #1-3 from the sampling performed. In these reports, the NPS would identify:

- 1 Success criteria and how the compensation sites compare to those criteria.
2. A comparison of the sizes of the proposed and actual compensation areas to project impact areas.
3. Classification of compensation areas based on type (Cowardin classification).
4. Interpretation of data collected in items #1 and 2 and discussion as to how compensation is determined to be demonstrating success or failure.
5. Identification of problems that have arisen and corrective measures that have been implemented or proposed.
6. Routine wetland delineation data forms or similar forms, which contain appropriate data fields.
7. Plan view map(s).
8. Color photos of compensation sites from permanently established locations.
9. A contingency plan should the compensation plans and implementation prove unsuccessful.

CONCLUSION

Although 1.70 – 1.90 acres of wetlands would be permanently impacted and 1.55-1.75 acres will be temporarily impacted, this represents the minimum possible disturbance to carry out the National Park Service's responsibility for providing adequate and safe access within Yellowstone National Park. In accordance with the NPS no net loss of wetlands policy, impacted wetlands would be replaced with comparable wetland habitats via restoration of 2.10-2.30 acres of previously disturbed wetlands. We therefore find this project to be consistent with NPS procedures for complying with Executive Order 11990.

Approximately 1.66 acres of existing road fill would be removed from the Obsidian Creek floodplain. A total of approximately 0.09 acres of road fill would be added to the floodplain to accommodate road widening. Where filling occurs, it would have negligible impacts to natural floodplain values including but not limited to vegetation, wildlife habitat, dissipation of flood energy, sedimentation processes, and groundwater.

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APPENDIX 1. PLANT NAMES AND WETLAND INDICATOR STATUS.

A list of plants found in wetlands within 200 feet of the Norris to Golden Gate. Nomenclature follows that used by Reed (1996), Dorn (1992), and Hitchcock and Cronquist (1973).

Wetland Indicator Status categories are defined as follows (Environmental Laboratory, 1987, and Reed, 1996):

OBL = OBLIGATE WETLAND PLANT: Occurs almost always (probability > 99%) in wetlands.

FACW = FACULTATIVE WETLAND PLANT: Usually occurs in wetlands (probability 67% - 99%).

FAC = FACULTATIVE PLANT: Has a similar probability (probability 33% - 67%) of occurring in both wetlands and non-wetlands.

FACU = FACULTATIVE UPLAND PLANT: One that occurs less often in a wetland as compared to a non-wetland (1% - 33% probability of occurring in a wetland).

Stratum	Scientific Name	Common Name	Wetland Indicator Value
Tree	<i>Abies lasiocarpa</i>	Subalpine fir	FACU
	<i>Picea engelmannii</i>	Engelmann Spruce	FAC
	<i>Pinus contorta</i>	Lodgepole Pine	FAC
	<i>Pinus flexilis</i>	Limber Pine	--
	<i>Pseudotsuga menziesii</i>	Douglas-Fir	FACU
Shrub	<i>Abies lasiocarpa</i>	Subalpine fir	FACU
	<i>Artemisia cana</i>	Silver Sagebrush	FACU
	<i>Picea engelmannii</i>	Engelmann Spruce	FAC
	<i>Pinus albicaulis</i>	Whitebark Pine	--
	<i>Pinus contorta</i>	Lodgepole Pine	FAC
	<i>Pseudotsuga menziesii</i>	Douglas-Fir	FACU
	<i>Salix boothii</i>	Booth Willow	OBL
	<i>Salix drummondiana</i>	Drummond Willow	FACW
	<i>Salix lemmonii</i>	Lemmon Willow	FACW+
	<i>Salix planifolia</i>	Diamond-Leaf Willow	OBL
	<i>Salix wolfii</i>	Wolf Willow	OBL
Herb	<i>Abies lasiocarpa</i>	Subalpine fir	FACU
	<i>Achillea millefolium</i>	Common Yarrow	FACU
	<i>Aconitum columbianum</i>	Monkshood	FACW
	<i>Agoseris glauca</i>	Mountain Dandelion	FAC-
	<i>Agropyron sp.</i>	Wheatgrass	--
	<i>Agrostis exarata</i>	Spike Bentgrass	FACW
	<i>Agrostis idahoensis</i>	Idaho Bentgrass	FACW
	<i>Agrostis scabra</i>	Rough Bentgrass	FAC
	<i>Agrostis sp.</i>	Bentgrass	--
	<i>Agrostis stolonifera</i>	Redtop	FACW
	<i>Allium brevistylum</i>	Wild Onion	NI
	<i>Alopecurus aequalis</i>	Foxtail	OBL
	<i>Anaphalis margaritacea</i>	Pearly Everlasting	UPL
	<i>Angelica sp.</i>	Angelica	--
	<i>Antennaria corymbosa</i>	Flat-Top Pussytoes	FAC
	<i>Antennaria sp.</i>	Pussy-Toes	--
	<i>Arnica mollis</i>	Hairy Arnica	FAC

Stratum	Scientific Name	Common Name	Wetland Indicator Value
	<i>Cicuta douglasii</i>	Western Water Hemlock	OBL
	<i>Cirsium arvense</i>	Creeping Thistle	FACU
	<i>Cirsium scariosum</i>	Elk's Thistle	NI
	<i>Collinsia parviflora</i>	Blue-eyed Mary	NI
	<i>Collomia linearis</i>	Narrow-Leaved Collomia	FACU
	<i>Corydalis aurea</i>	Corydalis	NI
	<i>Danthonia intermedia</i>	Timber Oatgrass	FACU+
	<i>Delphinium sp.</i>	Larkspur	--
	<i>Deschampsia cespitosa</i>	Tuftend Hairgrass	FACW
	<i>Dichanthelium acuminatum</i>	Panic Grass	FAC
	<i>Dodecatheon pulchellum</i>	Shooting Star	FACW
	<i>Eleocharis acicularis</i>	Least Spikerush	OBL
	<i>Eleocharis palustris</i>	Creeping Spikerush	OBL
	<i>Eleocharis quinqueflora</i>	Fewflower Spikerush	OBL
	<i>Eleocharis rostellata</i>	Beaked Spikerush	OBL
	<i>Eleocharis sp.</i>	Spikerush	--
	<i>Elymus glaucus</i>	Blue Wild-Rye	FACU
	<i>Elymus sp.</i>	Wild-Rye	--
	<i>Elymus trachycaulus</i>	Slender Wheatgrass	FAC
	<i>Epilobium angustifolium</i>	Fireweed	--
	<i>Epilobium brachycarpum</i>	Tall Annual Willowherb	UPL
	<i>Epilobium ciliatum</i>	Hairy Willowherb	FACW-
	<i>Epilobium lactiflorum</i>	Milkflower Willowherb	FACW
	<i>Epilobium sp.</i>	Willowherb	--
	<i>Equisetum arvense</i>	Field Horsetail	FAC
	<i>Equisetum hyemale</i>	Scouringrush Horsetail	FACW
	<i>Equisetum laevigatum</i>	Smooth Horsetail	FACW
	<i>Erigeron sp.</i>	Fleabane	--
	<i>Eriogonum sp.</i>	Buckwheat	--
	<i>Eriophorum chamissonis</i>	Cotton Grass	OBL
	<i>Eriophorum polystachion</i>	Cotton Grass	OBL
	<i>Euphorbia sp.</i>	Leafy Spurge	--
	<i>Fragaria vesca</i>	Wood Strawberry	NI
	<i>Fragaria virginiana</i>	Virginia Strawberry	FACU
	<i>Galium aparine</i>	Stickwilly	FACU
	<i>Galium bifolium</i>	Twinleaf Bedstraw	NI
	<i>Galium boreale</i>	Northern Bedstraw	FACU
	<i>Galium trifidum</i>	Sweet-Scented Bedstraw	FACW+
	<i>Gaultheria humifusa</i>	Alpine Spicy Wintergreen	FACW

Stratum	Scientific Name	Common Name	Wetland Indicator Value
	<i>Muhlenbergia filiformis</i>	Pullup Muhly	FACW-
	<i>Myriophyllum sp.</i>	Water	--
	<i>Nuphar polysepala</i>	Rocky Mountain Pond	OBL
	<i>Panicum acuminatum</i>	Matting Rosette Grass	--
	<i>Parietaria pensylvanica</i>	Pellitory	--
	<i>Parnassia fimbriata</i>	Grass-Of-Parnassus	OBL
	<i>Pedicularis groenlandica</i>	Elephant's Head	OBL
	<i>Penstemon rydbergii</i>	Rydberg's Penstemon	FACU
	<i>Pentaphylloides floribunda</i>	Shrubby Cinquefoil	FACU-
	<i>Perideridia gairdneri</i>	Gardiner's Yampah	FAC
	<i>Perideridia montana</i>	Montana Yampah	FAC
	<i>Phleum alpinum</i>	Alpine Timothy	FACW-
	<i>Phleum pratense</i>	Timothy Grass	FAC-
	<i>Phlox hoodii</i>	Hoodii Phlox	--
	<i>Picea engelmannii</i>	Engelman's Spruce	FAC
	<i>Pinus contorta</i>	Lodge-Pole Pine	FAC
	<i>Pinus flexilis</i>	Flexible Pine	--
	<i>Plagiobothrys scouleri</i>	Scouler's Popcornflower	--
	<i>Plantago major</i>	Common Plaintain	FAC
	<i>Platanthera dilatata</i>	Leafy White Orchid	FACW+
	<i>Poa palustris</i>	Fowl Bluegrass	FAC
	<i>Poa pratensis</i>	Kentucky Bluegrass	FAC
	<i>Poa sp.</i>	Bluegrass	--
	<i>Polemonium occidentale</i>	Western Jacob's-Ladder	FACW
	<i>Polemonium pulcherrimum</i>	Jacob's-Ladder	NI
	<i>Polygonum bistortoides</i>	American Bistort	FACW
	<i>Polygonum douglasii</i>	Douglas' Knotweed	FACU
	<i>Polygonum kelloggii</i>	Kellog's Knotweed	NI
	<i>Polygonum viviparum</i>	Alpine Bistort	FAC
	<i>Potamogeton sp.</i>	Pondweed	OBL
	<i>Potentilla anserina</i>	Silverweed	OBL
	<i>Potentilla diversifolia</i>	Varileaf Cinquefoil	FACU
	<i>Potentilla glandulosa</i>	Sticky Cinquefoil	FAC-
	<i>Potentilla gracilis</i>	Northwest Cinquefoil	FAC
	<i>Potentilla palustris</i>	Marsh Cinquefoil	--
	<i>Potentilla sp.</i>	Cinquefoil	--
	<i>Prunella vulgaris</i>	Heal All	FACU+
	<i>Pseudognaphalium stramineum</i>	False Cudweed	FAC+
	<i>Ranunculus aquatilis</i>	White-Water Buttercup	OBL

APPENDIX 2. TABLE OF WETLAND IMPACTS AND COMPENSATORY
MITIGATION/WETLAND RESTORATION

WETLAND	WETLAND	IMPACTS			TEMPORARY IMPACTS			WETLAND RESTORATION			MAP
ID	TYPE	sqft	m2	acres	sqft	m2	acres	sqft	m2	acres	NOS.
ngg209	PF04G	80.0	7.43	0.002	15.0	1.39	0.000				1
ngg193	PF04G	15.0	1.39	0.000	180.0	16.72	0.004	2,490.0	231.329	0.057	2
ngg190S	R3ABH	15.0	1.39	0.000							2
ngg190	PEMC	185.0	17.19	0.004							2
ngg196D	R4x	380.0	35.30	0.009							2
ngg192	PFO4F	20.0	1.86	0.000	1,165.0	108.23	0.027	730.0	67.819	0.017	3
ngg191	PFO4A	505.0	46.92	0.012				1,145.0	106.374	0.026	3
ngg189	PEMG	1,405.0	130.53	0.032							3
ngg187	PEMG				1,490.0	138.43	0.034	6,575.0	610.837	0.151	4
ngg185D	PEM1Dx	610.0	56.67	0.014							5
ngg181D	PEM1Dx	55.0	5.11	0.001							6
ngg178D	PEM1Dx	970.0	90.12	0.022							7
ngg177	PEMC				430.0	39.95	0.010	380.0	35.303	0.009	8
ngg175	PEMC				170.0	15.79	0.004	2,205.0	204.851	0.051	9
ngg176	PEMC				220.0	20.44	0.005	1,635.0	151.896	0.038	9
ngg174	PFOA										10
ngg169	PSS4C	60.0	5.57	0.001							11
ngg167D	PSSx	60.0	5.57	0.001							12
ngg166D	PEM1Dx	100.0	9.29	0.002							12
ngg157	PEMG	145.0	13.47	0.003							13
ngg157D	PEM1Dz	340.0	31.59	0.008							13
ngg155S	R4SBC	340.0	31.59	0.008							14
ngg150D	R4x	705.0	65.50	0.016							15
ngg142	PFOA	25.0	2.32	0.001							16
ngg143D	R4x	60.0	5.57	0.001							16
ngg140	PSS4G	35.0	3.25	0.001							17
ngg139	PEMC	45.0	4.18	0.001							18
ngg138D	R4x				215.0	19.974	0.005	220.0	20.439	0.005	18
ngg137	PEMA	365.0	33.91	0.008	435.0	40.413	0.010				19
ngg137D	R4x	675.0	62.71	0.015							19
ngg132	PEMC				35.0	3.25	0.001				20
ngg134	PSS4G				655.0	60.85	0.015	3,520.0	327.019	0.081	20
ngg118S	R3ABH	5.0	0.46	0.000							22
ngg118	PEMF	3,085.0	286.61	0.071							22
ngg117	PEMC	610.0	56.67	0.014							23
ngg116	PEMF	900.0	83.61	0.021							23
ngg113D	PEM1Dx	65.0	6.04	0.001							24
ngg115D	PEM1Dx	205.0	19.05	0.005							24
ngg119	PEMC							6,900.0	641.031	0.158	24

ngg031S	R	35.0	3.25	0.001							57
ngg030S	R	50.0	4.65	0.001							57
ngg033	PSS	105.0	9.75	0.002	160.0	14.864	0.004				57
ngg034	PEMC	1,215.0	112.88	0.028	465.0	43.200	0.011				57
ngg028	PSS	1,605.0	149.11	0.037	30.0	2.787	0.001				58
GardnerRvr	R				2,660.0	247.122	0.061				58
ngg022	PEMC	35.0	3.25	0.001							60
ngg024	PEMC	100.0	9.29	0.002							60
ngg025	PEMC	445.0	41.34	0.010							60
ngg023	PEMC	1,230.0	114.27	0.028							60
ngg016	PEMC	55.0	5.11	0.001							61
ngg004A	PSS	270.0	25.08	0.006							73
ngg001BS	R3	35.0	3.25	0.001							74
ngg005	PAB3	115.0	10.68	0.003							74
ngg002	PSS	130.0	12.08	0.003							74
ngg003	PSS	145.0	13.47	0.003							74
ngg001AS	R3	190.0	17.65	0.004							74
ngg004	PSS	210.0	19.51	0.005							74
ngg005S	R3	160.0	14.86	0.004							75
ngg004B	PSS	955.0	88.72	0.022							75
ngg130	PEMC	75.0	6.97	0.002	200.0	18.58	0.005				20 & 21
ngg109	PEMC				485.0	45.06	0.011	3,200.0	297.290	0.073	25 & 26
ngg105	PEMF				7,750.0	720.00	0.178	15,520.0	1,441.855	0.356	27 & 28
ngg103	PEMC				5,655.0	525.37	0.130	13,005.0	1,208.204	0.299	28-30
ngg105D	PEM1Dx	1,515.0	140.75	0.035							29 & 30
ngg188D	R4x	3,560.0	330.73	0.082							3 & 4
ngg102	PFO			0.481	9,460.0	878.863	0.217	20,090.0	1,866.422	0.461	30-32
ngg096S	R3UB4	545.0	50.63	0.013	110.0	10.219	0.003				33 & 35
ngg091	PEMF	2,570.0	238.76	0.059	3,640.0	338.167	0.084	2,830.0	262.916	0.065	35-38
ngg090	PF04C	45.0	4.18	0.001	4,125.0	383.225	0.095	1,085.0	100.800	0.025	38-40
ngg089	PF04C	125.0	11.61	0.003	1,995.0	185.342	0.046	2,015.0	187.200	0.046	40 & 41
ngg088	PSS4C	10.0	0.93	0.000	3,345.0	310.761	0.077	2,630.0	244.335	0.060	41 & 42
ngg036	PEMC	270.0	25.08	0.006							54 & 55
ngg029	PEMC	4,360.0	405.06	0.100	8,080.0	750.657	0.185				56 & 58
ngg027	PSS	1,340.0	124.49	0.031	7,135.0	662.863	0.164				58 & 59
ngg026	PEMC	5,370.0	498.89	0.123	70.0	6.503	0.002				58 & 59
ngg009	PEMC	2,640.0	245.26	0.061							61 & 62
ngg007	PSS	8,705.0	808.72	0.200							63-72
ngg021	PEMC	8,920.0	828.70	0.205							64-67
ngg020	PSS	2,545.0	236.44	0.058							69 & 70
NorrisWell	PEM							7,841.0	728.453	0.180	76
TOTALS		77,095.0	7,162.36	1.770	70,880.0	6,584.97	1.627	99,561.0	9,249.520	2.286	

EA LOSS = 1.70-1.90 acres EA TEMP = 1.55-1.75 acres EA GAIN = 2.10-2.30 acres

