

**ADDENDUM to**

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**Specialist Report 9.0  
Soils and Geologic Hazards**

**Oil and Gas Leasing EIS  
on Lands Administered by the  
Dixie National Forest**

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## 1.0 INTRODUCTION

This addendum updates Specialist Report 9.0: Soils and Geologic Hazards, which informed the DEIS. This addendum provides the supplemental information necessary to inform the FEIS and make a decision. The specific purposes of this supplement are to:

1. Provide an overview of changes between the Draft and Final EIS (**Section 2.0**).
2. Highlight the changes since the DEIS that were made specifically to protect Soils and Geologic Hazards or that are otherwise relevant to Specialist Report 9.0 (**Section 3.0**).

## 2.0 CHANGES BETWEEN DRAFT AND FINAL EIS

A number of changes were made to the DEIS in preparing the FEIS. These changes were primarily minor edits, corrections, and updates, and are reflected in the FEIS. Chapter 7 was added to the FEIS and contains an analysis of the public comments received on the DEIS and responses from the Dixie National Forest. The public involvement process since the DEIS is described in detail in Chapter 7, and summarized in Section 1.9.1 of the FEIS.

A Supplemental Information Report (SIR) was issued in January 2009 to address comments on the DEIS from agencies and the public concerning air resources and climate change. Other changes (i.e., not related to air and climate change) were not substantial changes to the proposed action, or significant new circumstances bearing on the proposed action (following 40 CFR Part 1502.9) that would require a supplemental DEIS. These changes are summarized in the following sections.

### 2.1 Revised Leasing Options

Several changes were made to the action alternatives, and specifically leasing options, in response to public comments on the DEIS. Other changes to leasing options reflect Forest or other Agency decisions made since the DEIS that have bearing on the resources analyzed. **Table 1** summarizes the changes to leasing options since the DEIS.

**Table 1 Changes to leasing options since the DEIS reflected in the new GIS model.**

Resource	DEIS Leasing Option	FEIS Leasing Option	Alternatives Affected
Inventoried Roadless Areas	NSO (mod*)	NSO	C, D1, and E1
SIO Unassigned	LN	CSU	B, C, D, and E
NPS Protective Measure (new)	n/a	NL	B
	n/a	NSO	C
ROS Primitive	NL	NSO	C
Sage-Grouse Leaks	1-mile buffer	2-mile buffer	B and C
Fisheries Habitat	300-foot buffer	500-foot buffer	C
Boreal Toad Habitat (new)	n/a	Added to "Forest Service-Sensitive Species and Suitable Habitat"	A-E
Desert Tortoise Habitat	various	No suitable habitat determination	A-E

Desert Tortoise Critical Habitat	various	No suitable habitat determination	A-E
Lava Fields over Sensitive Aquifers	NSO	NL	B and C
Class I Airsheds – 60 km buffer (new)	n/a	CSU	A-E
Iron Town Historic District	various	No acres on Dixie National Forest	A-E

\*Actual leasing option CSU but called a “modified NSO.”

## 2.2 New GIS Model

The GIS model was re-run to incorporate the changes made to leasing options and the addition of new resources in the FEIS. The new model output, or the number of acres under each leasing option across the Forest, and revised baseline acres where appropriate, is reflected in each resource section in the FEIS. Regarding these specialist report updates (i.e., addendums), individual number replacements in the text that reflect the new model output for the FEIS are not listed in the errata sections. Instead, tables of data, usually replacing a specific table in the DEIS specialist report, are presented in each specialist report addendum to summarize the data changes in the FEIS.

## 2.3 Errata

Errata correct (**Section 2.3.1**) or expand on data previously presented (**Section 2.3.2**), or incorporate new information or decisions since the DEIS (**Section 2.3.3**).

### 2.3.1 Clarifications

Clarifications to the DEIS were made to correct errors or to eliminate confusion. Most were made as responses to public comments on the DEIS.

- Chapter 1
  - Section 1.5.2, Lands Not Legally Available for Leasing, clarification to language describing Utah Wilderness Act of 1984.
  - Section 1.5.2, Lands Not Legally Available for Leasing, clarification to language describing Split-estate parcels.
  - Section 1.8.2, 2001 Roadless Area Conservation Rule and Legal Activity, clarification to how Roadless Areas on the Dixie are officially identified.
- Chapter 3
  - Section 3.5.4, Aquatic Species and Habitat, clarification to which waterbodies on the Dixie are Blue Ribbon Fisheries, following a memo from the Blue Ribbon Fisheries Advisory Council dated 26 March 2006.
  - Section 3.6.2.3, Candidate Species, GIS error and clarification on acres of greater sage-grouse brood-rearing habitat within the Dixie.
- Chapter 4
  - All Sections, all effects determinations under NL were changed to “No Effect” (from “negligible”).
  - Section 4.6.4, Impacts of Connected Actions by Leasing Option, reducing impact adversity determinations for Utah prairie dog, greater sage-grouse, and pygmy rabbit.
  - Sections 4.6.4, 4.6.5, 4.9.4, and 4.9.5, Impacts of Connected Actions by Leasing Option and by Alternative: Reduced impact adversity determinations for pygmy rabbit, sensitive bats, sensitive raptors, big game, and marginally unstable slopes (soils) under CSU for some of the action alternatives due to misunderstanding

- (by the consultant) of the application of resource-specific CSUs.
  - Section 4.6.4, Impacts of Connected Actions by Leasing Option, road density was clarified as Open Motorized Road Density (OMRD).
  - Section 4.7.4, Impacts of Connected Actions by Leasing Option, clarification added to lava fields over sensitive aquifer impacts regarding the BLM Onshore Oil and Gas Order requirement for well casing.
  - Section 4.12.2.4 and 4.12.2.5, Class I Cumulative Impact Analysis and Visibility and Deposition Analysis, clarifications added (since SIR) regarding the need for additional air quality analyses for proposed projects and the criteria under which further analyses are required.
  - Section 4.12.2.7 (new), Direct Ozone Impacts, this section was added to clarify that ozone impacts are discussed in the cumulative effects section of Air Resources (5.12.3.1).
  - Section 4.17, Forest Plan Consistency Determination, assessments of compliance with the Forest Plan in the DEIS were eliminated due to the Forest Plan amendment that will be implemented to reflect the stipulations needed for resource protection.
- Chapter 5
  - Section 5.6.2, Past, Present, and Reasonably Foreseeable Future Actions, cumulative effects discussion regarding grazing effects to Utah prairie dog and greater sage-grouse expanded to include more of the scientific information available.

### **2.3.2 Expanded Analyses**

Expanded analyses were made as a result of the comments received on the DEIS. Apart from the SIR, which presented a new analysis on Climate Change and other aspects of Air Resources not in the DEIS (e.g., ozone), the main areas with information added were night skies (Visual Resources, 3.2 and 4.2), unroaded/undeveloped areas (IRAs/WSRs, 3.3 and 4.3), and greater sage-grouse (Special Status Species, 3.6 and 4.6). In the case of greater sage-grouse, impact determinations were re-assessed for alternatives B-E. Scientific evidence or Agency direction not previously considered was added to these discussions in response to public comments on the DEIS from government agencies and environmental groups.

The Air Resources analysis expanded upon in the SIR was further expanded in response to public comment on the SIR. Areas with new information include NAAQS for nitrogen oxides and ozone, secondary PM<sub>2.5</sub> analysis, updated ozone monitoring data from Zion NP, an expanded ozone analysis based on the UBAQS, and additional information on the impacts to sagebrush habitat from climate change.

### **2.3.3 New information or Agency direction (since 2008)**

The following decisions, regulations, or information were incorporated in the FEIS where applicable:

- Omnibus Public Land Management Act 2009
- Memorandums 1042-154 (2009) and 1042-155 (2010) (RACR)
- Wild and Scenic Rivers Suitability Study (2008)
- Forest Service Strategic Plan (2007-2012)
- National Visitor Use Monitoring Study (2010)
- Motorized Travel Plan (2009)

- Dixie National Forest Annual Monitoring Reports (2008 and 2009)
- Dixie National Forest Aquatic Monitoring Amendment (2010)
- Conservation Agreements for southern leatherside (UDWR 2010)
- New BLM RFPs – Cedar City and Richfield Field Offices (both 2008)
- Alton Coal Development update
- Updated R4 TESP list (2011)
- New definition of Sensitive Fisheries Habitat on the Dixie (=occupied *and suitable*; 2009)
- Updated occurrence and habitat data for TES species on the Dixie (2008-2010)
- Biological Opinion from USFWS (2011), including Lease Notices
- USFS SOPA (since 1<sup>st</sup> quarter 2011; updates to Foreseeable Future Actions)  
BLM IM No. UT 2010-055 (Protection of Ground Water Associated with Oil and Gas Leasing, Exploration, and Development – Utah BLM)

## **3.0 CHANGES TO SOILS AND GEOLOGIC HAZARDS**

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### **3.1 Revised Leasing Options and New Model**

The main change to soils resources between the DEIS and FEIS analysis pertains to caves, and specifically, the impacts determinations to cave resources under Alternatives B and C. These changes in impacts are a direct result of the modified leasing options to Lava Fields over Sensitive Aquifers under Alternatives B and C, from NSO to NL in the FEIS. The locations of cave resources on the Dixie National Forest are largely unknown, but caves are most likely to occur within the mapped Lava Fields over Sensitive Aquifer features. Therefore, the increased protection for these features under the FEIS model led to a reduced likelihood for adverse impacts to cave resources.

The following changes were made to the FEIS to reflect this:

#### **Section 9.5.4.3, Impacts by Alternative, “Alternative B”:**

- Add to end of first paragraph:

There would be no leasing (NL) on cave resources that overlap with lava fields over sensitive aquifers.

- Replace last paragraph with:

The possibility of a catastrophic event that would affect caves (locations unknown), although unlikely, would be similar under Alternatives B, C, D, and E (see *Measurement Indicators #2 and #5*), which could have moderate or major impacts regardless of leasing options. Impacts with regard to *Measurement Indicator #4* (acres disturbance on sensitive landforms) could be moderate under Alternatives B, C, D, and E (refer to impacts under CSU). However, impacts to caves under Alternative B (and C) would actually be less adverse than as described in Section 9.5.4.1 (CSU) because there is a relatively high likelihood that caves occur within lava fields over sensitive aquifers, which are NL under Alternative B (and C). Due to this likely overlap, impacts to cave resources under Alternative B would actually be minor.

**Section 9.5.4.3, Impacts by Alternative, “Alternative C”:**

- Replace last paragraph with:

Impacts to cave resources under Alternative C would be as described under Alternative B due to the likely overlap with lava fields over sensitive aquifers. Impacts to rockfall/unstable areas, steep slopes, unstable slopes, and areas of erosion potential would be very similar to Alternative B because leasing options are the same between alternatives.

- Replace the following impact determinations (shown in **bold**) in Table 9.5-6 Impacts with respect to measurement indicators #2 through #5:

Resource	MI	ALT B	ALT C
Cave Resources	MI #2	<b>Minor</b> ST-LT	<b>Minor</b> ST-LT
	MI #3	Neg ST	Neg ST
	MI #4	<b>Minor</b> LT	<b>Minor</b> LT
	MI #5	<b>Minor</b> LT	<b>Minor</b> LT
	MI #6	Neg ST <sup>c</sup>	Neg ST <sup>c</sup>

The output of the new GIS model as pertains to soils and geologic hazards is shown in **Table 9.5-4**.

**Table 9.5-4 Acreage of Resource Components under each Leasing Stipulation by Alternative**

Resource Component <sup>3</sup>	Leasing Option <sup>4</sup>	Alternative <sup>1,2</sup>						
		A	B	C	D1	D2	E1	E2
Active rockfall and landslide areas Rockfall/ unstable	NA	9,340	9,340	9,340	9,340	9,340	9,340	9,340
	NL	7,813	6,097	190				
	NSO		1,716	7,623	7,813	7,813	4,400	
	CSU							
	SLT						3,413	7,813
Slopes >35%	NA	64,759	64,759	64,759	64,759	64,759	64,759	64,759
	NL	317,718	245,189	3,256				
	NSO		72,529	314,462	176,851	17,261	169,821	
	CSU				140,868	300,458		
	SLT						147,897	317,718
Areas of High Erosion Potential	NA	12,260	12,260	12,260	12,260	12,260	12,260	12,260
	NL	83,704	58,559	1,628				
	NSO		25,145	82,076	39,734	5,590	37,696	
	CSU				43,971	78,114		
	SLT						46,008	83,704

Resource Component <sup>3</sup>	Leasing Option <sup>4</sup>	Alternative <sup>1,2</sup>						
		A	B	C	D1	D2	E1	E2
Marginally Unstable Soils	NA	772	772	772	772	772	772	772
	NL	43,216	33,423	577				
	NSO		9,371	40,785	21,086	2,300	19,972	
	CSU		422	1,855	22,130	40,916		
	SLT						23,244	43,216

<sup>1</sup> Small discrepancies in the acreage presented for each alternative are due to the fact that the GIS database has limitations when applied over an extremely large area that result in an inability to calculate acreages that match exactly between alternatives. A more detailed table that separates the acreage by resource component and ranger district will be available in Appendix B.

<sup>2</sup> Alternatives D1, D2, E1, and E2 represent the dual analysis of Alternatives D and E. D1 and E1 represent the acres available with NSO in all IRAs. D2 and E2 represent the acres with leasing allowed in IRAs under a less restrictive leasing option.

<sup>3</sup> Note that there is some overlap of resource components (e.g. soils can be both steep and rocky). Thus, the total acreage by resource component is more than the total acres of sensitive soils by approximately 11 percent.

<sup>4</sup> Areas not legally available (NA) for leasing are included in the Table to provide context to the analysis.

### 3.2 Errata

Errata specific to Specialist Report 9.0 expand on or correct data previously presented, or incorporate new information or decisions since the DEIS. Some changes, clarification and updates to resource-specific data and analysis were made as a result of the comments received on the DEIS. The errata below update the original Specialist Report.

#### Page 3 (Section 9.4.2)

- Replace **Table 9.4-1** with the following:

**Table 9.4-1 Sensitive soils and geologic hazards on the Dixie National Forest listed by Ranger District**

Ranger District	Acres of Public Land Defined As Having Sensitive Soils, Not Taking Into Account Any Overlap:				Total Acres of Public Land	
	Steep Slopes	Erosive Soils	Unstable Soils	Prone to Rockfall	Sensitive Soils in Ranger District, with each acre counted only once	All Lands in Ranger District
Pine Valley	126,058	35,410	0	7,857	<b>144,023</b>	463,020
Cedar City	56,174	12,085	13,758	1,373	<b>79,201</b>	353,424
Powell	108,476	26,357	8,041	2,865	<b>126,415</b>	383,899
Escalante	91,769	22,111	22,190	5,058	<b>112,193</b>	430,897
<b>TOTAL Acres<sup>1</sup></b>	<b>382,477</b>	<b>95,964</b>	<b>43,988</b>	<b>17,153</b>	<b>461,831</b>	<b>1,631,240</b>

<sup>1</sup> Note that Total Acres of Steep, Erosive, Unstable, and Rockfall soils is 539,582 acres, but there are only 461,831 acres of sensitive soils. This is because there is some overlap: some areas are both steep and erosive. The column "Sensitive Soils in Ranger District ..." counts each acre of sensitive soils only once.

- The following sections of text were removed due to use of a now-retracted set of references in the DEIS (Dixie National Forest "Comprehensive Evaluation Reports" from

2006):

**Section 9.4.3**, Soil and Geologic Conditions Identified for further evaluation, “Erosive Soils”: Remove last sentence in first paragraph.

**Section 9.4.3**, Soil and Geologic Conditions Identified for further evaluation, “Unstable Slopes”: Remove third to last sentence in first paragraph.

**Section 9.5.4.5**, Past Present, and Reasonably Foreseeable Future Actions, “Fire”: Remove last sentence in first paragraph.

Page 28 (**Section 9.5.4.2**)

- The following data was modified in **Table 9.5-3** following the new GIS model output (shown in **bold**):

Cedar City: Sensitive Soils/Geologic Hazards in the District = **79,201** acres  
 Escalante: Sensitive Soils/Geologic Hazards in the District = **112,193** acres

Page 32 (**Section 9.5.4.3**)

- Due to an error in the DEIS analysis that did not take leasing options for the resource fully into account under the preferred alternative (Alternative C), impact determinations in the FEIS were reduced slightly for Marginally Unstable Slopes under Alternative C (shown in **bold**) in order to match those under Alternative B, where leasing options are the same:

**Table 9.5-6 (in part) Impacts with respect to measurement indicators #2 through #5**

Resource	MI	ALT B	ALT C
Unstable Areas	MI #2	Minor <sup>b</sup> ST-LT	<b>Minor<sup>b</sup></b> ST-LT
	MI #3	Neg ST	<b>Neg</b> ST
	MI #4	Moderate LT	Moderate LT
	MI #5	Minor LT	<b>Minor</b> LT
	MI #6	Neg ST <sup>c</sup>	<b>Neg</b> ST <sup>c</sup>

a Impacts to cave resources could be major if a road, production well or field was located over a cave void or passage.

b Impacts would generally be minor and short-term. However, if a reportable hydrocarbon spill occurred, impacts could be major and long-term.

c Impacts would be negligible but could persist for a long term depending on the type of activity occurring (exploration vs. development).

Page 35 (**Section 9.5.4.3**)

Due to the overlap with Lava Fields over Sensitive Aquifers not taken into account in the DEIS, the adverse impact determinations for Cave Resources under Alternatives D1 and D2 were reduced. This is because NSO stipulations protect Lava Fields over Sensitive Aquifers under

Alternatives D1 and D2 and would very likely protect caves as well.

- “Alternative D1 (NSO in IRAs)”: Add to last sentence in first paragraph:  
 “...or within a lava field (over sensitive aquifers).”
- “Alternative D1 (NSO in IRAs)”: Replace first two sentences in second paragraph with the following:

Effects of Alternative D1 would be limited to seismic activities, and would be the same as described under Section 9.5.4 (for all sensitive soils), and Section 9.5.4.1, (NSO; for areas of high erosion potential, marginally unstable slopes). Due to likely overlap with lava fields over sensitive aquifers, impacts to cave resources would be limited to seismic activities and directional drilling. These impacts would be minor to moderate and long term.

Page 33 (Section 9.5.4.3)

- Impact determinations were reduced slightly for cave resources (shown in **bold**):

**Table 9.5-6 (in part) Impacts with respect to measurement indicators #2 through #5**

Resource	MI	ALT D1	ALT D2
Cave Resources	MI #2	Minor- <b>mod</b> <sup>a</sup> ST-LT	Minor- <b>mod</b> <sup>a</sup> ST-LT
	MI #3	Neg ST	Neg ST
	MI #4	<b>Minor</b> LT	<b>Minor</b> LT
	MI #5	Minor- mod LT	Minor- mod LT
	MI #6	Neg ST <sup>c</sup>	Neg ST <sup>c</sup>

a Impacts to cave resources could be major if a road, production well or field was located over a cave void or passage.  
 b Impacts would generally be minor and short-term. However, if a reportable hydrocarbon spill occurred, impacts could be major and long-term.  
 c Impacts would be negligible but could persist for a long term depending on the type of activity occurring (exploration vs. development).

Page 37 (Section 9.5.4.5)

- In “Roads”: in order to clarify the impact of MTP implementation on soil impact from roads, the following footnote was added to “Route Impacts” within **Table 9.5-5**:  
<sup>1</sup> Motorized Travel Plan implementation (see USFS 2009c) will close some routes that are negatively impacting soil, water, and wildlife resources, and/or are not needed for future resource management activities.

Page 45 (Section 9.5.4.6)

- In **Table 9.5-7**, under “Cumulative Effect” for Alternative B, remove last sentence:

“Cumulative impacts could also result from increased use of motorized travel or unauthorized roads...”

Page 50

Add the following new reference:

US Department of Agriculture. Forest Service. 2009c. Dixie National Forest Motorized Travel Plan. Final Environmental Impact Statement. US Department of Agriculture, Forest Service, Intermountain Region. April 2009.