

# CHAPTER 2

## DESCRIPTION OF ALTERNATIVES

Introduction .....	2-1
Alternatives Considered in Detail .....	2-1
<i>Alternative 1 - No Action</i> .....	2-1
<i>Alternative 2 - Proposed Action</i> .....	2-5
<i>Alternative 3 - No Snowmaking or Snowplay</i> .....	2-17
<i>Mitigation Measures and Best Management Practices</i> .....	2-21
Alternatives Considered but not Analyzed in Detail.....	2-32
Comparison of Alternatives .....	2-39
Data Integrity .....	2-61

ARIZONA

SNOWBOWL

Coconino National Forest  
Peaks Ranger District



## 2. DESCRIPTION OF ALTERNATIVES

### INTRODUCTION

Chapter 2 describes the alternatives considered within this environmental analysis and summarizes the environmental consequences anticipated to result with the implementation of each. As required by the Council on Environmental Quality (CEQ), the alternatives considered are presented in comparative form.<sup>1</sup> Mitigation measures and best management practices (BMPs), designed to lessen or avoid impacts anticipated to occur as a result of implementation of the action alternatives, are also detailed.

The National Environmental Policy Act (NEPA) requires that an environmental analysis examine a range of alternatives, which are “reasonably related to the purpose of the project.”<sup>2</sup> Both CEQ Regulations and Forest Service Handbook direction emphasize that alternatives must meet the “reasonableness” criteria in order to warrant detailed analysis. Alternatives which were considered within the analysis process, but were determined not reasonable were eliminated from detailed study with a brief discussion of the rationale for their elimination.<sup>3</sup>

The process used to develop alternatives to the Proposed Action followed external public and internal agency scoping. The issues raised during the scoping process were utilized as the basis for determining the need for alternatives to the Proposed Action. A Comment Disposition Analysis, documenting the categorization and responses to all comments submitted, was prepared as a key component of the scoping and alternatives formulation process. The Comment Disposition Analysis is contained in the project record at the Peaks Ranger District.

### ALTERNATIVES CONSIDERED IN DETAIL

In addition to the Proposed Action, a second action alternative (Alternative 3) and the required No Action Alternative are analyzed in detail within this EIS.

#### ALTERNATIVE 1 – NO ACTION

As required by NEPA, a No Action Alternative has been included in this analysis for review alongside the action alternatives.<sup>4</sup> The No Action Alternative reflects a continuation of existing management practices without changes, additions, or upgrades. Selection of Alternative 1 would result in creation of a new Master Development Plan (MDP) which would provide for operation and maintenance of existing facilities. No new facilities, trail improvements, or snowmaking would occur under the No Action Alternative and the Snowbowl would continue to operate at its existing Comfortable Carrying Capacity (CCC) of 1,880 skiers-at-one-time. Peak day visitation would

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<sup>1</sup> 40 CFR 1502

<sup>2</sup> 40 CFR 1502.14a

<sup>3</sup> 46 Federal Register 18026

<sup>4</sup> 40 CFR 1502.14(d)

continue to reach in excess of 3,400 skiers-at-one-time.<sup>5</sup> The No Action Alternative provides a baseline for comparing the effects of the Proposed Action and Alternative 3.

The No Action Alternative is illustrated on Figure 2-1.

### **Snowplay**

Dispersed snowplay (sledding, tubing, building snowmen, etc.) is not permitted within the Snowbowl SUP area or at any point along the Snowbowl Road. Parking along the Snowbowl road was recently prohibited in order to manage the level of dispersed snowplay activities and their attendant issues. Under the No Action Alternative, snowplay would continue to be prohibited within the Snowbowl SUP and along the Snowbowl Road.

### **Lifts/Uphill Capacity**

Under the No Action Alternative, the Snowbowl would continue to operate five lifts: Agassiz (triple); Sunset (triple); Hart Prairie (double); Aspen (double); and Spruce (surface). Over time, as the lifts age, their periodic replacement would become necessary and would occur.

### **Terrain**

Under the No Action Alternative, Snowbowl's terrain would remain in its current configuration with 32 formal (named) trails comprising approximately 139 acres.

### **Guest Service Facilities**

Existing on-mountain visitor services are provided in two buildings: the Hart Prairie Lodge (at the base of the Hart Prairie and Sunset chairlifts) and the Agassiz Lodge at the base of the Agassiz Chairlift. In total, these two buildings comprise approximately 23,500 square feet of guest service and administrative space. There are presently a total of 614 indoor, cafeteria style seats and 648 outdoor seats available between the two buildings. Under the No Action Alternative, neither building would change, with the exception of minor modifications and routine maintenance.

### **Summer Activities**

Under Alternative 1, no change would occur to the Scenic Sky Ride program that operates daily on the Agassiz Chairlift. As is currently the case, hiking from the top of the lift back to the base area is not allowed, guests would therefore continue to be required to return back to the base area via the lift.

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<sup>5</sup> Refer to the Recreation section presented in Chapter 3 for additional details regarding daily and annual visitation.

## **Infrastructure and Utilities**

### **Sewer and Wastewater**

Snowbowl's existing septic system is adequate to meet the current demands of the ski area. Snowbowl currently relies on vehicular delivery for 100 percent of its potable and non-potable water demands. It is estimated that over 60 percent of the potable water transported to the ski area is ultimately consumed by toilet services. Under the No Action Alternative, this practice would continue.

### **Roads**

Under the No Action Alternative, Snowbowl would not construct any new on-mountain maintenance roads.

### **Parking**

Approximately 10.3 acres of parking are currently provided in the parking lots adjacent to the Hart Prairie Lodge, and the upper lots below the Agassiz Lodge. The combined capacity of the lots is approximately 1,200 vehicles. No additional parking areas would be constructed under Alternative 1.

### **Pedestrian Access**

Under the No Action Alternative, pedestrian movement across the main access road (between the Hart Prairie lodge/parking areas and the Sunset Chairlift) would not be addressed.

**Figure 2-1: No Action Alternative**

## **ALTERNATIVE 2 - PROPOSED ACTION**

Alternative 2 would result in the creation of a MDP that includes all projects outlined in the following Proposed Action description.

Under the Proposed Action, the Snowbowl's CCC would increase to the previously approved<sup>6</sup> level of 2,825 skiers-at-one-time. Peak day visitation would continue to reach in excess of 3,400 skiers-at-one-time.

The Proposed Action is illustrated on Figures 2-2 through 2-6.

### **Snowmaking**

Snowbowl proposes to install the necessary snowmaking infrastructure to cover 205.3 acres of terrain throughout the duration of its winter operating season (refer to Figure 2-3). Snowbowl would almost certainly cover the full extent of this area during the pre- and early season (approximately October through December) each year in order to create a sufficient base layer that would subsequently be covered by natural snowfall. However, the ski area may continue to produce snow throughout the winter to compensate for inadequate natural snowfall, depending on weather trends.

The City of Flagstaff has agreed to provide the ski area with up to 1.5 million gallons per day (gpd) of Class A reclaimed water from the Rio De Flag Treatment Plant between November 1<sup>st</sup> and the end of February, for a period of five years. Currently, reclaimed water from the Rio De Flag Treatment Plant is utilized to irrigate city parks, school playgrounds, and golf courses during the summer, but goes unused throughout the winter. The Arizona Department of Environmental Quality (ADEQ) allows reclaimed water with an "A" rating to be used for snowmaking purposes. The reclaimed water produced by the Rio de Flag Water Treatment Plant currently exceeds this standard.

The reclaimed water originating from the Rio de Flag Water Treatment Plant would be transported to the ski area via an approximate 14.8-mile buried pipeline (refer to Figure 2-4). The waterline would be connected to the reclaimed water circulation system currently used by the City of Flagstaff near Thorpe Park and follow existing utility easements and rights-of-way across a mix of federal, state, and private lands to the intersection of U.S. Highway 180 and Snowbowl Road. From this point the waterline would follow the Snowbowl Road to the ski area and subsequently be routed up a ski trail to a proposed 10 million gallon reservoir (explained below). Two booster stations would be installed along the pipeline to maintain appropriate pressure. These would likely be located near Thorpe Park and along Snowbowl Road. Each pump station would entail the construction of a small pump house building.

The currently proposed pipeline route was identified after discussions with Transwestern Pipeline Company, the Forest Service, Arizona State Land Department, and Lowell Observatory. Lowell Observatory is very interested in providing fire hydrants on observatory property west of their campus and also in replacing a private and antiquated potable water delivery system to the campus from Flagstaff. In accordance with Forest

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<sup>6</sup> Approved in the 1979 Arizona Snowbowl Ski Area Proposal Final Environmental Statement and subsequently incorporated by reference the CNF Forest Plan.

Plan direction to locate additional uses within existing utility corridors, the proposed reclaimed water pipeline route follows the Transwestern Lateral Natural Gas Pipeline from west of the observatory to the intersection of U.S. Highway 180 and Snowbowl Road. The remainder of the proposed pipeline route is located on observatory private property or existing Forest Service roads. The proposed route was also selected to minimize impacts and inconveniences to traffic and private property during construction of the pipeline.

A 10 million gallon water storage impoundment (approximately 30.7 acre-feet in volume and 1.9 acres in surface area) is proposed to be constructed near the top terminal of the existing Sunset Chairlift for operation of the snowmaking system (refer to Appendix A for more detail on the proposed impoundment's design specifications). Ten million gallons of capacity would not only provide for early and mid-season snowmaking, but would help ensure a sufficient water supply of snowmaking water past the end of February, when the City of Flagstaff would discontinue reclaimed water service. Necessary pumps and a compressor would be installed within a primary pumphouse building to be located near the impoundment. Preliminary discussions with City officials have identified a potential desire to maintain pressure throughout the snowmaking pipeline throughout the year to provide a water source for fire suppression needs within the residential communities proximate to the pipeline between Flagstaff and the ski area. Hydrants could be situated along the pipeline to provide access to this water.<sup>7</sup> Additionally, a residual pool would be maintained within the impoundment during the summer months to allow for potential use by wild land fire suppression.

Generally, "airless" style fan-gun snowmaking technology would be used in the base area, while high-tech air/water tower guns are proposed for the upper portions of the mountain. Construction of the snowmaking system would involve the burial of air, water and power lines along the edges of trails to be covered, as well as the construction of a 3,000 to 4,000 square foot snowmaking control building in the vicinity of the existing maintenance shop (refer to Figure 2-3).

Because of the SUP's rocky terrain, it is anticipated that burying the snowmaking water lines to a depth that prevents freezing would be impractical and expensive. Therefore, the proposed snowmaking system has been designed to back drain after each snowmaking period. This would allow for the water lines to be buried at shallower depths because the entire network of snowmaking lines could be drained after each use. Depending on location, orientation, and distance of the water lines from the snowmaking water impoundment, the back drainage system would return the reclaimed water to the main snowmaking water impoundment or an addition smaller catchment pond (approximately one acre-foot capacity) proposed to be located north of the snowtubing parking lots.

Approximately 178 million gallons of water would be available to Snowbowl between November 1 and February 28 of each year.<sup>8</sup> At 325,852 gallons of water per acre foot (AF), this equates to approximately 548 AF of water available to Snowbowl each season.

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<sup>7</sup> The exact number and locations of hydrants is yet to be determined.

<sup>8</sup> 1.5 million gpd x 119 days.

However, annual water use for the snowmaking system would vary according to natural conditions, and has been modeled according to dry, wet and average precipitation years.<sup>9</sup>

### **Snowplay/Tubing Facility**

Snowbowl proposes the development of a managed and professionally designed snowplay/tubing facility at the base area. The snowtubing area would entail dedicating approximately eight acres of terrain in Hart Prairie area to development of six to eight tubing lanes (refer to Figure 2-2). These lanes would be serviced by a combination of four surface lifts. While the surface of the snowtubing area would be graded, construction of the individual lanes would be completed with snow each season (and is dependant upon snowmaking). The snowtubing facility has been designed with a capacity of approximately 600 tubers-at-one-time.

A 400-space parking area (approximately 3.3 acres) would be constructed to service the proposed tubing facility. From the parking area, guests would have foot access to a proposed guest service facility adjacent to the tubing area. Constructed and located specifically for snowplaying activities, this 5,000 square foot building would offer food service, restrooms (necessitating construction of an on-site septic system), ticket sales, and a sun deck. A buried water storage tank would be located proximate to the facility.

### **Non-Significant Forest Plan Amendment**

Because Forest Plan direction for management of the Snowbowl SUP area does not specifically allude to amenities such as snowtubing and snowmaking, a non-significant Forest Plan amendment is included as a portion of the Proposed Action in order to allow the Forest Service and Snowbowl to respond to key portions of the Purpose and Need. The complete amendment language is contained in Appendix B.

### **Lifts/Uphill Capacity**

Antiquated lift equipment is proposed to be replaced with more modern and efficient chairlift technology as detailed below (refer to Figure 2-2):

#### **Sunset Chairlift**

The Sunset Chairlift would be replaced and realigned with a high speed chair. It would also be realigned and lengthened with a new top-drive terminal located at 10,900 feet in elevation – approximately 300 feet south/southwest of the existing mid-station on the Agassiz Chairlift.

#### **Humphreys Chairlift**

The existing Sunset Chairlift would be relocated and installed as the proposed Humphreys Chairlift, accessing a new pod of proposed ski trails. The lift would start near the Agassiz Lodge and extend approximately 3,000 linear feet to terminate at an elevation of approximately 10,400 feet. The Humphreys Chairlift would require vehicular access to both terminals. Permanent access to the top terminal would be via the existing mountain access road and temporary access would be via a portion of one of the

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<sup>9</sup> Refer to either the Watershed (Section H) or Soils (Section I) analyses of Chapter 3 for additional details.

proposed ski trails. Power would be supplied to the bottom terminal via a spur from the Agassiz Lodge power line.

### Hart Prairie Chairlift

The Hart Prairie Chairlift would be upgraded to a high-speed, detachable lift; it would remain top-driven with the bottom terminal being relocated approximately 200 feet downhill and 250 feet north of the present terminal site. The resulting lift alignment would require only incidental vegetative clearing.

### Aspen Chairlift

The Aspen Chairlift would be upgraded and realigned, swinging the bottom terminal approximately 500 feet north, within the existing SUP boundary. This realignment would also improve on-fall-line skiing within the pod.

### Surface Lifts

Three 150-foot surface conveyor (Magic carpet) type lifts are proposed for the area north of the Hart Prairie Lodge, which would be redesigned and designated as a beginner/learning area. One additional 300-foot handle tow (surface lift) is proposed to service the planned halfpipe and terrain park (detailed below).

### Snowtubing Surface Lifts

As noted, a combination of four surface lifts would service the snowtubing facility. Snowtubing lifts are designed and engineered specifically for pulling snowtubes.

### Terrain

Approximately 73.7 acres of new skiing terrain would service primarily intermediate and advanced intermediate skill levels, bringing total developed skiable terrain (i.e., excluding glades) at Snowbowl to approximately 204.2 acres. Specific areas planned for additional skiing terrain include an extension of the *Spur Catwalk* (trail #27), widening of the existing lift line below the *Spur Catwalk* paralleling the Agassiz Chairlift (trail #43B), widening of *White Lightning* (trail #28) and *Tiger* (trail #18), the creation of new trails under the proposed Sunset and Humphreys chairlifts, the construction of one new trail connecting *Lower Ridge* (trail #21) with *Wild Turkey* (trail #20), and the development of a skiway (trail #44) (providing skier, ski patrol, and maintenance/construction access) from *Upper Logjam* (trail #25) to the top terminal of the proposed Humphreys Chairlift.

Additionally, approximately 47.4 acres of tree thinning/glading would occur within the Agassiz and Sunset pods to create improved gladed skiing opportunities. Thinning within these pods is proposed to address recreational, fuel reduction, and forest health objectives. Timber removal would be concentrated on unhealthy/dead trees. Overall, the thinning has been designed to maintain 80 percent of the existing overstory vegetation.

Table 2-1 describes the nature of the proposed terrain additions.

**Table 2-1  
Proposed Terrain Breakdown (acres)**

<b>Ability Level</b>	<b>Acreage</b>
Beginner	2.0
Novice	44.0
Low Intermediate	34.5
Intermediate	51.0
Advanced Intermediate	41.9
Expert	31.8
<b>Total</b>	<b>204.2</b>

In association with the creation of additional terrain and snowmaking coverage, a number of areas are proposed to be graded and smoothed to improve the skiing experience. Two separate methods of earthwork are proposed for specific areas; grading and stumping/smoothing. Graded areas would be carefully stripped of topsoil resources, reshaped and re-contoured, followed by redistribution of topsoil and immediate revegetation. In areas to be stumped/smoothed, rocks and stumps protruding from the surface would be disposed of. Disturbed areas would be promptly revegetated.

A dedicated teaching area would be developed near the Hart Prairie Lodge in order to better accommodate beginner skiers. Construction of the teaching area would require re-contouring approximately three acres.

A halfpipe<sup>10</sup> would also be built approximately 300 feet southeast of the bottom terminal of the Sunset Chairlift. The contour of the halfpipe would be rough-shaped out of dirt to minimize the total snowmaking coverage necessary for utilization. Additionally, a small surface lift would be installed immediately parallel to the proposed halfpipe.

### **Guest Service Facilities**

In order to better accommodate existing use levels, both the Hart Prairie and Agassiz day lodges would be enlarged and upgraded. The Hart Prairie Lodge would increase by approximately 6,000 square feet. A new guest services facility totaling approximately 10,000 square feet would be developed immediately adjacent to the existing Agassiz Lodge. The increased building space would allow for the provision of critical guest functions such as additional restrooms, lockers, dining and kitchen areas, and first aid services. This would increase Snowbowl's total guest/administrative square footage from approximately 23,500 square feet to approximately 39,500 square feet. All guest services would be designed to meet ADA requirements.

Snowbowl proposes the development of a 2,500 square foot Native American cultural and education center, which would be constructed within the Agassiz Lodge.

On the mountain, three new ski team buildings are proposed to replace the existing buildings. The start and finish race facilities would be approximately 100 square feet each; the start would be located on *Phoenix* (trail #16) just below the split with *Lower*

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<sup>10</sup> Halfpipes are linear, U-shaped terrain features constructed down appropriately steep slopes used for freestyle skiing and snowboarding. Halfpipes are common amenities at ski areas all over the world.

Ridge (trail #21), and the finish would be located on the skier's right near the bottom of Agassiz (trail #12). The third building would be a clubhouse approximately 640 square feet in size located approximately 150 feet south of the Agassiz Lodge.

### **Summer Trails**

Snowbowl proposes the construction of a trail from the existing Agassiz Chairlift mid-station to the top terminal.<sup>11</sup> Hikers would primarily use the trail; however, the trail would be wide enough to permit ski area maintenance personnel to access the top terminal using all terrain vehicles (e.g., four wheelers). Additionally, the proposed trail would provide a method of moving guests from the upper reaches of the Agassiz Chairlift should a summer lift evacuation be necessary. This trail would be approximately 5,280 feet in length and constructed to a width of five feet (slightly wider at switchbacks) to allow for ATV use. Vegetation removal associated with construction of this trail would be focused on understory and dead/dying trees, however, incidental removal of live overstory trees may be necessary to maintain proper grades along the trail alignment.

The proposed trail has been designed to allow guests to hike from the observation deck at the top of the Agassiz Chairlift down to the mid-station, then follow *Midway Catwalk* (trail #24 – refer to Figure 2-2 for specific location) north to proposed trail #44. Guests could then descend through the proposed Humphreys pod to proposed trail #33 for access to Hart Prairie. The main base area could be accessed through Hart Prairie.

Additionally, Snowbowl proposes an Americans with Disabilities Act (ADA) compliant summer access trail into Hart Prairie from the parking lot near Agassiz Lodge.

### **Infrastructure and Utilities**

#### **Wastewater**

Snowbowl is currently dependent on vehicular delivery for 100 percent of its water needs (potable and non-potable alike). This results in potable water being used for non-potable uses.<sup>12</sup> In order to reduce the environmental impacts and costs associated with the vehicular delivery, Snowbowl proposes to install a spur from the reclaimed water pipeline to the Hart Prairie and Agassiz day lodges, as well as the snowplay facility to service non-potable uses such as toilets. A 10,000-gallon water storage tank would be constructed at each of the lodges and at the snowplay building to facilitate the use of reclaimed water.

#### **Roads**

Snowbowl proposes a redesigned entrance circle which would have signage directing guests to parking lots, day lodges, and snowplay parking. Additionally, the traffic circle would allow the ski area to more effectively manage capacity by providing a safe location to turn vehicles around once the parking areas are full.

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<sup>11</sup> 30 percent of guests who participate in the summer Sky Ride express an interest in being allowed to hike off the mountain.

<sup>12</sup> Arizona Snowbowl estimates that over 60 percent of the potable water transported to the ski area is ultimately consumed by toilet services.

In order to construct and maintain the proposed snowmaking water impoundment, Snowbowl would require permanent access to the facility. This is proposed to be achieved by utilizing a portion of an existing, although infrequently used, two-track road between the maintenance area and the top of the Sunset Chairlift. Approximately 3,650 feet of the existing two-track road would be utilized after bringing it up to standard in order to accommodate construction and maintenance equipment. However, an approximate 1,100-foot spur of new road would be constructed between the existing maintenance road that traverses *Sunset Boulevard* (trail #10) and *Southern Belle* (trail #9) and the upgraded impoundment access road. In total the road length would be approximately 4,760 feet. However, with the proposed road construction and reconstruction, a 3,050-foot segment of the existing two-track road would be obliterated and reclaimed.

## Parking

### **Skier Parking**

To increase parking lot efficiency, facilitate snow removal, and improve pedestrian safety, Snowbowl proposes to combine existing parking lots #1 and #2 by re-grading and leveling them. See Figure 2-2, item “F” for parking area location. This would add a marginal number of parking spaces – approximately 35 spaces across 0.3 acre.

### **Snowplay Parking**

Snowbowl proposes the development of a 400-space parking lot to the north of the proposed entrance loop, as discussed within the snowplay/tubing section.

## Pedestrian Access

A pedestrian underpass is proposed to allow skiers to pass directly to and from the Hart Prairie lodge/parking areas and the Sunset Chairlift without walking across the main access road.

**Figure 2-2: Alternative 2 – Proposed Action**

**Figure 2-3: Alternative 2 – Snowmaking Plan**

**Figure 2-4: Proposed Reclaimed Water Pipeline Route**

**Figure 2-5: Alternative 2 – Grading Plan**

**Figure 2-6: Alternative 2 – Utility Map**

## **ALTERNATIVE 3 – NO SNOWMAKING OR SNOWPLAY**

As with the Proposed Action, Alternative 3 would result in the creation of a MDP that includes all projects outlined in the Proposed Action description, with the major exception of snowmaking (including the transmission line from Flagstaff, pipelines and the impoundment). Because construction and utilization of the proposed snowplay facility is dependant upon the ability of the Snowbowl to produce snow, this facility and associated parking would not be constructed under Alternative 3. Finally, Alternative 3 does not include realignment of the Aspen Chairlift or associated vegetation clearing in the northwestern portion of Hart Prairie, as in the Proposed Action.

Under Alternative 3 the Snowbowl's CCC would increase to the previously approved<sup>13</sup> level of 2,825 skiers-at-one-time. Peak day visitation would continue to reach in excess of 3,400 skiers-at-one-time. Developed skiing terrain would increase to approximately 202.6 acres. Peak day visitation would be expected to continue to exceed 3,400 skiers-at-one-time.

Alternative 3 is illustrated in figures 2-7 through 2-9.

By excluding all snowmaking infrastructure and the associated use of reclaimed water on the San Francisco Peaks, tribal and public concerns over effects to cultural and spiritual values as well as effects to water quality within the watershed would be addressed. Alternative 3 also responds to Heritage Issue #2 (scarring of the San Francisco Peaks) with reduced ground and vegetation disturbance. When compared to the Proposed Action, Alternative 3 reduces permanent and temporary ground disturbance (refer to Table 2-4). However, with the absence of snowmaking in Alternative 3, additional grading is proposed on new and existing terrain to minimize the depth of natural snow required for utilization (refer to Figure 2-8).

As detailed within the Social and Economic Resources, and Recreation sections of Chapter 3, operations under Alternative 3 would continue to be heavily dependant upon natural snowfall. Correspondingly, skier visitation levels, and therefore revenues, are not anticipated to stabilize. As such, it is probable that the owners of the Snowbowl would be unable or unwilling to continue to infuse the recurring capital necessary to maintain the quality and service level currently offered, or to implement all of the projects included in Alternative 3. Likely, a portion of the Alternative 3 improvements - those requiring smaller investments – would be developed. Dependant upon which facilities are ultimately implemented, the actual effects to the human, physical and biological environment would realistically be a blending of those effects described under the No Action Alternative and those detailed under Alternative 3.

For the purposes of comparison, this analysis primarily assesses anticipated effects of Alternative 3 assuming that *all* of the Alternative 3 improvements would be implemented.

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<sup>13</sup> Approved in the 1979 Arizona Snowbowl Ski Area Proposal Final Environmental Statement and subsequently incorporated by reference the CNF Forest Plan.

**Figure 2-7: Alternative 3**

**Figure 2-8: Alternative 3 – Grading Plan**

**Figure 2-9: Alternative 3 – Utility Map**

## MITIGATION MEASURES AND BEST MANAGEMENT PRACTICES

NEPA and CEQ regulations require that all relevant, reasonable mitigation measures that will reduce the impacts resulting from a project be identified, even if those measures are outside the jurisdiction of the Forest Service. Mitigation, as defined in the CEQ regulations, includes the following:

- Avoiding the impact altogether by not taking a certain action or parts of an action
- Minimizing impacts by limiting the degree or magnitude of the action and its implementation
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment
- Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action
- Compensating for the impact by replacing or providing substitute resources or environments

An integral part of the analysis process is mitigation of the potential effects resulting from implementation of the action alternatives. Therefore, to minimize resource impacts, the mitigation measures detailed in Table 2-2 would be implemented for either of the action alternatives. The potential effects of each alternative (provided in Chapter 3) were analyzed with the specified mitigation measures applied. Appropriate mitigation measures and BMPs would occur previous to, or simultaneously with, approved ground disturbing activities.

Each mitigation measure or BMP includes rating of anticipated effectiveness and feasibility as well as an indicated objective. Responsibility for ensuring that these mitigation measures are implemented rests with the Snowbowl management and the Forest Service. In all cases, the ultimate enforcement mechanism for implementation of the specified mitigation measures would be the Record of Decision for this EIS, and would extend to the Forest Service Special Use Permit Administrator, the District Ranger and the Forest Supervisor.

The effectiveness, feasibility, and objectives of the required mitigation measures and BMPs detailed in Table 2-2 were assessed based on the following rating system:

### EFFECTIVENESS

- |                 |  |
|-----------------|--|
| <b>High</b>     | Almost always reduces effects substantially. Commonly applied.           |
| <b>Moderate</b> | Usually results in a significant reduction of effects. Commonly applied. |
| <b>Low</b>      | May not substantially reduce effects. <sup>14</sup>                      |

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<sup>14</sup> BMPs with effectiveness ratings of “Low” were avoided to provide more adequate protection of natural resources.

## **FEASIBILITY**

- F1** May be technically difficult.
- F2** Technically probable. Costs moderate in comparison to other options.
- F3** Technically easy. Cost high in comparison to other options.
- F4** Technically easy. Costs low in comparison to other options.

Categorical objectives have been developed for the Mitigation Measures and BMPs detailed in the following table and are referenced using the following codes:

## **OBJECTIVE**

- A** Promote revegetation of disturbed sites
- B** Reduce runoff, erosion, and sediment delivery
- C** Conserve productive soil resources
- D** Protect soil and water resources from contamination
- E** Minimize the effects of smoke and particulate matter proliferation
- F** Reduce the visual prominence of proposed projects
- G** Reduce impacts to cultural resources
- H** Prevent overtopping of the snowmaking water impoundment embankment crest
- I** Prevent piping<sup>15</sup> development in the downstream toe of the snowmaking water impoundment embankment
- J** Prevent liquefaction<sup>16</sup> of the embankment foundation
- K** Ensure the protection of protected status flora and/or fauna
- L** Promote active vegetation management within the SUP area
- M** Define appropriate response scenarios, provide for specific notification plans, for all potential modes of snowmaking water impoundment failure
- N** Identify, minimize and correct any discovered safety deficiencies related to the snowmaking water impoundment.
- O** Monitor impacts to cultural resources
- P** Reduce the potential for human/wildlife encounters

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<sup>15</sup> Piping involves the transport of solid particles from within an embankment or foundation soil in response to high seepage pressures or seepage velocities.

<sup>16</sup> Liquefaction is a phenomenon that causes loss of shear strength during the strong ground motion accompanying an earthquake. Liquefaction requires two conditions: loose cohesionless soils and saturated conditions.

**Table 2-2  
Mitigation Measures and BMPs**

<b>Resource, BMP/Mitigation Measure</b>	<b>Objective</b>	<b>Effectiveness/Feasibility</b>
<b>VEGETATION</b>		
Understory vegetation will be preserved to the extent possible in all areas designated for flush cutting and/or overstory vegetation removal.	A, B, C, G	High/F4
Prior to construction, the disturbance limits of the site will be flagged. Pop fencing, flagging, or a staked rope line will be established to denote the limits of construction proximate to sensitive resource boundaries.	A, B, C, D, K	High/F4
Prior to removal of merchantable timber, decking areas and removal routes will be designated in the field and approved by the Forest Service.	C, D, K	Moderate/F4
The Snowbowl shall continue to restrict access to within the SUP during the summer months to prevent potential impacts to San Francisco Peaks groundsel and bearded gentian. Interpretive signage shall be developed and placed along the summer trail to be constructed between the Agassiz Chairlift top terminal and mid-station. As a portion of its ongoing interpretive program, Arizona Snowbowl shall provide general enforcement of access restrictions along the proposed summer trail. Arizona Snowbowl shall annually monitor the condition of alpine tundra areas to assess potential impacts and the adequacy of the restrictions. No equipment shall be operated at anytime outside the SUP.	K	High/F3
The Snowbowl shall coordinate with the CNF Silviculturalist to develop a vegetation management plan or specific treatment prescription for stands within the SUP. The CNF will approve the final prescription plan to address insect outbreaks (spruce beetle), fire risk, safety, and other management considerations that will maintain desired landscape characteristics.	L	Moderate/F3
Topsoil replacement, seeding, and weed-seed free mulching (as necessary), will be used to stabilize disturbed soils in all areas where grading and soil disturbance will occur to promote native plant re-establishment.	A, C, D, F, K,	Moderate/F2

**Table 2-2  
Mitigation Measures and BMPs**

Resource, BMP/Mitigation Measure	Objective	Effectiveness/Feasibility
Local seeding guidelines will be used to determine detailed procedures and appropriate mixes. Preference is given to local seed sources, cultivars, and species available commercially. To avoid weed contamination, all seed purchased shall be certified weed-seed free. Seed will be tested by the producer in a certified seed lab against the Coconino NF invasive weed list, the Arizona noxious weed list, and the federal noxious weed list.	A, C, D, F, K,	Moderate/F2
Before ground-disturbing activities begin, identify and locate all equipment staging areas in the SUP. Treat existing noxious weeds in these areas prior to the staging of any equipment. Establish equipment wash stations (1) at the base of the ski area for construction activities and (2) at the base of Snowbowl Road for construction of the reclaimed water pipeline. Each station shall have a filter system, for example at least 6 inches of large cinder or gravel spread over an area 10' x 30'. Filter cloth may be used for temporary stations. The area will be a perched drainage to allow excess moisture to drain after being filtered. Equipment wash stations shall be located at least 200 yards from any natural drainage to avoid contamination. All soiled equipment shall be washed before entering and before leaving the project area. This includes construction personnel vehicles in addition to trucks and other heavy equipment. Equipment wash stations shall be monitored frequently and after completion of all construction activities. All weed materials shall be removed promptly.	A, C, D, F, K	Moderate/F3
For construction of the reclaimed water pipeline, the existing paved surface of the Snowbowl Road shall be used for all equipment staging and materials stockpiling. Any fill dirt obtained off-site shall be certified to be free of noxious weeds prior to its use in construction areas.	A, D, F, K,	Moderate/F3
Monitor all construction areas and roadways within the SUP annually for at least five growing seasons and treat any noxious weeds found. Annually inspect all parking lots and areas surrounding guest service and maintenance facilities at the base of the ski area within the SUP and document and treat any new noxious weed infestations.	D, L	High/F4
Prior to ground disturbances affecting bearded gentian, the plants will be either transplanted to other suitable areas or collected for research purposes at the discretion of the Forest Botanist.	K	Low/F4

**Table 2-2  
Mitigation Measures and BMPs**

<b>Resource, BMP/Mitigation Measure</b>	<b>Objective</b>	<b>Effectiveness/Feasibility</b>
<b>SOIL AND WATER</b>		
A grading plan will be developed and submitted to the Forest Service for review and approval prior to implementation of proposed project elements.	A, B, C, D	High/F4
Soil-disturbing activities will not be initiated during periods of heavy rain or excessively wet soils.	B, C	High/F4
Immediately following completion of approved ground disturbing activities and seeding, all areas of ground disturbance will be mulched with weed-free straw, wood chips, bark, jute mat, etc.	A, B, C	Moderate/F3
In all areas where grading or soil disturbance will occur (excluding flush cut lift corridors), stockpile topsoil and re-spread topsoil following slope grading and prior to re-seeding. The stockpiled soil will be protected from wind and water erosion.	A, C, D	Moderate/F3
Check dams and sediment barriers (i.e., silt fence, weed-freed hay bales, wattles, etc.) will be placed in all temporary erosion channels with minimum sufficient spacing to control runoff velocity and encourage sediment deposition.	B, C	High/F4
Logs and logging debris removal will minimize dragging or pushing through soil to minimize disturbances.	B, C	Moderate/F4
In areas where site conditions necessitate (i.e., excessively steep slopes and/or highly erosive soil types), temporary sediment detention basins will be created to detain runoff and trap sediment. Sediment basins will be created within the overall disturbance limits of the applicable project elements. Temporary sediment basins will be reclaimed following reestablishment of permanent vegetation and will likewise be revegetated.	B, C	High/F4

**Table 2-2  
Mitigation Measures and BMPs**

<b>Resource, BMP/Mitigation Measure</b>	<b>Objective</b>	<b>Effectiveness/Feasibility</b>
<p>On steeper slopes (&gt;30% slope gradient), areas exposed by grading will require implementation of jute-netting or other appropriate geo-textiles to further stabilize disturbed soils. Installation should include:</p> <ul style="list-style-type: none"> <li>• Seeding and mulching of the disturbed area</li> <li>• Burial of the top end of the netting in a trench of at least four inches depth and eight inches width. The trench shall be backfilled and tamped.</li> <li>• Netting should extend beyond the edge of the mulched and/or seeded area at least one foot on the sides and three feet on the top and bottom.</li> <li>• The netting should be rolled downslope and secured with staples or pins.</li> <li>• Netting should overlap at least four inches on the sides and secured with staples five feet apart along the overlap</li> <li>• The lower end of the uphill strip should overlap the downhill strip at least one foot and should be secured with staples one foot apart.</li> </ul>	A, B, C	High/F3
<p>Water bars (12 to 18 inches deep) and cross-drains will be constructed across all roads, trails, and other disturbed areas after seeding and fertilization at 50, 75, or 100-foot intervals as a function of slope angle, or as necessary, to disperse road surface runoff. The frequency will be sufficient to prevent rill erosion and sediment delivery channel formation. Alternatively, “parabolic slope water bars” may be constructed at the gradient beginning at the center of the road or trail surface and traversing outward to spill into undisturbed vegetation on both sides of the road or trail prism. Waterbars and outlets will be inspected seasonally, maintained, and cleared of sediment at regular intervals as necessary.</p>	A, B, C	High/F4
<p>Windrows will be installed where fill-slope erosion is possible, or where road-derived sediment may be delivered (i.e., outflow area of culverts, rolling dips, etc.).</p>	B, C, D	Moderate/F4
<p>All towers and concrete necessary for lift construction will be transported via helicopter, unless otherwise approved by the Forest Service in the field.</p>	C, K, F	High/F3
<p>Prior to construction, a construction access plan will be developed detailing access routes to pertinent project elements (i.e., lift towers, lift terminals, building sites, helicopter routes).</p>	C, K, F	High/F4
<p>Fuel delivery and storage will be located, designed, constructed and maintained to reduce the potential and severity of spills.</p>	D	High/F4

**Table 2-2  
Mitigation Measures and BMPs**

<b>Resource, BMP/Mitigation Measure</b>	<b>Objective</b>	<b>Effectiveness/Feasibility</b>
Fuel, oil and other hazardous materials will be stored in structures placed on impermeable surfaces with impermeable berms designed to fully contain the hazardous material plus accumulated precipitation for a period at least equal to that required to mitigate a spill.	C, D, K	High/F4
Helicopter refueling area(s) will be designated according to Forest Service refueling standards.	D, K	High/F4
An oil spill contingency plan will be developed and approved prior to initiation of construction activities.	D	High/F4
New and expanded parking lots and roads will be surfaced with aggregate materials.	B, D	High/F4
Concrete truck washout areas will be designated in the field and approved by the Forest Service prior to construction commencement.	D	High/F4
Where snowmaking and utility lines will be installed on slopes greater than 30 percent, temporary check dams will be placed within open sections of trench when those open sections exceed 100' in length.	B, C	High/F4
<b>DUST ABATEMENT</b>		
During construction under dry conditions, all exposed soil, including roadways, parking lots, buildings and lift terminal areas will be sufficiently watered to prevent excessive amounts of dust. In the absence of natural precipitation, watering of these areas will occur as necessary. This measure excludes trail grading or other project elements that do not have sufficient road access to facilitate water truck access.	E	High/F4
<b>AIR QUALITY</b>		
Lop and scatter slash and small woody debris generated across the width of new trails	B, C, E	Moderate/F4
Burning of slash/timber will be staged to reduce the volume of smoke being produced at any one time.	E	High/F4
Slash burning will be minimized by the removal of commercial grade timber and the practice of lopping and scattering where possible.	E	Moderate/F3

**Table 2-2  
Mitigation Measures and BMPs**

<b>Resource, BMP/Mitigation Measure</b>	<b>Objective</b>	<b>Effectiveness/Feasibility</b>
To the extent practicable, burning of slash piles during periods of time when the atmospheric conditions would transport smoke away from the Flagstaff area.	E	Moderate/F4
Non-agricultural material will not be included in slash burns.	E	High/F4
<b>AESTHETICS</b>		
Construct new structures with materials that blend with the landscape character.	F	Moderate/F3
Strategically locate and camouflage or screen all proposed fuel and water tanks.	F	High/F4
Straight edges in the forest canopy will be avoided by feathering the layouts of proposed trails and by selectively removing trees of different species and ages to the extent possible.	G, F	Moderate/F3
<b>CULTURAL RESOURCES</b>		
As per the National Historic Preservation Act, a Memorandum of Agreement (MOA) will be developed specifying the mitigation requirements necessary to minimize the project's adverse effects. This process is currently underway and will be complete prior to a Record of Decision being rendered for the project.	G	Moderate/ <i>Required</i>
<b>WILDLIFE</b>		
Arizona Snowbowl will install bear-proof waste receptacles in public areas within the SUP as necessary to discourage scavenging by black bears and to reduce encounters by humans and bears.	P	High/F4
There will be no tree removal within Restricted Areas or PACs. Prior to initiating construction of the reclaimed water pipeline, a subsequent survey will be conducted to identify any occupied nest sites within the PACs. If an active nest is located, any construction activities within ½-mile radius of the active nest site will be restricted to periods outside the breeding season, which extends from March 1 to August 31.	K	High/F4
Prior to initiating construction of the reclaimed water pipeline, a subsequent survey will be conducted to identify any occupied nest sites within the PFAs. If an active nest is located, any construction activities within ½-mile radius of the active nest site will be restricted to periods outside the breeding/fledging season, which extends from March 1 to September 30.	K	High/F4

**Table 2-2  
Mitigation Measures and BMPs**

<b>Resource, BMP/Mitigation Measure</b>	<b>Objective</b>	<b>Effectiveness/Feasibility</b>
<b>STABILITY OF SNOWMAKING WATER IMPOUNDMENT</b>		
The uncontrolled emergency spillway should be checked routinely and frequently as part of normal operations for potential blockage by snow, ice, or debris and cleared if significant blockage is found.	H	High/F4
Install an automatic cutoff switch that would shut down pumps when the water surface in the impoundment reaches its maximum storage level.	H	High/F4
A composite liner system consisting of HDPE liner above a minimum six-inch thick bedding of compacted clay would restrict the flow volume sufficiently to prevent saturation of the foundation and embankment soils and create enough head loss to reduce high exit gradients in the toe area of the dam.	I	High/F4
Grout will be injected into any open fractures exposed during excavation prior to covering with the local sand bedding and the HDPE liner. The plugging of these fractures will either prevent the entry of water into the fractures or at least create enough head loss to reduce exit pressures at the embankment site.	I	Moderate/F4
Check the relative density of entire soil profile and quantify the liquefaction potential of the deeper soils through a site-specific drilling program at the time of final design of the impoundment. If a liquefaction risk is identified at the time of final design, it can be easily mitigated by removing loose soil and replacing it with compacted, densified soil, or deep layers can be stabilized with grout.	J	High/F3
An Emergency Action Plan will be assembled to define appropriate response scenarios for all potential modes of failure and includes specific notification plans (updated at least every two years with current phone numbers), and evacuation plans. All responsible operating staff must be familiar with the Emergency Action Plan.	M	Moderate/F4

**Table 2-2  
Mitigation Measures and BMPs**

<b>Resource, BMP/Mitigation Measure</b>	<b>Objective</b>	<b>Effectiveness/Feasibility</b>
<p>Snowmaking water impoundment will require an Operation &amp; Maintenance inspection by a qualified Forest Service engineer on an annual basis. Timing of said inspection shall be such to allow correction of discovered safety deficiencies prior to the immediately following season of operation. Inspection criteria shall be according to current safety criteria and engineering state-of-art judgment, and manual FSM 7500 direction. In addition, there shall be completed within three calendar days after any event of any unusual event; such as an earthquake of Richter magnitude 5.0 or greater within a twenty-mile radius of the event epicenter, in the event of an overtopping event, or at the discretion of the Forest Service. The Forest Service shall be notified by the facility owner/operator in the event of any unusual facility operational behavior or physical characteristic.</p>	<p>N</p>	<p>High/F4</p>

## **ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL**

Federal agencies are required by NEPA to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not analyzed in detail.<sup>17</sup> Public comments received in response to the Proposed Action provided suggestions for alternative methods for achieving the established project purpose and need. Some of these alternatives may have been outside the scope of the proposal, duplicative of the alternatives considered in detail, or determined to be components that would cause unnecessary environmental harm. Therefore, a number of alternatives were considered, but dismissed from detailed consideration for reasons summarized below.

### **NIGHT LIGHTING**

In the fall of 2002, the Snowbowl developed and submitted a proposal to the Forest Service for improving the recreational opportunities at the ski area while addressing safety, customer service, and economic issues associated with the existing ski area operations. A large-scale, state-of-the-art night lighting system was included to enable the ski area to provide night skiing, snowplay and adequate lights in the ski area's parking lots to accommodate proposed nighttime activities. At that time, CNF Supervisor Jim Golden accepted night lighting as a part of Snowbowl's proposal and the NEPA process was initiated.

The public and tribal scoping process (detailed in Chapter 1) quickly revealed the controversial nature of the night lighting component of the Proposed Action. Concerns raised by the public and tribes pertaining to night lighting precipitated the identification of two significant issues. First, the general public was concerned with the "sky glow" that would inevitably be produced in the horizon due to lighting Snowbowl's reflective, snow covered trails. The sky glow's effects on Flagstaff's designation as a Dark Sky city, visibility of the lights from points across the Colorado Plateau, and effects to local observatories were a major concern. Second, tribal concerns focused on the cultural/spiritual effects of installing a large scale lighting system on the San Francisco Peaks, which are held sacred. To the tribes, night lighting would interfere with the natural processes of day and night and therefore the ability of the San Francisco Peaks to rest at night.

Public and tribal concerns regarding lighting, in addition to both the expense and technical difficulty of modeling the visual impacts of the lighting system (as well as mitigating the effects) led Snowbowl and the CNF to determine that it is not prudent to carry the night lighting component forward at this time. Therefore, the night lighting system (associated with nighttime skiing and snowtubing, as well a parking lot lighting system to accommodate proposed nighttime activities) were eliminated from the proposal and are therefore not analyzed in this EIS.

However, prior to night lighting being dropped from the Proposed Action, three alternatives were developed by the ID Team that would have responded to issues surrounding the night lighting issue. Those alternatives, which have since been eliminated from further analysis, included the following:

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<sup>17</sup> 40 CFR 1502.14

### **No Snowmaking, Night Lighting or Snowplay**

This alternative included all components of the original Proposed Action, with the exception of snowmaking (and all associated infrastructure – including the transmission line from Flagstaff, pipelines and the reservoir), lighting and the snowplay facility.

This alternative responded to all four of the significant issues raised during the public and internal scoping process. Two of these significant issues were subsequently eliminated by withdrawing the proposed night lighting system. With the elimination of lighting from the Proposed Action, this alternative was in essence identical to the existing Alternative 3, as previously described.

### **No Night Skiing (With Minimal Lighting for Snowplay)**

This alternative included all components of the original Proposed Action, with the exception of the lighting system necessary for night skiing. This alternative would have included installation of a minimal, low-level lighting system associated with evening operation of the snowplay facility and lighting in the snowplay parking lot.

By eliminating higher wattage lighting necessary for night skiing, potential for sky glow would have been minimized and this alternative would have responded to the two significant issues (subsequently eliminated) raised by the public and tribes.

### **Proposed Action Without Night Lighting**

This alternative would have included all components of the original Proposed Action with the exception of the lighting system (for night skiing, snow tubing and parking).

By eliminating all forms of night lighting, all issues associated with night lighting would have been responded to. This alternative would have been identical to the Proposed Action currently under analysis in this EIS.

### **ELIMINATION OF THE HUMPHREYS POD**

In response to the issue relating to permanently evident visible alterations (“scarring”) on the Peaks (detailed in Chapter 1 of this document) the Forest Service initially considered an alternative that would have carried forward all projects identified in the Proposed Action, with the exception of new lift and trail construction associated with the Humphreys Pod. This alternative would have partially addressed the “scarring” issue by eliminating both permanent and temporary ground disturbance; overstory vegetation removal and lift construction in the Humphreys pod.

However; this alternative was not carried forward because it only partially responded to the issue raised and would have failed to meet a key purpose and need of the Proposed Action - “To improve skiing and recreational opportunities, bringing terrain and infrastructure into balance with current use levels.” Specifically, the stated need to “Improve the quantity and distribution of beginner and intermediate terrain by developing additional ski trails and spaces within the existing SUP area” could not have been met. The proposed Humphreys Pod offers a unique, and needed, source of intermediate terrain within an undeveloped portion of Snowbowl’s SUP area.

Additionally, an alternative that excludes lift and trail development in Humphreys pod would not relieve Snowbowl's current uphill (i.e., lift) capacity shortfalls on peak days, in which lift line wait times can exceed 40 minutes. In contrast, under the Proposed Action the comfortable capacity of the ski area would increase to 2,825, whereas under an alternative without the Humphreys pod, the CCC would only increase to 2,360. Given that frequent peak days will continue to exceed 3,400 skiers, the "No Humphreys Pod" alternative accomplishes far less in terms of fulfilling the need to service existing levels of visitation to the ski area and providing an adequate guest experience.

Additionally, the visual simulation which was completed to assess the anticipated visual changes resulting from the development of the Humphreys pod indicates that the mosaic of these trails would not be inordinately visible – and in fact is very much in keeping with the Scenic Integrity Levels required by the CNF Forest Plan.<sup>18</sup>

### **REDUCED SNOWMAKING COVERAGE**

In order to address potential effects associated with providing snowmaking coverage on the full extent of Snowbowl's terrain (approximately 205.2 acres), the Forest Service initially considered an alternative to the Proposed Action that would have reduced the total amount of snowmaking coverage, and therefore the amount of reclaimed water used on the mountain. Under this scenario, snowmaking coverage would have been focused on the Snowbowl's base areas. However, this alternative would not have addressed the Snowbowl's need to stabilize visitation and financial viability. Often, sporadic temperature and precipitation patterns lead to a patchy snowpack throughout the SUP area. Focusing snowmaking infrastructure in the base area would not have provided for snowpack consistency throughout the extent of SUP area. Additionally, this alternative would have only slightly reduced anticipated concerns related to the use of reclaimed water, water quantity and quality, and reduced temporary soil disturbance within the SUP area. Therefore, a reduced snowmaking alternative would not reduce or mitigate heritage issues and impacts to the TCP. Given the extraordinary level of infrastructure necessary to introduce snowmaking at the Snowbowl, developing only a portion of the system (and therefore coverage areas) was determined to be impractical – particularly given the potential alternative's inability to meaningfully respond to the specific issues. This potential alternative was therefore eliminated from further detailed analysis.

### **ALTERNATIVE ON-SITE AND NEARBY WATER SOURCES**

For several years prior to the current proposal, Snowbowl explored the possibility of using numerous different water sources to meet potential snowmaking needs. Some of those sources included the following:

- Drilling deep wells within the SUP area
- Developing nearby wells in lower Hart Prairie that were drilled in the 1970s as components of another development plan for the ski area
- Drilling wells on private property owned by the Snowbowl in Fort Valley and constructing a six-mile pipeline to transport water to the ski area
- Acquiring the rights to an existing well in Fort Valley that Snowbowl had used for

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<sup>18</sup> Refer to the Section D - Aesthetic Resources of Chapter 3, specifically Figure 3D-2, for additional details and photo simulations of the lift and trail development in the Humphreys pod.

- potable water in the 1980's
- Hauling water by tanker truck to the Snowbowl for storage in a reservoir
- Tapping into the pipeline/storage distribution system owned by the City of Flagstaff which currently transports water from the Inner Basin on the San Francisco Peaks to the City
- Utilizing potable water from the City of Flagstaff with a pipeline identical to the one being proposed

After ample due diligence, (logistical and economic considerations, water availability research, etc.) it was determined that the use of potable water sources were not prudent choices to meet the Snowbowl's snowmaking requirements. In order to achieve the quantity of water necessary for Snowbowl's snowmaking needs, the current proposal to use reclaimed water from the City of Flagstaff represents the most reliable, practical, and ecologically responsible option.

## **ALTERNATIVE SUMMER RECREATIONAL OPPORTUNITIES**

For many years local outdoor enthusiasts have voiced their opinions and desires for the Snowbowl to provide additional recreational activities, similar to those currently occurring at other ski areas. Mountain biking on the ski area with lift access and paragliding from near the top of the Agassiz lift are the most frequently requested activities (comments were received relating to both activities during the scoping process). Both mountain biking and paragliding are gaining in popularity in Flagstaff and across the western United States. Chairlift accessed mountain biking programs are common at ski areas operating on NFS lands, and several ski areas are nationally recognized for their paragliding programs. Construction of an Alpine slide for use during summer months was also briefly considered, but eliminated.

The Snowbowl has the physical attributes that would make all of these activities viable and also the consumer demand from within the local community and the state of Arizona. These two activities were considered but eliminated at the early stages of planning for the Snowbowl's Proposed Action. The Forest Service and the management of the Snowbowl jointly determined that the most immediately critical need for the ski area was to ensure a consistent and reliable operating season, thereby maintaining the economic viability of the Snowbowl. These potential additional summer recreation activities were deemed not to be critical to the success of the ski area. The main reasons for not evaluating these two activities follow:

### **Paragliding**

The primary launch site for paragliders could potentially impact critical botanical habitat in the Alpine areas. Additionally, flight paths would most certainly be over the Kachina Peaks Wilderness.

### **Mountain Biking**

The Forest Service feels that there is currently ample mountain biking trails and opportunities in the greater Flagstaff area. Having lift-served mountain biking at the ski area is not critical to providing general mountain biking opportunities. In addition, the Forest Service believes that biking within the SUP could lead to the development of

unsanctioned “social” trails exiting the SUP area and entering the surrounding Kachina Peaks Wilderness. Prohibiting mountain bike use within the adjacent Wilderness would be virtually impossible. Finally, Snowbowl has no existing mountain road system appropriate for bikes, especially the novice level cyclists which are typically attracted to lift-served programs. Single track trails and roads would need to be constructed (involving inherent ground disturbance); projects that the Forest Service did not believe were appropriate uses of the National Forest at this time.

## **ALTERNATIVE SNOWMAKING WATER PIPELINE ALIGNMENTS**

Several potential routes for the proposed snowmaking water pipeline between the City of Flagstaff and the Snowbowl were evaluated. After a thorough review, it was determined that several suitable locations for connecting to Flagstaff’s reclaimed water distribution system existed. Preliminary reclaimed water pipeline alternatives that were considered early in this proposal are described below and are depicted on Figure 2-10.

1. Forest Avenue and U.S. Highway 180 to Fort Valley
2. Buffalo Park north to Elden Lookout Road and Shultz Pass
3. Rio de Flag through Coconino Estates to Cheshire
4. Existing utility corridors for Arizona Public Service overhead power lines from Cheshire to Fort Valley
5. West Route 66 over A-1 Mountain in an existing utility corridor
6. Westridge Estates near Thorpe Park across State and Federal property
7. Cedar Hill to Elks Lodge to Shultz Pass Road to Transwestern Main Line
8. Highway 180 to FS Road 164b to Snowbowl Road
9. APS/Qwest overhead power line corridor from Hot Shot Ranch to Maintenance Shop

Each of the above mentioned routes were evaluated for financial feasibility, necessary entitlements, issues pertaining to co-locating with existing utilities, engineering constraints, overall distance, traffic mitigation, community inconvenience, private property impacts, and availability of electrical service.

The initial and most direct route would have connected the snowmaking water pipeline with Flagstaff’s reclaimed water distribution network at the intersection of Forest Street and U.S. Highway 180. A buried pipeline would have then followed U.S. Highway 180 to the Snowbowl Road intersection. This would have provided for possible future reclaimed water use at Sechrist Elementary School, Museum of Northern Arizona Property, Cheshire Park, and would also accommodate the installation of fire hydrants near several rural subdivisions.

The feasibility of the U.S. Highway 180 route was further evaluated as part of the City of Flagstaff’s proposed urban trail along U.S. Highway to Cheshire. ADOT engineers were asked to determine the feasibility of locating a 12-inch diameter pipeline under the highway, adjacent to the highway or underneath the proposed urban trail. The engineering evaluation determined that such a pipeline could not be placed within the Highway easement or within the corridor established for the urban trail. It was determined that the highway easement, the trail corridor, and the highway itself are already at maximum capacity in terms of existing utilities which are already in place within the corridor. Therefore, the design specifications and code requirements

pertaining to reclaimed water pipelines could not have been met with the U.S. Highway 180 route to Cheshire.

The currently proposed pipeline route was identified after discussions with Transwestern Pipeline Company, the Forest Service, Arizona State Land Department, and Lowell Observatory. Lowell Observatory is very interested in providing fire hydrants on observatory property west of their campus and also in replacing a private and antiquated potable water delivery system to the campus from Flagstaff. As a part of the Proposed Action, the Forest Service has agreed to consider the reclaimed water pipeline to be co-located within the Transwestern Lateral Natural Gas Pipeline easement from west of the observatory all the way to the intersection of U.S. Highway 180 and Snowbowl Road. The remainder of the proposed pipeline route is located on observatory private property or existing Forest Service roads or utility easements. The proposed route was also selected due to minimize impacts and inconveniences to traffic and private property during construction of the pipeline. Under the proposed pipeline route, Sechrist School and Cheshire Park would not have the ability to obtain reclaimed water from a new and nearby pipeline.

**Figure 2-10: Alternative Pipeline Routes Considered but Eliminated**

## COMPARISON OF ALTERNATIVES

Table 2-3 compares each alternative as based on response to significant issues.

**Table 2-3  
Response to Significant Issues**

Significant Issue	Alternative 1 <i>No Action</i>	Alternative 2 <i>Proposed Action</i>	Alternative 3 <i>No Snowmaking</i>
<b>Heritage #1 - Snowmaking</b> (creating snow by artificial means, use of reclaimed water)	<b>Yes:</b> No snowmaking is proposed	<b>No:</b> Approximately 207 acres of snowmaking coverage are proposed	<b>Yes:</b> No snowmaking is proposed
<b>Heritage #2 – Scarring</b> (Ground disturbance associated with grading, vegetation clearing and snowmaking pipeline installation)	<b>Yes:</b> No additional ground disturbance is proposed	<b>No:</b> Includes ~245 acres of temporary/permanent ground disturbance and approximately 76 acres of overstory vegetation removal.	<b>Yes:</b> Reduces temporary/permanent ground disturbance and overstory vegetation removal compared to the Proposed Action.

Table 2-4 provides a comparison of project elements associated with each alternative.

**Table 2-4  
Alternatives Matrix**

	Alternative 1 <i>No Action</i>	Alternative 2 <i>Proposed Action</i>	Alternative 3
<b>GUEST CAPACITIES</b>			
<b>On-Mountain Comfortable Carrying Capacity (skiers)</b>	1,880	2,825	2,825
<b>Uphill Capacity (skiers)</b>	1,880	2,825	2,825
<b>Snowtubing Facility (tubers)</b>	N/A	600	N/A
<b>ON-SITE PARKING</b>			
<b>Existing Parking Area (acres)</b>	10.3	10.3	10.3
<b>Proposed Parking Area (acres)</b>			
Improved On-Mountain Parking	N/A	0.3	0.3
Snowtubing Parking	N/A	3.3	N/A
<b>Total Parking Area (acres)</b>	<i>10.3</i>	<i>13.9</i>	<i>10.6</i>
<b>Parking Capacities (Vehicles):</b>			
On-Mountain	1,200	1,235	1,235
Snowtubing	N/A	400	N/A
<b>Parking Capacities (Guests):</b>			
Guests – On-Mountain	3,000	3,087	3,087
Guests – Snowplay	N/A	600	N/A
<b>TERRAIN</b>			
<b>SUP Area</b>	777 acres	777 acres	777 acres
<b>Developed On-Mountain Terrain (acres):</b>			
Existing	138.6	130.4 <sup>a</sup>	138.6
Proposed	N/A	73.7	64.0
<i>Total</i>	<i>138.6</i>	<i>204.2</i>	<i>202.6</i>
<b>Improved Glades (acres)</b>	N/A	47.4	47.4

**Table 2-4  
Alternatives Matrix**

	<b>Alternative 1 No Action</b>	<b>Alternative 2 Proposed Action</b>	<b>Alternative 3</b>
<b>Terrain Distribution (percent):</b>			
Beginner	1	3	3
Novice	44	35	35
Low Intermediate	25	22	22
Intermediate	22	23	23
Advanced Intermediate	6	13	13
Expert	2	4	4
<b>LIFT NETWORK</b>			
<b>Aerial Chairlifts:</b>			
Sunset Realignment	N/A	Yes	Yes
Agassiz	No Change	No Change	No Change
Hart Prairie Realignment	N/A	Yes	Yes
Aspen Realignment	N/A	Yes	N/A
Proposed Humphreys	N/A	Yes	Yes
<i>Total Aerial Chairlifts</i>	<i>4</i>	<i>5</i>	<i>5</i>
<b>Surface Lifts</b>			
Spruce	No Change	No Change	No Change
Hart Prairie Beginner Chairlifts	N/A	3	3
Halfpipe	N/A	1	1
Snowtubing	N/A	4	N/A
<i>Total Surface Lifts</i>	<i>1</i>	<i>9</i>	<i>5</i>
<b>Total Lifts in Network</b>	<b>5</b>	<b>14</b>	<b>10</b>
<b>SNOWMAKING</b>			
<b>Coverage Area (acres)</b>	N/A	<b>205.2<sup>b</sup></b>	N/A
<b>GUEST SERVICES</b>			
<b>Guest Service Space (square feet):</b>			
Agassiz Lodge	5,080	15,080	15,080
Hart Prairie Lodge	18,425	24,425	24,425
Snowtubing Facility	N/A	5,000	N/A
Native American Cultural & Education Center	N/A	2,500	2,500
<i>Total Guest Services Square Footage</i>	<i>23,505</i>	<i>47,005</i>	<i>42,005</i>
<b>GROUND DISTURBANCE</b>			
<b>Permanent (acres):</b>			
Buildings	N/A	0.8	0.5
Lift Terminals	N/A	0.2	0.2
Snowmaking Valve Houses	N/A	0.02	N/A
Snowmaking Water Impoundment	N/A	2.4	N/A
Snowmaking Catchment Pond	N/A	0.1	N/A
Hiking/Maintenance Access Trail	N/A	0.6	0.6
Parking Lots	N/A	3.6	0.3
Snowplay Access	N/A	0.3	N/A
Pedestrian Underpass	N/A	0.1	0.1
Road Reconstruction	N/A	1.7	N/A
New Road Construction	N/A	0.6	N/A
<i>Total Permanent Ground Disturbance</i>	<i>N/A</i>	<i>10.4</i>	<i>1.7</i>

**Table 2-4  
Alternatives Matrix**

	<b>Alternative 1 No Action</b>	<b>Alternative 2 Proposed Action</b>	<b>Alternative 3</b>
<b>Temporary (acres):</b>			
Buildings	N/A	2.3	1.7
Lift Terminals	N/A	2.0	2.4
Grading			
Trails	N/A	87.3	111.6
Pedestrian Underpass	N/A	0.1	0.1
Snowmaking Water Impoundment	N/A	1.0	N/A
Parking	N/A	2.0	N/A
Grading Sub-Total	N/A	90.4	111.7
Vegetation Clearing	N/A	4.8	4.8
Utility and/or Snowmaking Pipelines	N/A	72.0	9.7
Snowmaking Pipeline Corridor	N/A	64.3	N/A
<i>Total Temporary Ground Disturbance</i>	<i>N/A</i>	<i>235.7</i>	<i>130.3</i>
<b>Total Temporary &amp; Permanent Ground Disturbance (acres)</b>	<b>N/A</b>	<b>245.4</b>	<b>131.4</b>
<b>OVERSTORY VEGETATION DISTURBANCE (ACRES)</b>			
<b>Developed Trails</b>	N/A	64.3	58.6
<b>Buildings</b>	N/A	1.1	0.7
<b>Lift Terminals</b>	N/A	1.2	1.2
<b>Snowmaking Water Impoundment</b>	N/A	1.8	N/A
<b>Pedestrian Underpass</b>	N/A	0.04	0.04
<b>Snowplay Walkway</b>	N/A	0.3	N/A
<b>Lift Corridors</b>	N/A	3.6	3.6
<b>Road Reconstruction</b>	N/A	0.8	N/A
<b>New Road Construction</b>	N/A	0.4	N/A
<b>Parking Lot Construction/Improvements</b>	N/A	2.1	0.3
<b>Snowmaking Water Transmission Line</b>	N/A	See footnote <sup>c</sup>	N/A
<b>Total Permanent Overstory Vegetation Removal</b>	<i>N/A</i>	<i>76.3</i>	<i>64.4</i>
<b>ROAD IMPROVEMENTS AND RECLAMATION</b>			
<b>Road Construction</b>	N/A	1,110 feet	N/A
<b>Road Reconstruction</b>	N/A	3,650 feet	N/A
<b>Road Obliteration</b>	N/A	3,050 feet	N/A

<sup>a</sup> In the Proposed Action, the snowtubing facility would occupy approximately 7.8 acres of existing skiable terrain in Hart Prairie, hence the reduction in developed terrain as compared to alternatives 1 and 3.

<sup>b</sup> In the Proposed Action, snowmaking coverage differs from total developed on-mountain terrain for two reasons: 1) the snowtubing area is excluded from the developed terrain acreage but is dependent on snowmaking, and 2) one existing trail (#18) is excluded from snowmaking coverage.

<sup>c</sup> Incidental removal of overstory vegetation would occur along the extent of the 14.8-mile snowmaking water transmission line corridor, making an acreage estimate impractical. Therefore, a tree count was performed, indicating that 167 trees (pines and aspens of different sizes) would be removed for construction of the transmission line.

Table 2-5 provides a *brief* summary of the direct and indirect environmental consequences associated with implementation of each alternative, as further detailed in Chapter 3 – Affected Environment and Environmental Consequences. Table 2-5 is broken down according to resource area, issue statement and indicator. In some cases, the effects of different alternatives are combined in order to avoid redundancy.

**Table 2-5  
Summary of Direct and Indirect Environmental Consequences**

ALTERNATIVE 1 – NO ACTION	ALTERNATIVE 2 – THE PROPOSED ACTION	ALTERNATIVE 3
<b>HERITAGE AND CULTURAL RESOURCES</b>		
<b><i>Issue #1: The installation and operation of snowmaking infrastructure as described in the Proposed Action</i></b>		
<ul style="list-style-type: none"> <li>▪ <i>Indicator - Qualitative discussion of how spiritual values of the San Francisco Peaks would be impacted through use of snowmaking infrastructure and reclaimed water</i></li> </ul>		
N/A	<p>Snowmaking would adversely impact the belief in the natural process of precipitation. From an ethnographic landscape perspective, the use of reclaimed water and resulting increased moisture (thereby taking away the responsibilities of the spirits that reside on the Peaks) associated with snowmaking within the SUP area may further impact the spiritual character of the entire Peaks beyond historic and existing ground disturbance. This could impact the tribes' ability to properly complete rituals.</p>	N/A
<b><i>Issue #2: Proposed ground disturbances and vegetation removal may result in permanently evident alterations of the San Francisco Peaks landscape</i></b>		
<ul style="list-style-type: none"> <li>▪ <i>Indicator - Narrative description of existing and historic vegetation and ground disturbance within the SUP area</i></li> </ul>		
<p>While numerous changes to lands within the boundary of the Snowbowl SUP have occurred, comments to Forest Service personnel over the years indicate that the Peaks retain an integrity related to the traditional religious, cultural, natural, and social values which make the Peaks significant to the tribal people of the region.</p>		
<ul style="list-style-type: none"> <li>▪ <i>Indicator - Quantification of existing and additional proposed temporarily and permanently evident vegetation and ground disturbances</i></li> </ul>		
<p>Since approximately 1938, approximately 100 acres of overstory vegetation have been cleared throughout the Snowbowl SUP area, along with additional ground disturbance for terrain and related infrastructure.</p>	<ul style="list-style-type: none"> <li>▪ 76.3 acres of overstory vegetation removal</li> <li>▪ 10.4 acres of permanent ground disturbance</li> <li>▪ 235.7 acres of temporary ground disturbance</li> </ul>	<ul style="list-style-type: none"> <li>▪ 64.4 acres of overstory vegetation removal</li> <li>▪ 1.7 acres of permanent ground disturbance</li> <li>▪ 130.3 acres of temporary ground disturbance</li> </ul>
<ul style="list-style-type: none"> <li>▪ <i>Indicator - Qualitative discussion of the cultural significance of proposed ground and vegetative disturbances within the SUP area</i></li> </ul>		
N/A	The Peaks are viewed as a living entity, where any additional ground disturbances would be harmful.	

**Table 2-5  
Summary of Direct and Indirect Environmental Consequences**

ALTERNATIVE 1 – NO ACTION	ALTERNATIVE 2 – THE PROPOSED ACTION	ALTERNATIVE 3
<ul style="list-style-type: none"> <li>Indicator - Narrative discussion why the Proposed Action is not dependent upon completion of the National Register nomination/designation processes</li> </ul>		
The National Register Nomination process is underway and will be completed regardless of which alternative is approved.		
<ul style="list-style-type: none"> <li>Indicator - Narrative discussion of the ability for the proposed projects to coexist with a National Register designation if nomination is approved</li> </ul>		
The cultural values that pertain to the Peaks would be retained under any alternative.		
<b>NOISE</b>		
<b>Issue #4: The proposed snowmaking system would increase noise levels potentially disturbing resident, recreationists, and/or wildlife (Tracking)</b>		
<ul style="list-style-type: none"> <li>Indicator - Modeled analysis of snowmaking-related noise emissions above ambient background levels (dBA)</li> </ul>		
<ul style="list-style-type: none"> <li>Existing ambient levels 30-43 dBA</li> <li>Existing short duration levels 43-85 dBA</li> </ul>	<ul style="list-style-type: none"> <li>Heavy Equipment: 72-93 dBA at 50 feet</li> <li>Rock Drills: 81-98 dBA at 50 feet</li> <li>Fan Gun: 62 dBA at 200 feet</li> <li>Tower Gun: 73 dBA at 200 feet</li> <li>Booster Stations: Not audible beyond 100 feet</li> <li>Snowmaking Control Building: Not audible &gt;100 feet</li> </ul>	<ul style="list-style-type: none"> <li>Heavy Equipment: 72-93 dBA at 50 feet</li> <li>Rock Drills: 81-98 dBA at 50 feet</li> </ul>
<ul style="list-style-type: none"> <li>Indicator – Modeled analysis of noise dispersion to define audible areas</li> </ul>		
N/A	<p>Hart Prairie/The Nature Conservancy could be disrupted by nighttime snowmaking and rock drills during construction period; snowmaking noise would not be audible from within homes of buildings.</p> <p>From the Fort Valley area operation of the snowmaking system would not be audible; temporary audible noise during construction of water transmission line from Flagstaff to the Snowbowl.</p>	Hart Prairie/The Nature Conservancy could temporarily be disrupted by construction-related activities.

**Table 2-5  
Summary of Direct and Indirect Environmental Consequences**

ALTERNATIVE 1 – NO ACTION	ALTERNATIVE 2 – THE PROPOSED ACTION	ALTERNATIVE 3
<b>TRAFFIC AND RESORT ACCESS</b>		
<i><b>Issue #5: The Proposed Action could affect traffic volumes and/or congestion on U.S. Highway 180 and/or the Snowbowl Road (Tracking)</b></i>		
<ul style="list-style-type: none"> <li>▪ Indicator - Historic and projected traffic counts for U. S. Highway 180</li> <li>▪ Indicator - Comparison of anticipated winter traffic volumes with existing winter traffic volumes and the design capacities of U.S. Highway 180 and the Snowbowl Road</li> <li>▪ Indicator - Relative comparison of existing and anticipated winter traffic with current summer traffic volumes</li> </ul>		
<p>See Chapter 3, Section C for historic average annual daily traffic (AADT) on U.S. Highway 180.</p> <ul style="list-style-type: none"> <li>▪ Winter: average ~350 vehicles/day on U.S. Highway 180 attributable to Snowbowl’s operations between December and March</li> <li>▪ Summer: average ~95 vehicles/day on U.S. Highway 180 attributable to Snowbowl’s operations between Memorial and Labor day</li> <li>▪ No additions to capacities of Snowbowl Road or U.S. Highway 180 would be necessary</li> </ul>	<p>See Chapter 3, Section C for historic AADT on U.S. Highway 180.</p> <ul style="list-style-type: none"> <li>▪ Winter: average ~500 vehicles/day on U.S. Highway 180 attributable to Snowbowl’s operations between December and March</li> <li>▪ Summer: average ~95 vehicles/day on U.S. Highway 180 attributable to Snowbowl’s operations between Memorial and Labor</li> <li>▪ No additions to capacities of Snowbowl Road or U.S. Highway 180 would be necessary</li> </ul>	<p>See Chapter 3, Section C for historic AADT on U.S. Highway 180.</p> <ul style="list-style-type: none"> <li>▪ Winter: average ~365 vehicles/day on U.S. Highway 180 attributable to Snowbowl’s operations between December and March</li> <li>▪ Summer: average ~95 vehicles/day on U.S. Highway 180 attributable to Snowbowl’s operations between Memorial and Labor</li> <li>▪ No additions to capacities of Snowbowl Road or U.S. Highway 180 would be necessary</li> </ul>
<b>AESTHETIC RESOURCES</b>		
<i><b>Issue #6: Proposed ground disturbance and vegetation removal within the SUP may incrementally affect the aesthetic quality of the west face of the San Francisco Peaks (Tracking)</b></i>		
<ul style="list-style-type: none"> <li>▪ Indicator - The incremental aesthetic effects of the proposed projects compared to historic landscape alterations within the SUP area</li> </ul>		
<p>No changes to Snowbowl’s SUP area would occur under the No Action Alternative and its facilities would continue to comply with Forest Plan VQOs of <i>Modification</i> and <i>Maximum Modification</i>.</p>	<p>Some ground disturbing activities under the Proposed Action are considered temporary in nature, since these areas would be promptly revegetated. Direct, permanent aesthetic impacts are associated with components of the Proposed Action that, whether occurring in new or previously disturbed areas, would represent long-term visible elements of the ski area’s presence within the SUP</p>	<p>While Alternative 3 eliminates temporary ground disturbance associated with snowmaking line installation, it includes essentially all of the lift and trail additions contained in the Proposed Action. However, Alternative 3 increases temporary ground disturbance associated with trail grading – necessary to provide for increased skiability under reduced natural snow conditions. Overall, the</p>

**Table 2-5  
Summary of Direct and Indirect Environmental Consequences**

ALTERNATIVE 1 – NO ACTION	ALTERNATIVE 2 – THE PROPOSED ACTION	ALTERNATIVE 3
	area when perceived in either the foreground, middleground or background views. Proposed landscape alterations can be implemented while maintaining full consistency with the VQOs of Modification and Maximum Modification.	aesthetic impacts are slightly reduced between alternatives 2 and 3. However, for the purposes of this analysis, they can be considered virtually identical, especially when perceived in the middleground and background distance zones.
<ul style="list-style-type: none"> <li>▪ <i>Indicator - Visual simulations from identified representative viewpoints of the proposed landscape alterations as compared to the existing condition.</i></li> </ul>		
Refer to Chapter 3, Section D which depicts a series of photo simulations.		
<b>SOCIAL AND ECONOMIC RESOURCES</b>		
<b><i>Issue #7: Implementation of the Proposed Action may have social and economic effects on Flagstaff and Coconino County (Tracking)</i></b>		
<ul style="list-style-type: none"> <li>▪ <i>Indicator – Discussion of the potential for the Proposed Action to affect a change in key local economic indicators</i></li> </ul>		
Refer to Table 3E-13 within Chapter 3	Refer to Table 3E-13 within Chapter 3	Refer to Table 3E-13 within Chapter 3
<ul style="list-style-type: none"> <li>▪ <i>Indicator – Analysis of the correlation between Snowbowl annual skier visitation and annual retail and Bed, Board, and Booze (BBB) and tax revenues</i></li> </ul>		
Calculations indicate that Snowbowl visitors make a positive contribution to BBB tax collections. However, because this is an economy of significant size, BBB tax generated by Snowbowl visitors constitutes a small portion of total tax collections.		
<ul style="list-style-type: none"> <li>▪ <i>Indicator – Narrative description of the recreational/social function which Snowbowl serves</i></li> </ul>		
The continuation of the current operation as a for-profit business may not be sustainable; the ski area would likely decrease expenditures on maintenance and non-essential services leading to an overall reduction in the quality of the services offered under Alternative 1. In this event, much of the social and economic functions served by Snowbowl may be reduced or lost. The quality of the most significant Alpine recreation venue within the Flagstaff area would be diminished.	The recreational and social functions of the Snowbowl would be enhanced under Alternative 2, as described in chapters 2 and 3.	Same as for Alternative 1.

**Table 2-5  
Summary of Direct and Indirect Environmental Consequences**

ALTERNATIVE 1 – NO ACTION	ALTERNATIVE 2 – THE PROPOSED ACTION	ALTERNATIVE 3
<p>▪ <i>Indicator – The effects of dry roads/fair weather on tourism in Flagstaff and the BBB</i></p>		
<p>The relationship between annual snowfall and Flagstaff’s annual tourism volume is shown in Figure 3E-5 in Chapter 3. There is no obvious relationship between snowfall and Flagstaff tourism. The analysis suggests that, over the years, dry roads/fair weather bears little relationship to Flagstaff tourism volume and thus the BBB tax.</p>		
<p>▪ <i>Indicator – Presentation of historical data analyzing the relationship between winter tourism levels for the City of Flagstaff, with annual snowfall, and annual skier visitation</i></p>		
<p>The relationship between average monthly precipitation and average variation in Flagstaff’s monthly tourism volume is shown in Figure 3E-6 in Chapter 3. There is no obvious relationship between the two variables. While declining precipitation appears to relate to increasing tourism in May and June, tourism is at its highest level in the month with the highest average precipitation (July).</p>		
<p>▪ <i>Indicator – The percentage of the total economy represented by winter tourism</i></p>		
<p>Tourism in total is estimated to account for approximately 24.5 percent of the Flagstaff economy; winter tourism can be estimated to account for approximately 8.6 percent of the City’s economy.</p>		
<p>▪ <i>Indicator – Financial viability of the ski area under all alternatives</i></p>		
<p>Alternative 1 would result in no significant change in the Snowbowl’s viability as a for-profit business. While average annual skier visits are projected to increase by 12.7 percent over the current level, season-to-season totals would continue to fluctuate dramatically. As such, it is reasonable to project that under Alternative 1, the ski area would continue to experience negative net income in 30 to 40 percent of its operating seasons. Thus, the viability of the ski area would remain tenuous.</p>	<p>While the investment required to achieve Alternative 2 is substantial and would result in a higher break-even point (more skier visits required to achieve profitable operations), year-to-year variations in business levels would be minimalized and would result in positive net income in a higher percentage of seasons than under current operating conditions. The ski area would be in a significantly better financial position from which to maintain the physical facilities and maintain quality levels. The viability of the Arizona Snowbowl as a for-profit business would be enhanced under this alternative.</p>	<p>A prudent business operator would not make the majority of the investments in Alternative 3, as the break-even point for profitable operations would increase while skier visit totals would continue to fluctuate dramatically. The overall viability of the ski area would decline significantly if the Alternative were to be fully implemented.</p>

**Table 2-5  
Summary of Direct and Indirect Environmental Consequences**

ALTERNATIVE 1 – NO ACTION	ALTERNATIVE 2 – THE PROPOSED ACTION	ALTERNATIVE 3
<b>RECREATION</b>		
<i>Issue #8: The effects of the Proposed Action on the quality, distribution, and opportunity for winter and summer recreational experiences within the SUP area (Tracking)</i>		
<ul style="list-style-type: none"> <li>▪ <i>Indicator - Comparison of historic annual winter and summer recreational visitation versus those anticipated under various alternatives</i></li> </ul>		
<p>Annual winter visitation could be expected to fluctuate from roughly 98,000 (historic) to 110,000 between year 0 and year 11.</p> <p>The summer Ski Ride program would be expected to continue to draw approximately 30,000 visitors each year.</p>	<p>Annual winter visitation levels could be expected to increase from roughly 98,000 in year 0 to around 215,000 by year 11.</p> <p>Overall summer visitation would not be expected to increase substantially, and would likely continue to be approximately 30,000 visitors annually.</p>	<p>Under Alternative 3, winter attendance is anticipated to increase slightly above the No Action Alternative, but below that of the Proposed Action. Alternative 3 could be expected to produce annual skier visitation levels between 98,000 and 118,000 between year 0 and year 11.</p> <p>Overall summer visitation would not be expected to increase substantially, and would likely continue to be approximately 30,000 visitors annually.</p>
<ul style="list-style-type: none"> <li>▪ <i>Indicator - Narrative description of the quality of winter and summer recreational opportunities under all alternatives.</i></li> </ul>		
<p>In lieu of updating guest service facilities at Snowbowl, selection of the No Action Alternative would translate to a continuation of crowded, and sometimes undesirable, guest experiences in many areas, such as in the lodges and on the chairlifts.</p>	<p>The only aerial lift at Snowbowl that would remain unchanged is Agassiz. Snowbowl’s developed terrain network would increase from approximately 139 acres to approximately 204 acres (a 47 percent increase). Snowmaking technology would provide consistent snowpack from season-to-season that would help redefine the Snowbowl as a reliable winter sports facility in Northern Arizona’s recreational setting. Terrain/infrastructural upgrades and increased CCC under the Proposed Action would improve the Snowbowl’s ability to accommodate the existing levels of visitation. Skier densities would remain within the industry norm while lift line waiting periods would decrease. The proposed hiking trail from Agassiz Lodge to the top of the Agassiz Chairlift would add a new element to Snowbowl’s summertime recreational offerings.</p>	<p>Alternative 3 does not include the primary elements associated with the Proposed Action which would most affect the overall recreational experience (snowmaking and snowtubing). Therefore, the overall recreation experience at Snowbowl would be less desirable than the Proposed Action, particularly on busy days, and would continue to deteriorate as skiers and snowboarders seek more favorable, out-of-state opportunities. The ski area’s reputation in Northern Arizona’s recreational environment would continue to be defined by climatic conditions with a continued dependency on natural precipitation. While difficult to measure, skier export to neighboring states would be expected to continue, as warranted by snowfall and climatic trends.</p>

**Table 2-5  
Summary of Direct and Indirect Environmental Consequences**

ALTERNATIVE 1 – NO ACTION	ALTERNATIVE 2 – THE PROPOSED ACTION	ALTERNATIVE 3
<b><i>Issue #9: Implementation of the Proposed Action may affect the experience of wilderness users within the surrounding Kachina Peaks Wilderness (Tracking)</i></b>		
<ul style="list-style-type: none"> <li>▪ <i>Indicator - Quantification of seasonal Wilderness utilization and visitation</i></li> <li>▪ <i>Indicator - Narrative discussion of the anticipated effects to Wilderness users</i></li> </ul>		
Annual utilization of the Wilderness would be expected to follow historic trends, as provided in Table 3F-6 in Chapter 3. Access, use and enjoyment of the Wilderness would not change.	Similar to the No Action Alternative, neither of the Action Alternatives would directly or indirectly impact summer or winter access, use or enjoyment of the adjacent Kachina Peaks Wilderness. All projects likely to occur under either of the Action Alternatives would be confined to the established Snowbowl SUP area, and no additional access to, or use of, the Wilderness area is anticipated.	
<b>INFRASTRUCTURE AND UTILITIES</b>		
<b><i>Issue #10: Effects of the Proposed Action on ski area infrastructure and supporting utilities within and beyond the SUP area (Tracking)</i></b>		
<ul style="list-style-type: none"> <li>▪ <i>Indicator – Disclosure of current versus anticipated requirements for guest seating, power, domestic water supply and wastewater treatment, and parking capacity</i></li> </ul>		
CCC would remain at 1,880. Facilities and infrastructure would continue to be work well for this CCC, but would become overtaxed when exceeded.	CCC would increase to 2,825. Guest service facilities and related infrastructure have been sized to accommodate 125 percent of CCC.	As with the Proposed Action, Alternative 3 would size guest service facilities and related infrastructure to accommodate approximately 125 percent of CCC.
Snowbowl would continue to transport all of its domestic water from Flagstaff - there would be no additional storage capacity and demand would be anticipated to remain the same.	The Snowbowl would continue to transport 100 percent of its potable water via truck from Flagstaff. However, with construction of the reclaimed water pipeline, it would no longer be necessary for the Snowbowl to use potable water for non-potable services.	Without the reclaimed water pipeline to supply non-potable water, Snowbowl would continue to utilize approximately 60 percent of the potable water it trucks to the ski area to accommodate its non-potable water needs.
Because the existing electrical service is adequate to meet Snowbowl’s current needs, upgrades to power supply and distribution are not necessary.	With the addition of snowmaking infrastructure, new/upgraded lifts and other projects, Snowbowl’s existing power supply is inadequate and would need to be upgraded.	Because Alternative 3 excludes snowmaking, Snowbowl’s existing power supply is adequate to meet anticipated needs
No additional communication lines would be installed.	The main telephone line servicing Snowbowl would need to be upgraded.	Alternative 3 would not necessitate any changes to the existing communications network at Snowbowl.
Guest seating and restrooms would continue to be inadequate on even moderately busy days.	Proposed improvements to the Hart Prairie and Agassiz day lodges would help achieve a better balance between guest services and attendance levels.	Alternative 3 improvements to guest services would be identical to the Proposed Action.

**Table 2-5  
Summary of Direct and Indirect Environmental Consequences**

ALTERNATIVE 1 – NO ACTION	ALTERNATIVE 2 – THE PROPOSED ACTION	ALTERNATIVE 3
<b>WATERSHED RESOURCES</b>		
<i><b>Issue #11:</b> The application of Class A reclaimed water for snowmaking within the SUP area may affect water quality within the receiving subwatersheds (Tracking)</i>		
<ul style="list-style-type: none"> <li>▪ <i>Indicator - Description of the certification process for allowing Class A water to be used for snowmaking</i></li> <li>▪ <i>Indicator - Discussion of the applicability of the Rio de Flag Water Treatment Plant NPDES permit to the proposed snowmaking application</i></li> </ul>		
<p>ADEQ developed the Reclaimed Water Permit Program to define conditions and requirements for reuse of treated municipal wastewater. The program specifies reclaimed water standards and defines five classes of reclaimed water. Class A reclaimed water is the highest quality and is required for reuse applications where there is a relatively high risk of human exposure to treated effluent. The State of Arizona specifically allows Class A and A+ reclaimed water for direct reuse in snowmaking.</p>		
<ul style="list-style-type: none"> <li>▪ <i>Indicator - Literature search on use of reclaimed water for various recreational and municipal purposes</i></li> </ul>		
<p>Reuse of municipal wastewater has become increasingly important during the past several decades due to the growth in urban population, constraints on the development of new water sources, and more stringent treatment requirements to protect the quality of the receiving water for aquatic life. Reuse is practiced extensively in the United States and around the world.</p>		
<ul style="list-style-type: none"> <li>▪ <i>Indicator - Literature search and narrative description of the potential presence of pharmaceuticals, pathogens, and hormones in Class A reclaimed water</i></li> </ul>		
<p>Municipal wastewater contains a variety of PPCPs that are pharmaceutically active and known to act on the endocrine system at therapeutic doses. Although the occurrence of antibiotics and steroids has generated nearly all the controversy to date, many other classes of drugs, bioactive metabolites and transformation products, and personal care products have yet to be examined. Chemicals found in both non-prescription and prescription medications have been detected in municipal wastewaters and may act as endocrine disruptors. In addition to prescribed human drugs, other PPCPs of potential concern include veterinary and illicit drugs and such common substances as caffeine, cosmetics, food supplements, sunscreen agents, solvents, insecticides, plasticizers, and detergent compounds. The analysis notes that humans are thought to be susceptible to endocrine disrupting compounds only at high exposure levels.</p>		

**Table 2-5  
Summary of Direct and Indirect Environmental Consequences**

ALTERNATIVE 1 – NO ACTION	ALTERNATIVE 2 – THE PROPOSED ACTION	ALTERNATIVE 3
<p>▪ <i>Indicator - Documentation of compliance with State and Federal water quality standards regarding Class A wastewater and its uses</i></p>		
<p>The Rio de Flag Water Reclamation Facility (WRF) is authorized to discharge treated wastewater to the Rio de Flag under National Pollutant Discharge Elimination System (NPDES) Permit that was issued in November 1999. The permit requires that water quality of the reclaimed water meet State Surface Water Quality Standards for discharge to the Rio de Flag. ADEQ has assigned designated uses of partial-body contact (PBC) and aquatic and wildlife for effluent-dependent water to the receiving waters of the Rio de Flag WRF. EPA and ADEQ conduct annual inspections of the Rio de Flag WRF to assure the facility is operated and maintained in compliance with Federal and State regulations. NPDES inspection reports obtained for the past four years indicate that no deficiencies were found in the operation and maintenance of the Rio de Flag WRF.</p>		
<p>▪ <i>Indicator - Analysis of potential water quality effects of using reclaimed water in the snowmaking system to down gradient users</i></p>		
<p>N/A</p>	<p>Additional groundwater recharge associated with use of reclaimed water for snowmaking would increase the concentration of solutes in groundwater. Groundwater recharge that occurs in areas of proposed snowmaking would contain larger concentrations of TDS, TOC, total nitrogen, and other dissolved constituents from the reclaimed water than groundwater recharge from natural precipitation. However, the solute concentrations would be decreased substantially from concentrations in the reclaimed water by commingling and blending with natural precipitation.</p> <p><u>Snowbowl Sub-Area</u>: The net effect of changes in groundwater recharge from alternating dry, average, and wet climatic conditions would be to dilute and attenuate the flux of solute concentrations reaching the underlying perched aquifer system.</p> <p><u>Agassiz Sub-Watershed</u>: Although concentrations of TDS, TOC, and total nitrogen concentrations are larger than comparable concentrations assumed for water available for groundwater recharge from natural precipitation, the concentrations of TDS and TOC are decreased by more</p>	<p>N/A</p>

**Table 2-5  
Summary of Direct and Indirect Environmental Consequences**

ALTERNATIVE 1 – NO ACTION	ALTERNATIVE 2 – THE PROPOSED ACTION	ALTERNATIVE 3
	<p>than an order of magnitude from concentrations in the reclaimed water.</p> <p><u>Hart Prairie Watershed</u>: Due to the distant location of the four small springs downgradient from the Agassiz sub-watershed and limited overall change in solute concentrations, the anticipated indirect effects to water quality at springs in Hart Prairie from Alternative 2 are considered to be negligible.</p>	
<p><b><i>Issue #12: Use of reclaimed water for snowmaking purposes between November and February of each year could affect aquifer recharge (Tracking)</i></b></p>		
<p>▪ <i>Indicator - Quantification of anticipated snowmaking water use in average dry, median, and wet years</i></p>		
N/A	<p><u>Agassiz Sub-Watershed</u></p> <ul style="list-style-type: none"> <li>▪ Dry Year: 40 AF/yr</li> <li>▪ Average Year: 30 AF/yr</li> <li>▪ Wet Year: 20 AF/yr</li> </ul> <p><u>Hart Prairie Watershed</u></p> <ul style="list-style-type: none"> <li>▪ Dry Year: 446 AF/yr</li> <li>▪ Average Year: 334 AF/yr</li> <li>▪ Wet Year: 223 AF/yr</li> </ul>	N/A
<p>▪ <i>Indicator - Description and quantification of the Rio de Flag Reclamation facility’s historic seasonal discharges</i></p>		
<p>The Rio de Flag WRF was built to provide four millions gallons per day (MGD) of wastewater treatment capacity, with the potential for expansion to six MGD. The Rio de Flag WRF has treated wastewater at an average rate of 681 million gallons per year (1.87 MGD) during the past four years. The most recent data from 2002 indicate that approximately 25 percent of the wastewater treated at the WRF was beneficially reused in the Reclaimed Water System and 75 percent was discharged as Grade A+ treated effluent to the Rio de Flag channel.</p>		
<p>▪ <i>Indicator - Description and quantification of current uses of reclaimed water within the City of Flagstaff by season</i></p>		
<p>The Rio de Flag WRF currently provides reclaimed water for turf irrigation to the Catholic Cemetery; Northern Arizona University; Pine Canyon Golf Course; Flagstaff Medical Center; the Flagstaff public school system; and the city’s public parks, facilities, and cemetery. Reclaimed water from the Wildcat Hill WWTP is used for irrigation at golf courses, public parks, the Christmas tree farm, and for dust control at various locations in east Flagstaff.</p>		

**Table 2-5  
Summary of Direct and Indirect Environmental Consequences**

ALTERNATIVE 1 – NO ACTION	ALTERNATIVE 2 – THE PROPOSED ACTION	ALTERNATIVE 3
<ul style="list-style-type: none"> <li>▪ <i>Indicator - Discussion of existing water rights and the ability to implement the proposed snowmaking with or without procuring additional water rights</i></li> </ul>		
<p>The right to the use of reclaimed water in Arizona was established by the 1989 decision of the Arizona Supreme Court in the case of <i>Arizona Public Service v. Long</i>.</p>		
<ul style="list-style-type: none"> <li>▪ <i>Indicator - Narrative description of both the City of Flagstaff's well field and reclaimed water uses and their hydrologic relationship to the regional aquifer</i></li> </ul>		
N/A	<p>As noted in Table 3H-4, proposed snowmaking would result in an estimated net average reduction in groundwater recharge to the regional aquifer of 178 AF per year. This calculated reduction represents slightly more than two percent of the City of Flagstaff's total annual water production (as averaged over the 10 year period from 1992 to 2001). This amount is negligible compared to the annual groundwater recharge rate of approximately 290,000 AF to the regional aquifer estimated for the Lake Mary well field.</p>	N/A
<ul style="list-style-type: none"> <li>▪ <i>Indicator - Quantification of annual consumptive watershed losses resulting from snowmaking</i></li> </ul>		
N/A	<p><u>Snowbowl Sub-area</u></p> <ul style="list-style-type: none"> <li>▪ Dry Year: 1,464 AF/yr</li> <li>▪ Average Year: 1,692.9 AF/yr</li> <li>▪ Wet Year: 1,681.7 AF/yr</li> </ul> <p><u>Agassiz Sub-Watershed</u></p> <ul style="list-style-type: none"> <li>▪ Dry Year: 830.2 AF/yr</li> <li>▪ Average Year: 1,276.7 AF/yr</li> <li>▪ Wet Year: 1,350.9 AF/yr</li> </ul> <p><u>Hart Prairie Watershed</u></p> <ul style="list-style-type: none"> <li>▪ Dry Year: 4,532.1 AF/yr</li> <li>▪ Average Year: 6,442.6 AF/yr</li> <li>▪ Wet Year: 6,569.2 AF/yr</li> </ul>	N/A

**Table 2-5  
Summary of Direct and Indirect Environmental Consequences**

ALTERNATIVE 1 – NO ACTION	ALTERNATIVE 2 – THE PROPOSED ACTION	ALTERNATIVE 3
<b>SOILS AND GEOLOGY</b>		
<i><b>Issue #13: The Proposed Action has potential to change soil chemistry and moisture due to the application of machine produced snow (Tracking)</b></i>		
<ul style="list-style-type: none"> <li>▪ <i>Indicator - Anticipated volume of machine-produced snow applied under various scenarios: dry year, average year, wet year (refer to Table 3I-10 for watershed breakdown)</i></li> </ul>		
N/A	<ul style="list-style-type: none"> <li>▪ Dry Year: 486.0 AF/yr</li> <li>▪ Wet Year: 243 AF/yr</li> <li>▪ Average Year: 364 AF/yr</li> </ul>	N/A
<ul style="list-style-type: none"> <li>▪ <i>Indicator - Modeled anticipated changes in the duration and intensity of annual snowmelt compared to historic natural variation</i></li> </ul>		
N/A	<p>The application of snowmaking alters the volume and timing of snowmelt; machine-produced snow typically begins to melt later in the season than natural snow. This can increase the average duration of seasonal melt. Trail clearing affects the water balance by decreasing the amount of water removed via evapotranspiration, thus increasing the quantity of water available for infiltration or runoff. Interception and evaporation losses from the forest canopy would be reduced. Vegetation removal would affect the infiltration characteristics of the watershed, generally resulting in quicker runoff generation. Changes in vegetative cover also can affect the solar energy balance of the watershed, permitting increased solar radiation and therefore earlier and faster snowmelt. Together these changes would alter water balance characteristics and snowmelt timing.</p> <p><u>Average Year:</u> Introduction of additional water equivalent in the form of machine-produced snow, coupled with changes in land use due to trail construction activities, would result in a six percent increase in watershed recharge in an average year.</p>	N/A

**Table 2-5  
Summary of Direct and Indirect Environmental Consequences**

ALTERNATIVE 1 – NO ACTION	ALTERNATIVE 2 – THE PROPOSED ACTION	ALTERNATIVE 3
	<p><u>Dry Year</u>: Overall, an eight percent increase in annual recharge would be anticipated during dry-year conditions.</p> <p><u>Wet Year</u>: In a wet year, snowmaking represents a very small percentage of the overall water balance. For the Snowbowl watershed, receiving most of the snowmaking input, the change in recharge compared to existing conditions is two percent.</p>	
<p>▪ <i>Indicator - Modeled anticipated changes in erosion/sedimentation due to predicted changes in total snowpack</i></p>		
N/A	<p>While the sediment detachment quantities predicted by the WEPP model are measures of potential detachment, and not actual sediment yield or delivery, the anticipated increase in post-implementation detachment is approximately 483 tons. After re-vegetation, with decommissioning of a portion of the existing mountain access road reducing detachment by approximately 14 tons per year, the total increase in detachment is anticipated to be almost 180 tons. This increase is driven primarily by 43.3 acres of the 131 acres of total disturbance that are proposed to occur on slopes of 30 percent slope gradient or higher.</p>	<p>The anticipated increase in detachment immediately following project implementation is approximately 466 tons, and is four percent lower than the Proposed Action. The detachment rates are driven primarily by 42 acres of the 119 acres of total grading that are proposed to occur on slopes of 30 percent slope gradient or higher.</p>
<p>▪ <i>Indicator - Analysis of potential changes to soil chemistry due to anticipated increases in soil moisture and nutrient loading</i></p>		
N/A	<p>Overall, percolating treated wastewater through the soil profile would be unlikely to have a negative impact on either the soils or treated water.</p>	N/A

**Table 2-5  
Summary of Direct and Indirect Environmental Consequences**

ALTERNATIVE 1 – NO ACTION	ALTERNATIVE 2 – THE PROPOSED ACTION	ALTERNATIVE 3
<b>VEGETATION</b>		
<b><i>Issue #14: Plant communities (including T, E and S plant species, and regionally important plants) within the SUP area may be altered as a result of the proposed projects</i></b>		
<ul style="list-style-type: none"> <li>▪ <i>Indicator - Acres of mixed conifer forest on the San Francisco Peaks, within the SUP, and potentially effected by the Proposed Action</i></li> </ul>		
There would be no overstory tree removal in the analysis area; therefore, the total acreage of mixed conifer and Spruce-fir forest on the San Francisco Peaks would not change.	76.3 acres of permanent overstory vegetation removal within Spruce-fir forest in the SUP area; and treatment of 47.4 acres of Spruce-fir forest within the Agassiz and Sunset pods, consisting of 20% tree removal, are proposed.	64.4 acres of permanent overstory vegetation removal within Spruce-fir forest in the SUP area; and treatment of 47.4 acres of Spruce-fir forest within the Agassiz and Sunset pods, are proposed.
<ul style="list-style-type: none"> <li>▪ <i>Indicator - Potential impacts to montane grasslands within the SUP as a proportion of total grasslands on the San Francisco Peaks</i></li> </ul>		
There would be no change in acreage of montane grassland either within the SUP area or on the San Francisco Peaks.	2.7 acres of permanent loss, and 18.2 acres of temporary disturbance, to montane grassland in the SUP area are proposed.	0.1 acre of permanent loss, and 17.7 acres of temporary disturbance, to montane grassland in the SUP area are proposed.
<ul style="list-style-type: none"> <li>▪ <i>Indicator - Disclosure of effects to potentially occurring T, E, and/or S plant species or potential habitat</i></li> </ul>		
There would be no effect on the endangered San Francisco Peaks groundsel or its habitat, including designated critical habitat in the upper portion of the SUP.	May affect but is not likely to adversely affect the San Francisco groundsel or its habitat through 2.44 acres of disturbance within “mapped critical habitat.”	May affect but is not likely to adversely affect the San Francisco groundsel or its habitat through 2.44 acres of disturbance within “mapped critical habitat.”
<b><i>Issue #15: The Proposed Action has potential to change vegetation composition within the SUP area due to the application of machine-produced snow (Tracking)</i></b>		
<i>Indicator - Description of likely snowmaking scenarios for dry, wet and average snow years</i>		
N/A	See issue #13 above.	N/A

**Table 2-5  
Summary of Direct and Indirect Environmental Consequences**

ALTERNATIVE 1 – NO ACTION	ALTERNATIVE 2 – THE PROPOSED ACTION	ALTERNATIVE 3
<p>▪ <i>Indicator - Analysis of potential changes to botanical composition due to anticipated increases in soil moisture consistency and/or delayed snowpack desiccation</i></p>		
Vegetation communities in the analysis area would receive only natural precipitation.	Additional water and nitrogen from snowmaking would increase plant growth and may change plant species composition on existing and newly developed ski trails.	Vegetation communities in the analysis area would receive only natural precipitation.
<p>▪ <i>Indicator - Description of the certification process for allowing Class A water to be used for snowmaking</i></p>		
<p>The State of Arizona allows Class A and A+ reclaimed water for direct reuse in snowmaking. ADEQ developed the Reclaimed Water Permit Program to define conditions and requirements for reuse of treated municipal wastewater. The program specifies reclaimed water standards and defines five classes of reclaimed water. Class A reclaimed water is the highest quality and is required for reuse applications where there is a relatively high risk of human exposure to treated effluent.</p>		
<p>▪ <i>Indicator - Literature search on use of reclaimed water for various recreational and municipal purposes uses</i></p>		
<p>Reuse of municipal wastewater has become increasingly important during the past several decades due to the growth in urban population, constraints on the development of new water sources, and more stringent treatment requirements to protect the quality of the receiving water for aquatic life. Reuse is practiced extensively in the United States and around the world.</p>		
<p>▪ <i>Indicator - Documentation of compliance with State and Federal water quality standards regarding Class A wastewater and its uses</i></p>		
<p>The Rio de Flag WRF is authorized to discharge treated wastewater to the Rio de Flag under NPDES Permit (currently referred to as an AZPDES Permit since the program has been delegated to State authority) that was issued in November 1999. The AZPDES Permit requires that water quality of the reclaimed water meet State Surface Water Quality Standards (SWQS) for discharge to the Rio de Flag. The Arizona Department of Environmental Quality (ADEQ) has assigned designated uses of partial-body contact (PBC) and aquatic and wildlife for effluent-dependent water (A&amp;Wedw) to the receiving waters of the Rio de Flag WRF.</p>		
<p>▪ <i>Indicator - Description of nitrogen constituents of Class A wastewater</i></p>		
<p>Effects of supplemental nitrogen on plant communities on ski trails would be dependent on local conditions, nitrogen concentrations in the reclaimed water, and deposition rates. The rate of nitrogen saturation of the soil would be dependent on a number of factors, including soil physical and chemical characteristics, existing soil nutrient content, plant species diversity and density, and climate. Net nitrogen deposition as a result of snowmaking in the SUP would be from about two-fold to over 60-fold lower than that in the studies cited. Therefore, nitrogen saturation would likely occur over a longer time period.</p>		

**Table 2-5  
Summary of Direct and Indirect Environmental Consequences**

ALTERNATIVE 1 – NO ACTION	ALTERNATIVE 2 – THE PROPOSED ACTION	ALTERNATIVE 3
<b>WILDLIFE</b>		
<i><b>Issue #16:</b> The Proposed Action may result in the alteration and/or removal of habitat for terrestrial wildlife species within the SUP (Tracking)</i>		
<ul style="list-style-type: none"> <li>▪ <i>Indicator - Identification of any T, E, and S; MIS; and other wildlife species and habitats present within the SUP area and along the pipeline corridor</i></li> </ul>		
<p>One federally-listed threatened wildlife species occurs regularly within general the analysis area: Mexican spotted owl (<i>Strix occidentalis lucida</i>). The threatened bald eagle (<i>Haliaeetus leucocephalus</i>) may occur in the analysis area in winter. The endangered black-footed ferret (<i>Mustela nigripes</i>) is not known or expected to occur in the analysis area. On the San Francisco Peaks, the Navajo Mountain Mexican vole has been found in open grassy areas amid limber pine, spruce, fir, and aspen. There are two PFAs within the analysis area, both of which are located along the Snowbowl Road and the reclaimed water pipeline alignment. The Veit Spring PFA largely overlaps the Snowbowl Mexican spotted owl PAC. There are no MIS identified for Developed Recreation Areas (i.e., the Arizona Snowbowl SUP). Alpine habitat occupies about 20 acres above timberline in the SUP area and covers an estimated 1,600 acres on the San Francisco Peaks, generally above 11,500 feet. Only the water pipit is known to breed in this habitat type. The analysis area is located within Game Management Unit (GMU) 7. Large game species managed by the Arizona Game and Fish Department are the pronghorn antelope, black bear, elk, mule deer, and wild turkey. Mountain lions are also known to occur in the analysis area. A number of smaller game animals and fur bearers also occur, including Abert and red squirrel, gray-collared chipmunk, mantled ground squirrel, Gunnison’s prairie dog, coyote, and bobcat. Several species of bats have been documented in the Fort Valley area, west of the Snowbowl Road.</p>		
<ul style="list-style-type: none"> <li>▪ <i>Indicator - Disclosure/quantification of anticipated effects to those species and habitats present within the SUP area and along the pipeline corridor</i></li> </ul>		
<p>This alternative would have No Effect on any threatened, endangered, or sensitive species, management indicator species, migratory birds, or game and non-game wildlife</p>	<p><u>Threatened, Endangered, or sensitive species:</u> There would be No Effect on the Mexican spotted owl or its habitat, the bald eagle or its habitat, the peregrine falcon or its habitat, or the black-footed ferret or its habitat. The Proposed Action may impact the Navajo Mountain Mexican vole, and the Northern goshawk.</p> <p><u>Management Indicator Species:</u> Tree removal would not substantially affect habitat for the Abert squirrel, pygmy nuthatch, wild turkey, elk, hairy woodpecker, red squirrel, red-naped sapsucker, or pronghorn antelope.</p> <p><u>Migratory Birds:</u> Proposed activities may affect migratory bird species within the SUP directly through habitat removal or modification or indirectly through changes in prey populations.</p>	<p><u>Threatened, Endangered, or sensitive species:</u> There would be No Effect on the Mexican spotted owl or its habitat, the bald eagle or its habitat, the peregrine falcon or its habitat, or the black-footed ferret or its habitat. The Proposed Action may impact the Navajo Mountain Mexican vole.</p> <p><u>Management Indicator Species:</u> No effect on management indicator species.</p> <p><u>Migratory Birds:</u> Proposed activities may affect migratory bird species within the SUP directly through habitat removal or modification or indirectly through changes in prey populations.</p>

**Table 2-5  
Summary of Direct and Indirect Environmental Consequences**

ALTERNATIVE 1 – NO ACTION	ALTERNATIVE 2 – THE PROPOSED ACTION	ALTERNATIVE 3
	<u>Game and Non-game Wildlife</u> : Effects would result from increased moisture and nutrients due to snowmaking, construction activities, forest fragmentation, and summer recreation.	<u>Game and Non-game Wildlife</u> : Effects would result from noise due to construction activity, forest fragmentation, and an increase in summer recreation.
<b><i>Issue #17: Proposed snowmaking activities may result in a longer-duration snowpack and additional water storage for wildlife in the SUP area (Tracking)</i></b>		
▪ <i>Indicator - Acreage of proposed snowmaking coverage</i>		
N/A	205.2 acres	N/A
▪ <i>Indicator - Comparison of natural snowpack duration with the extended snowpack due to snowmaking</i>		
N/A	Snowmaking would generally extend the duration of snowpack in the SUP area. Snow grain (crystal) size of machine-produced snow is typically smaller than that of natural snow. This would result in denser snow that typically takes longer to melt than natural snow.	N/A
▪ <i>Indicator - Effects of both longer-duration snowpack and water storage (impoundment) on wildlife in the analysis area</i>		
N/A	Greater moisture availability from snowmaking and an extended snowpack would generally enhance the growth of grasses and forbs on cleared ski trails within the SUP area. This would locally increase forage conditions for deer and elk and result in higher densities of these game species in the SUP area. The snowmaking water impoundment would have no effect on most game and non-game wildlife because access would be precluded by fencing.	N/A

**Table 2-5  
Summary of Direct and Indirect Environmental Consequences**

ALTERNATIVE 1 – NO ACTION	ALTERNATIVE 2 – THE PROPOSED ACTION	ALTERNATIVE 3
<b>GEOTECHNICAL</b>		
<i>Issue #18: Geotechnical feasibility and associated hazards associated with construction of the proposed snowmaking impoundment on the ridge above the Sunset Chairlift must be analyzed (Tracking)</i>		
▪ <i>Indicator - Hazard classification</i>		
N/A	The structure would classify as a low hazard dam using the State of Arizona criteria, and a moderate hazard dam using the Forest Service criteria. Therefore, it is recommended that the final structure be designed using design criteria associated with a moderate hazard dam.	N/A
▪ <i>Indicator - Failure Risk</i>		
N/A	Low risks of failure are associated with: <ul style="list-style-type: none"> <li>▪ overtopping</li> <li>▪ piping (with appropriate mitigation)</li> <li>▪ static instability</li> <li>▪ excessive displacement during an earthquake is low</li> <li>▪ liquefaction (believed to be low, but needs to be verified by site-specific investigation at the time of final design)</li> <li>▪ excessive settlement</li> </ul>	N/A

**Table 2-5  
Summary of Direct and Indirect Environmental Consequences**

ALTERNATIVE 1 – NO ACTION	ALTERNATIVE 2 – THE PROPOSED ACTION	ALTERNATIVE 3
<ul style="list-style-type: none"> <li>Indicator - Dam breach and downstream inundation analysis</li> </ul>		
N/A	<p>The model indicates that the flood wave attenuates substantially on its way down the mountain and dissipates almost entirely in the broad floodplain of Fort Valley. Downstream from Fort Valley, it is anticipated that existing hydraulic structures (bridges, culverts, etc.) on the Rio De Flag would accommodate the passing breach flood without impact through the Flagstaff area.</p>	N/A
<b>AIR QUALITY</b>		
<p><b><i>Issue #19: Snowplay activities at Snowbowl could increase vehicular traffic and may negatively impact air quality in the region (Tracking)</i></b></p>		
<ul style="list-style-type: none"> <li>Indicator - Compliance with local, state and federal regulations regarding air quality</li> </ul>		
<p>There is no projected increase in visitation under Alternative 1. The area would remain in attainment for all six criteria pollutants and the visibility of the Kachina Peaks Wilderness would remain unimpaired. Snowbowl would maintain compliance with all local, state, and Federal air quality regulations.</p>	<p>While the Proposed Action would be accompanied by an increase in total annual vehicular traffic and short-term, construction related affects to air quality, Snowbowl would remain in attainment for all six criteria pollutants. It would also maintain the integrity of the visibility in the nearby Kachina Peaks Wilderness. Snowbowl would maintain compliance with all local, state, and Federal air quality regulations.</p>	<p>As a result of implementation of Alternative 3, Snowbowl would remain in attainment for all six criteria pollutants with a net reduction of direct and indirect effects as compared to those disclosed under the Proposed Action. It would also maintain the integrity of the visibility in the nearby Kachina Peaks Wilderness. Snowbowl would maintain compliance with all local, state, and Federal air quality regulations.</p>

## **DATA INTEGRITY**

Prior to undertaking this NEPA analysis, a thorough review of the existing mapping and data for Arizona Snowbowl was conducted. For the scope and detail of this analysis, the existing mapping and data was determined to be insufficient to model and analyze the Proposed Action in the detail required. For this analysis, high resolution, ortho-rectified, aerial photography and digital contour data was acquired for a 6,800 acre area including and surrounding the ski area. Digital contour data was created at a ten foot contour interval and the ortho-photography was captured at a one-foot pixel resolution. Additionally, this mapping was augmented using supplementary detailed data from a local surveyor and via GPS technology.

All of the data used in this analysis has been either created from, or corrected by, the digital aerial mapping. These datasets include but are not limited to the base mapping of the ski area such as lifts, trails, and infrastructure. DEM (Digital Elevation Model) and TIN (Triangulated Irregular Network) files have been compiled based on the elevation data from aerial and ground surveys. Additional datasets from sources such as the Forest-wide GIS database and sub-contractors have been corrected and rectified to coincide with the data generated from the aerial photography. This state-of-the-art GIS database was used to create, calculate, and analyze all of the anticipated impacts displayed within this analysis.