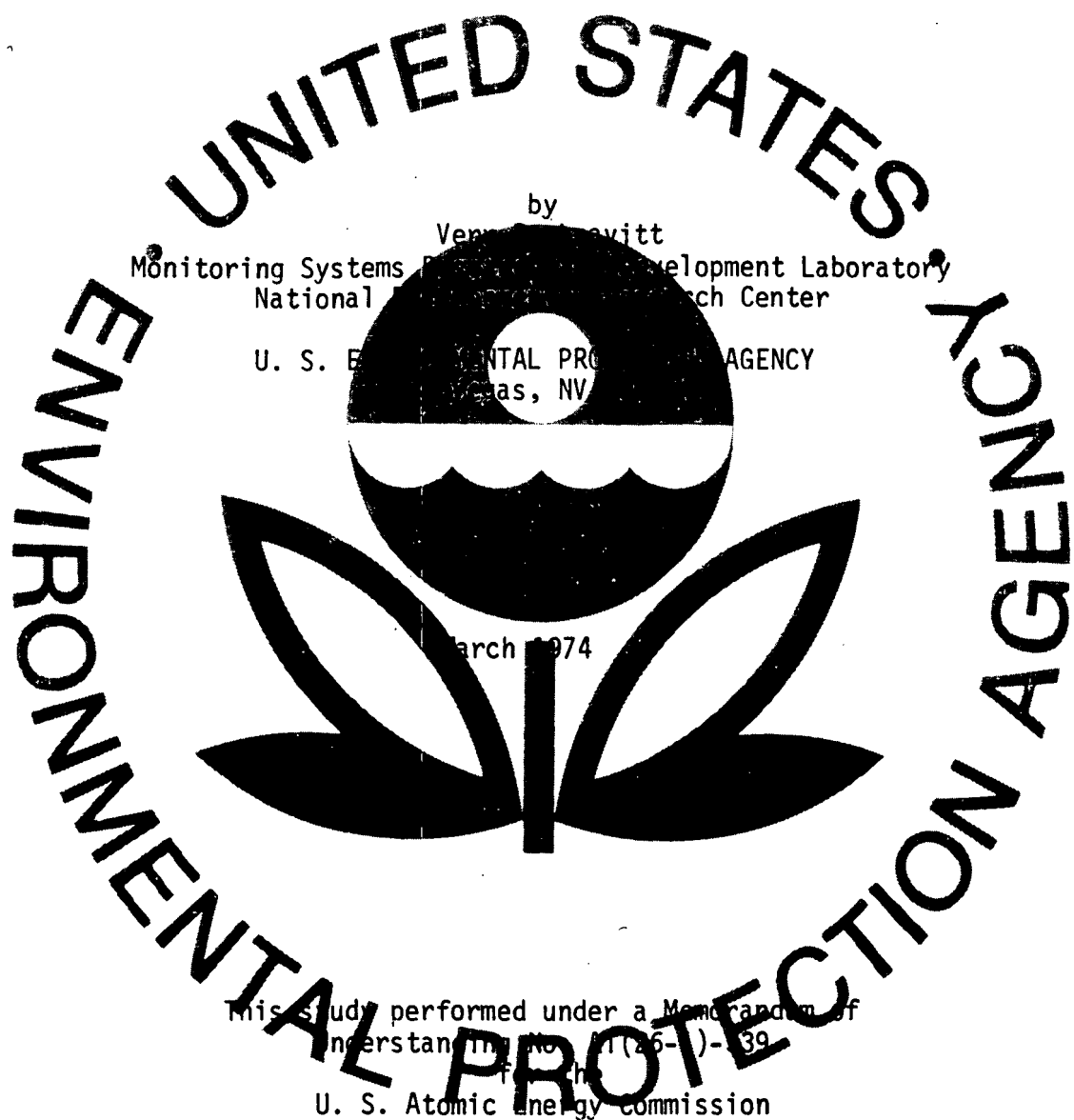


SOIL SURVEYS OF FIVE PLUTONIUM CONTAMINATED
AREAS ON THE TEST RANGE COMPLEX IN NEVADA



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SOIL SURVEYS OF FIVE PLUTONIUM CONTAMINATED
AREAS ON THE TEST RANGE COMPLEX IN NEVADA

by
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March 1974

This study performed under a Memorandum of
Understanding No. AT(26-1)-539
for the
U. S. Atomic Energy Commission

ABSTRACT

This report describes soils in five areas located on the Test Range Complex, Nye County, Nevada. All of the areas have at one time been sites of above-ground nuclear safety tests. The areas are contaminated with plutonium and are, therefore, the object of investigations regarding the movement of plutonium in the environment. Most of the surface soils in the five areas have a gravelly texture and are typically classified as gravelly sandy loam.. The majority of the surveyed land is either flood-plain or alluvial fan with deep soils having well-developed profiles and platy structure. All of the soils are alkaline ranging in pH from 7.0 to 9.0.

The vegetation is classified in two general categories, low and high desert shrub. The low desert shrubs are predominantly creosote-bush (*Larrea divaricata*), and white bursage (*Franseria dumosa*). The high desert shrubs are mostly fourwing saltbush (*Atriplex canescens*), winterfat (*Eurotia lanata*), and bud sagebrush (*Artemisia spinescens*).

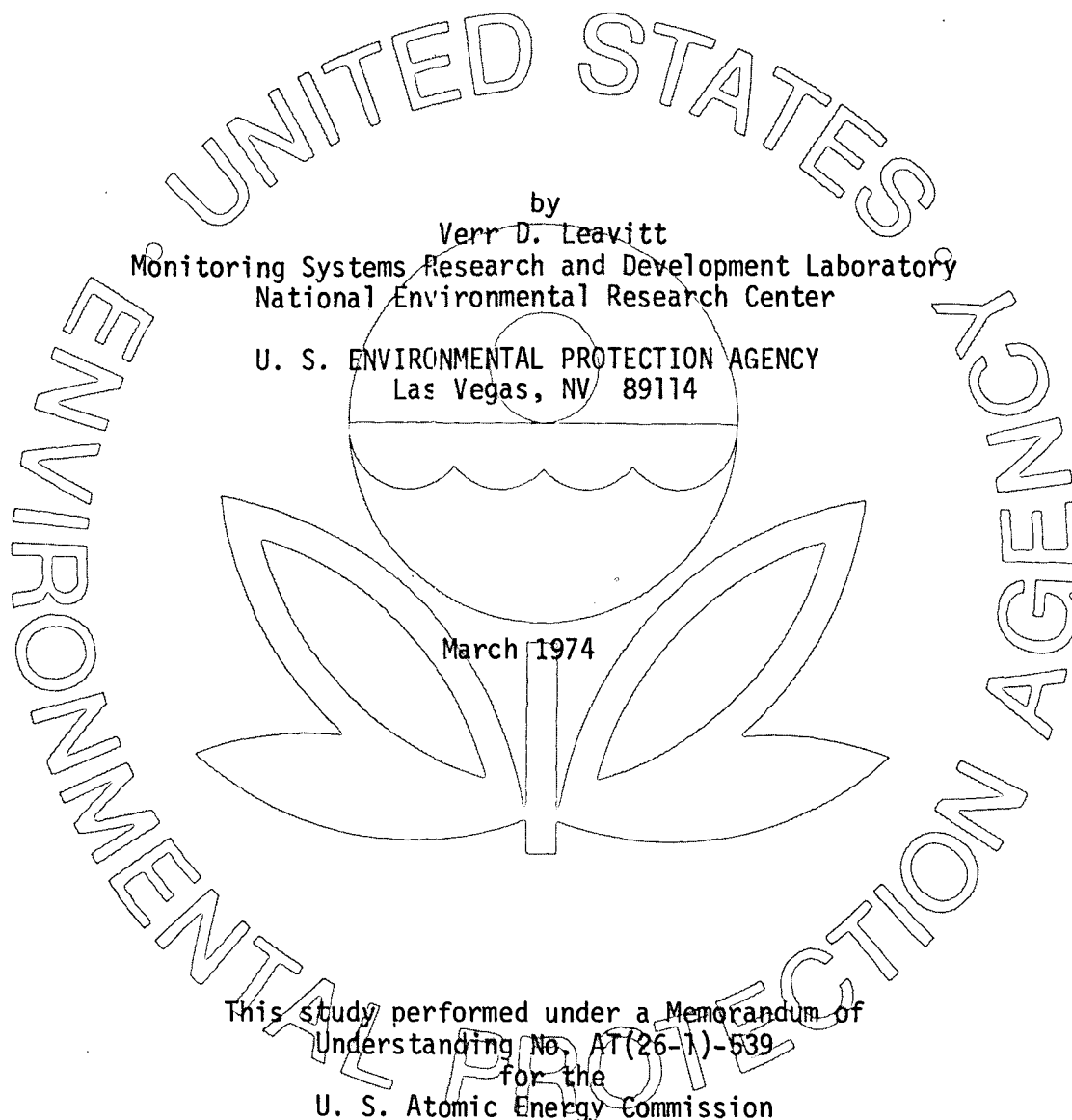
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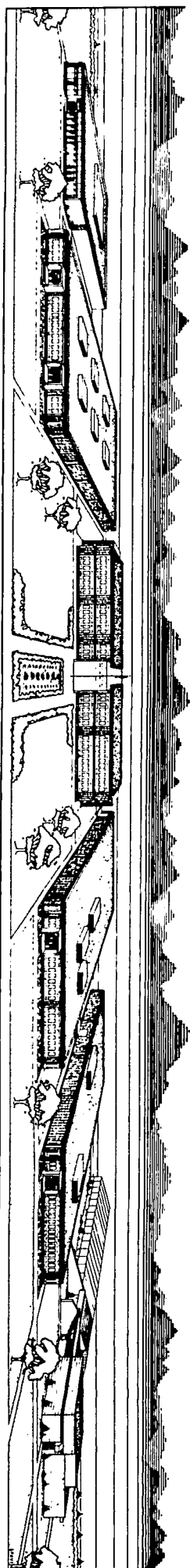


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I. INTRODUCTION

The purpose of the soil survey report was to gather information on the soil and the vegetation of Clean Slate #1, #2, and #3, Double Track, Area 5 GMX, Area 11 Plutonium Valley, and Area 13 on the Test Range Complex.*

This was done in conjunction with the Nevada Applied Ecology Group Plutonium Study. The areas surveyed are in the south-central and eastern parts of Nye County in southern Nevada (Fig. 1). These areas are semiarid with annual precipitation ranging from 4 to 8 inches⁽¹⁾. All of the areas are on range that provides only limited grazing for livestock, but approximately half of the acreage is potential agricultural land if water were available.

On the uplands the soils are shallow, moderately coarse or medium textured, and gravelly, cobbly, or stony. On the lowlands the soils are very deep and coarse textured.

All of the areas have at one time been sites of above ground-nuclear safety tests. The areas are contaminated with plutonium and are, therefore, the object of investigations regarding the movement of plutonium in the environment.

Mapping of the physical properties of the soil will be used to guide and supplement research on movement of plutonium through the soil and the uptake of plutonium by plants.

*Test Range Complex includes the Tonopah Test Range, NRDS, Nevada Test Site, and Nellis Air Force Range.

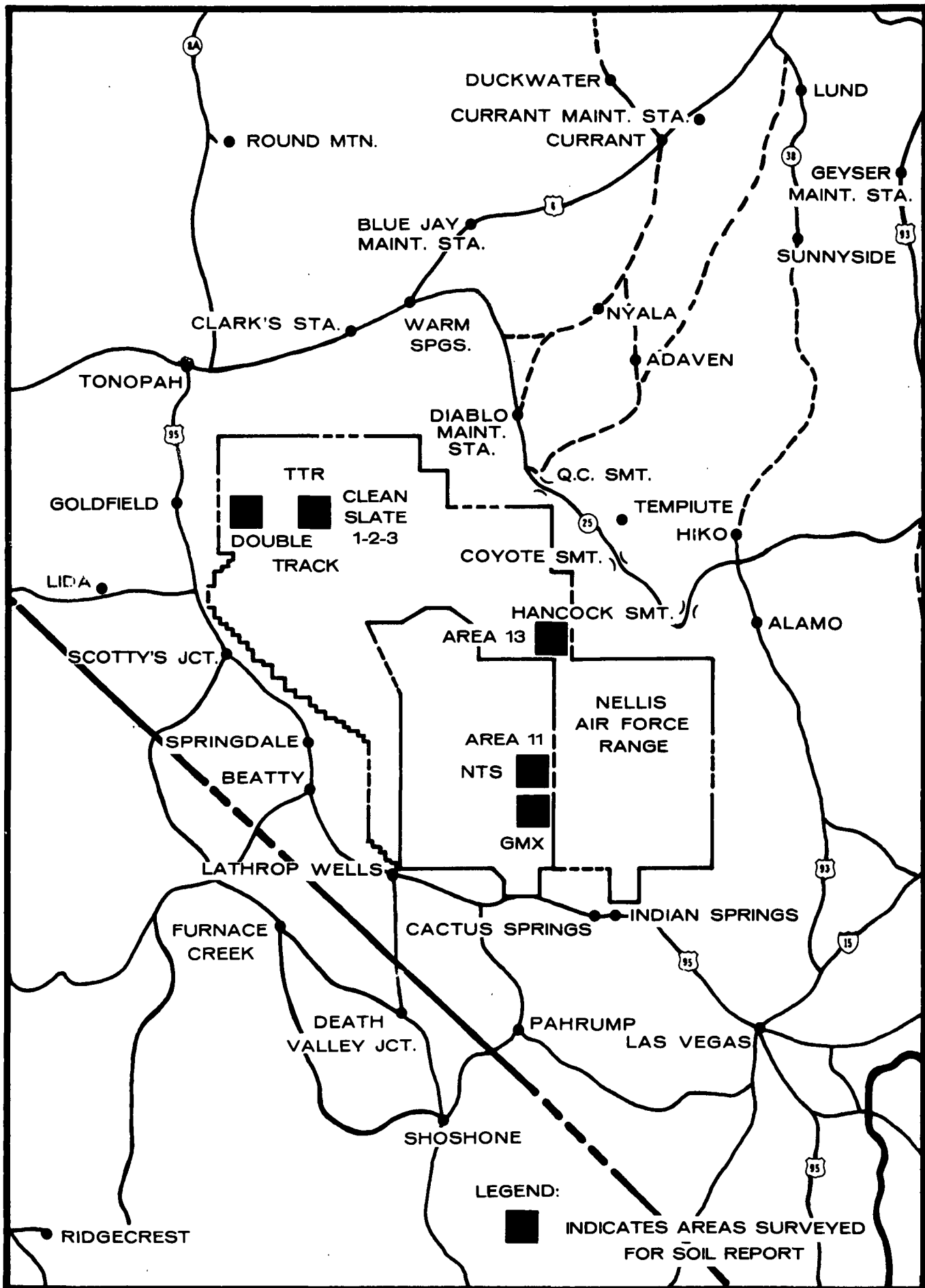


Figure 1. The Areas Surveyed for Report

II. METHODS

In each soil type one soil pit approximately 1 m² was dug to a depth which confirmed the C horizon continuity (generally 1 m deep). At the site of these pits, soil profiles were determined by visual inspection. Confirmation of soil types was made by digging auger holes or shallow pits approximately every 100 meters. Soil order designations were made according to the descriptions published by the Soil Conservation Service⁽²⁾.

Soil colors were determined by comparison with the Munsell Soil Color Chart⁽³⁾. Color is based on a combination of hue, value and chroma. Hue is the dominant spectral color. Value refers to the relative lightness of color and is a function of the total amount of reflected light. Chroma (sometimes called saturation) is the relative purity or strength of the spectral color and increases with decreasing grayness. Colors are for air-dry soil unless otherwise noted.

In using the color chart, accurate comparison is obtained by holding the soil sample above the color chips being compared.

Soil texture (particle size) was determined by feeling the soil. This determination depends on the accuracy and experience of the observer.

Soil structure (the aggregation of primary soil particles into compound particles) was described according to the criteria of the U. S. Soil Conservation Service⁽⁴⁾.

The pH was determined by using indicator dyes⁽⁴⁾. Cresol red was used between pH 7.2 and 8.8, thymol blue between pH 8.0 and 9.6.

Effervescence (an indication of the occurrence of certain salts in crystalline form) was determined by adding a few drops of 0.1 N HCl to the soil. Slight, strong, and violent effervescent reactions relate to the relative concentrations of carbonates of calcium, magnesium, and sodium⁽⁴⁾.

Crude density is generally defined as the number (or biomass) per unit total space (6). However, the crude plant density referred to in this report defines that portion of the study area canopied by vegetation and appears to be more responsive to survey objectives. Line-of-sight transects and subsequent canopy approximations were randomly checked with actual measurements in each of the five plutonium contaminated soil areas.

III. SOIL PROFILE DESCRIPTIONS

A numerical system was used to designate each profile. These numbers correspond to areas delineated on aerial photographs in Appendix II. The numerical system is as follows.

LOCATION	SOIL PROFILE NUMBER
Test Range Complex	Clean Slate #1 - 101, 102, and 103
	Clean Slate #2 - 104, 105, 106, and 107
	Clean Slate #3 - 108, 109, and 110
	Double Track - 111, 112, and 113
	Area 5 - GMX - 201, 202, and 203
	Area 11 - Plutonium Valley - 301, 302, 303, 304, 305, 306, 307, and 308
	Area 13 - 401, 402, 403, 404, and 405

Many terms used in the soil description and other sections are defined in the Glossary (see Appendix). The dominant factors of the five areas are summarized in Table VI.

CLEAN SLATE #1

Profile #101

This soil is of the Aridisol Order.

Typifying Pedon: gravelly sandy loam.

- A1 0 - 20 cm -Light gray (10YR 7/2) gravelly sandy loam; very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; soft, friable, nonsticky, nonplastic; noneffervescent, mildly alkaline (pH 7.6).
- A2 20 - 30 cm -Light gray (10YR 7/2) loam, brown (10YR 4/3) moist; strong thick platy structure; slightly hard, friable, slightly sticky, slightly plastic; many fine and medium vesicular and tubular pores; violently effervescent, moderately alkaline (pH 8.0).
- B2 30 - 45 cm -Yellowish red (5YR 4/5) clay loam; reddish brown (5YR 4/4) moist; coarse medium subangular blocky structure; slightly hard, friable, sticky, plastic; slightly effervescent, mildly alkaline (pH 7.8).
- B3 45 - 60 cm -Reddish brown (5YR 5/4) gravelly sandy loam; reddish brown (5YR 4/4) moist; coarse fine subangular blocky structure; soft, friable, slightly sticky, slightly plastic; slightly effervescent, mildly alkaline (pH 7.6).
- C1 60 - 102⁺ cm -Light reddish brown (5YR 6/4) gravelly sand, reddish brown (5YR 4/4) moist; single grain, loose dry and moist, nonsticky, nonplastic; slightly effervescent; mildly alkaline (pH 7.8).

The #101 soil is located on level, or nearly level, alluvial fans and floodplains with slope gradients of 0 to 2 percent. The soil is mapped as a complex with #102 soil. Both soils are formed in alluvium from rhyolite, quartzite, limestone and tuff. This soil is moderately well-drained with slow runoff and slow permeability (0.05 to 2.0 inches per hour). Moderate wind and slight water erosion is evident. The primary vegetation consists of fourwing saltbush, galleta grass, bud sagebrush, and annuals. The total plant density is 10 percent. This soil supports good winter and spring grazing for livestock and wildlife.

CLEAN SLATE #1

Profile #102

This soil is of the Aridisol Order.

Typifying Pedon: loam wasteland.

- A2 0 - 10 cm -Light gray (10YR 7/2) loam, brown (10YR 4/3) moist;
 strong thick platy structure; slightly hard, friable,
 slightly sticky, slightly plastic; many fine and
 medium vesicular and tubular pores; violently
 effervescent; moderately alkaline (pH 8.0).
- B2 10 - 30 cm -Yellowish red (5YR 4/5) clay loam, reddish brown
 (5YR 4/4) moist; coarse medium subangular blocky
 structure; slightly hard, friable, sticky plastic;
 slightly effervescent, mildly alkaline (pH 7.8).
- B3 30 - 61 cm -Reddish brown (5YR 5/4) gravelly sandy loam reddish
 brown (5YR 4/4) moist; coarse fine subangular blocky
 structure; soft, friable, slightly sticky, slightly
 plastic; slightly effervescent, mildly alkaline
 (pH 7.6).
- C1 61 - 102⁺ cm -Light reddish brown (5YR 6/4) gravelly sand, reddish
 brown (5YR 4/4) moist; single-grain, loose dry and
 moist; nonsticky, nonplastic; slightly effervescent,
 mildly alkaline (pH 7.8).

The #102 soil is on level playa, bare of vegetation and has a high salt content. This soil is moderately well-drained with rapid runoff,

and very slow permeability (0.05 to 2.0 inches per hour). Slight water erosion is evident. Because of the high salt content, no vegetation will grow on this soil.

CLEAN SLATE #1

Profile #103

This soil is of the Aridisol Order.

Typifying Pedon: gravelly sandy loam.

- A2 0 - 10 cm -Light gray (10YR 7/2) dry, gravelly sandy loam, brown (10YR 4/3) moist; strong thick platy structure; slightly hard, friable; slightly sticky, slightly plastic; many fine and medium vesicular pores; strongly effervescent, mildly alkaline (pH 7.8).
- B2 10 - 30 cm -Reddish brown (5YR 4/3) clay loam, moderate, medium subangular blocky structure; slightly hard, friable, sticky, plastic; slightly effervescent, moderately alkaline (pH 8.0).
- B3 30 - 60 cm -Reddish brown (5YR 4/3) sandy loam, weak fine subangular blocky structure, soft, friable, nonsticky, nonplastic; slightly effervescent, moderately alkaline (pH 8.2).
- C1 60 - 102 cm -Reddish brown (5YR 4/4) gravelly sandy loam, weak fine subangular blocky structure; soft, friable, nonsticky, nonplastic; strongly effervescent, moderately alkaline (pH 8.0).

The #103 soil is principally on the toe of alluvial fans and on floodplains with slope gradients of 0 to 4 percent. The soil is formed in residuum, primarily from rhyolite, quartzite, limestone and tuffs. The soil is well-drained, with medium runoff and moderate permeability

(0.80 to 2.50 inches per hour). Moderate wind and slight water erosion is evident. The principal vegetation is galleta grass, fourwing saltbush, and bud sagebrush. The total plant density is 20 percent. This soil supports good winter grazing for livestock and wildlife.

Profile #104

Typifying Pedon: gravelly sandy loam.

- The #104 soil occurs on old alluvial fans and floodplains with slope gradients of 1 to 4 percent. The soil is formed in residuum, weathered from rhyolite, quartzite, limestone and tuffs. The surface is dissected by few shallow channels. The soil is well-drained with medium runoff, and moderate permeability (0.80 to 2.50 inches per hour). Moderate wind and slight water erosion is evident. The predominant vegetation

is galleta grass, fourwing saltbush, winterfat, bud sagebrush, and Indian ricegrass. The total plant density is approximately 20 percent. This soil supports good winter grazing for livestock and wildlife.

CLEAN SLATE # 2

Profile #105

This soil is of the Aridisol Order.

Typifying Pedon: gravelly sandy loam.

- A1 0 - 13 cm -Light gray (10YR 7/2) dry, gravelly sandy loam, very dark grayish brown (10YR 3/2), strong medium platy structure; slightly hard, friable, slightly sticky, slightly plastic; slightly effervescent, moderately alkaline (pH 8.0).
- B11 13 - 38 cm -Reddish brown (5YR 4/4) sandy clay loam, moderate medium subangular blocky structure; soft, friable, sticky, plastic; slightly effervescent, mildly alkaline (pH 7.6).
- B12 38 - 76 cm -Reddish brown (5YR 4/4) sandy loam, weak fine subangular blocky structure; soft, friable, slightly sticky, slightly plastic; violently effervescent, mildly alkaline (pH 7.8).
- C1 76 - 102 cm -Reddish brown (5YR 4/3) sandy loam, weak fine subangular blocky structure; soft, friable, nonsticky, nonplastic; violently effervescent, mildly alkaline (pH 7.8).
- C2 102 - 127 cm Reddish brown (5YR 4/4) sandy loam, weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; violently effervescent, moderately alkaline (pH 8.0).

The #105 soil occurs on alluvial fans and low drainage-ways with slope gradients of 0 to 2 percent. The soil is formed in residuum, weathered from rhyolite, quartzite, limestone and tuff. The soil is well-drained with medium runoff and moderately rapid permeability (2.50 to 5.00 inches per hour). Slight wind and water erosion is evident. The principal vegetation is cattle saltbush, winterfat, bud sagebrush, bottlebrush squirreltail, fourwing saltbush, Indian ricegrass, and galleta grass. The total plant density is approximately 15 percent. This soil supports good winter grazing for livestock and wildlife.

CLEAN SLATE #2

Profile #106

This soil is of the Aridisol Order.

Typifying Pedon: sandy loam.

- A1 0 - 10 cm -Pale brown (10YR 6/3) sandy loam, very dark grayish brown (10YR 3/2) moist; strong thick platy structure; slightly hard, friable, nonsticky, nonplastic; slightly effervescent, neutral (pH 7.0).
- B1 10 - 38 cm -Light reddish brown (5YR 6/3) sandy clay loam, reddish brown (5YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky, plastic; slightly effervescent, neutral (pH 7.2).
- C1 38 - 76 cm -Pink (5YR 7/3) loam, reddish brown (5YR 4/3) moist; moderate medium subangular blocky structure; soft, friable, slightly sticky, slightly plastic; strongly effervescent, mildly alkaline (pH 7.4).
- C2 76 - 102 cm -Pinkish gray (5YR 6/2) gravelly sandy loam, reddish brown (5YR 4/3) moist; weak fine subangular blocky structure; soft, friable, nonsticky, nonplastic; strongly effervescent, mildly alkaline (pH 7.4).
- C3 102 - 152⁺ cm -Light reddish brown (5YR 6/3) gravelly loamy sand, reddish brown (5YR 4/3) moist; single grain; loose dry and moist; nonsticky, nonplastic; slightly effervescent, mildly alkaline (pH 7.4).

The #106 soil is on smooth nearly level floodplains and low stream terraces with slope gradients of 0 to 2 percent. The soil is formed in loamy alluvial and eolian materials from mixed rock sources such as rhyolite, quartzite, limestone and tuffs. The soil is well-drained, with slow runoff, and moderate permeability (0.80 to 2.50 inches per hour). Moderate wind and water erosion is evident. The vegetation is principally fourwing saltbush, cattle saltbush, big sagebrush, winterfat, bud sagebrush, and Indian ricegrass. The total plant density is about 20 percent. This soil supports good winter grazing for livestock and wildlife.

Profile #107

Typifying Pedon: gravelly sandy loam.

- | | | |
|------|-------------------------|--|
| A2 | 0 - 10 cm | -Light gray (10YR 7/2) gravelly sandy loam, brown (10YR 4/3) moist; strong thick platy structures; slightly hard, friable, nonsticky, nonplastic; many fine and medium vesicular pores; slightly effervescent, mildly alkaline (pH 7.6). |
| B21 | 10 - 30 cm | -Reddish brown (5YR 5/4) clay loam, reddish brown (5YR 4/3) moist; moderate medium subangular blocky structure; hard, friable, sticky, plastic; strongly effervescent, mildly alkaline (pH 7.6). |
| B22 | 30 - 46 cm | -Reddish brown (5YR 5/4) gravelly sandy loam, reddish brown (5YR 4/3) moist; moderate medium subangular blocky structure; soft, friable, slightly sticky, slightly plastic; violently effervescent, moderately alkaline (pH 8.2). |
| B3 | 46 - 60 cm | -Yellowish red (5YR 5/6) gravelly sandy loam, reddish brown (5YR 4/4) moist; weak fine subangular blocky structure; soft, friable, nonsticky, nonplastic; violently effervescent, moderately alkaline (pH 8.2). |
| Clca | 60 - 76 ⁺ cm | -Pinkish gray (5YR 7/2) gravelly loamy sand, reddish brown (5YR 5/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; |

high concentration of lime or silica; violently effervescent, moderately alkaline (pH 8.4).

The #107 soil is on smooth, nearly level to gently sloping floodplains and low stream terraces with slope gradients of 1 to 4 percent. The soil is formed in residuum, weathered from rhyolite, quartzite, limestone and tuffs. The soil is well-drained, with medium runoff and moderate permeability (0.80 to 2.50 inches per hour). Moderate wind and slight water erosion is evident. The dominant species of vegetation are galleta grass, bud sagebrush, winterfat, fourwing saltbush, Indian ricegrass, and globemallow. Total plant density is about 15 percent. This soil is used for livestock grazing and wildlife.

CLEAN SLATE #3

Profile #108

This soil is of the Aridisol Order.

Typifying Pedon: gravelly sandy loam (colors are for moist soil unless otherwise noted).

- A2 0 - 8 cm -Brown (10YR 4/3) gravelly loam; moderate medium platy structure; soft, friable, nonsticky, nonplastic; strongly effervescent, moderately alkaline (pH 8.2).
- C1 8 - 30 cm -Brown (10YR 4/3) gravelly sandy loam; weak fine subangular blocky structure; soft, friable, nonsticky, nonplastic; strongly effervescent, moderately alkaline (pH 8.2).
- C2 30 - 61 cm -Yellowish brown (10YR 5/4) gravelly sandy loam; weak fine subangular structure; soft, friable, nonsticky, nonplastic; strongly effervescent, moderately alkaline (pH 8.2).
- C3sica 61 - 91⁺ cm -Yellowish brown (10YR 5/4) gravelly sandy loam; massive; very hard, firm, nonsticky, nonplastic; weakly lime cemented sands with few discontinuous strongly silica-lime-cemented lenses; violently effervescent, strongly alkaline (pH 8.8).
- C4cm 91⁺ cm -Yellowish brown (10YR 5/4) gravelly loamy sand, massive; very hard, firm, nonsticky, nonplastic; silica-lime coatings on gravel; violently effervescent, strongly alkaline (pH 8.8).

The #108 soil is on smooth, level, or nearly level, alluvial fans and floodplains with slope gradients of 0 to 2 percent. Eroded area has very slight convex ridges and concave swales. The soil is formed in gravelly loamy alluvium from rhyolite, quartzite, limestone and tuffs. This soil is well-drained, with slow runoff, and rapid to moderately rapid permeability (2.50 to 10.00 inches per hour). Slight water and wind erosion is evident. The principal vegetation consists of fourwing saltbush, winterfat, bud sagebrush, galleta grass, shadscale, and Indian ricegrass. The total plant density is 10 percent. This soil is used for livestock grazing and wildlife.

CLEAN SLATE #3

Profile #109

This soil is of the Aridisol Order.

Typifying Pedon: gravelly sandy loam (colors are for moist soil unless otherwise noted).

- A1 0 - 10 cm -Dark grayish brown (10YR 4/2) sandy loam, weak fine subangular blocky structure; soft, friable, non-sticky, nonplastic; slightly effervescent, moderately alkaline (pH 8.0).
- B11 10 - 30 cm -Reddish brown (5YR 4/4) sandy clay loam, moderate medium subangular blocky structure; soft, friable, sticky, plastic; strongly effervescent, moderately alkaline (pH 8.4).
- B12 30 - 46 cm -Reddish brown (5YR 5/4) sandy clay loam, weak medium subangular blocky structure; soft, friable, sticky, plastic; violently effervescent, moderately alkaline (pH 8.2).
- C1casi 46 - 61 cm -Reddish brown (5YR 5/4) sandy loam, weak fine subangular blocky structure; soft, friable, non-sticky, nonplastic; weakly lime-silica cemented sands; strongly effervescent, moderately alkaline (pH 8.2).
- C2casi 61 - 91 cm -Reddish brown (5YR 5/4) loamy sand, massive, hard, friable, nonsticky, nonplastic; weakly lime-silica cemented sands; strongly effervescent, moderately alkaline (pH 8.2).

C3casi 91 - 152 cm -Pinkish white (5YR 8/2) dry, loam, light reddish brown (5YR 6/4) massive; hard, firm, slightly sticky, slightly plastic; high concentration of lime lacustrine sediments; violently effervescent, moderately alkaline (pH 8.2).

The #109 soil is on smooth, level, or nearly level, alluvial fans and low stream terraces with slope gradients of 0 to 2 percent. The soil is formed in gravelly loamy alluvium from rhyolite, quartzite, limestone and tuffs. This soil is moderately well-drained, with medium runoff, and moderately slow permeability (0.20 to 0.80 inches per hour). Moderate wind and slight water erosion is evident. The principal vegetation is galleta grass, fourwing saltbush, bud sagebrush, Indian ricegrass, winterfat, and desert needlegrass. Total plant density is 15 percent. This soil is used for livestock grazing and wildlife.

CLEAN SLATE #3

Profile #110

This soil is of the Aridisol Order.

Typifying Pedon: gravelly loam (colors are for moist soil unless otherwise noted).

- A2 0 - 10 cm -Light gray (10YR 7/2) dry, gravelly loam, dark grayish brown (10YR 4/2); strong thick platy structure; slightly hard, friable, slightly sticky, slightly plastic; strongly effervescent, moderately alkaline (pH 8.2).
- B2 10 - 46 cm -Reddish brown (5YR 4/3) clay loam, moderate medium platy structure; slightly hard, friable, sticky, plastic; violently effervescent, moderately alkaline (pH 8.0).
- B3 46 - 91 cm -Reddish brown (5YR 4/3) gravelly sandy loam, weak fine subangular blocky structure; soft, friable, slightly sticky, slightly plastic; strongly effervescent, moderately alkaline (pH 8.4).
- C1 91⁺ cm -Reddish brown (5YR 4/3) gravelly sandy loam, weak fine subangular blocky structure; soft, friable, nonsticky, nonplastic; strongly effervescent, moderately alkaline (pH 8.4).

The #110 soil is on smooth, level to nearly level, alluvial fans and floodplains with slope gradients of 0 to 2 percent. The soil is formed in gravelly loamy alluvium from rhyolite, quartzite, limestone

and tuffs. The soil is well-drained, with medium runoff, and moderate permeability (0.80 to 2.50 inches per hour). Moderate wind and slight water erosion is evident. The principal vegetation is fourwing saltbush, galleta grass, winterfat, bud sagebrush, and Indian ricegrass. The total plant density is 15 percent. This soil is used for livestock grazing and wildlife.

Profile # 111

Typifying Pedon: gravelly sandy loam.

- The #111 soil is on smooth, nearly level and gently sloping alluvial fans with slope gradients of 1 to 4 percent. Eroded area has very slight convex ridges and concave swales. The soil is formed in gravelly loamy alluvium from rhyolite, quartzite, limestone, and tuffs. The soil is somewhat excessively drained, with slow runoff, and rapid permeability (5.00 to 10.00 inches per hour). Slight water erosion is evident. The principal vegetation is horsebrush, winterfat, bud sagebrush, wolfberry, shadscale, Indian ricegrass, and fluffgrass. Total plant density is 15 percent. This soil is used for livestock grazing and wildlife.

DOUBLE TRACK

Profile #112

This soil is of the Entisol Order.

Typifying Pedon: gravelly sandy loam.

- C1 0 - 15 cm -Light gray (10YR 7/2) gravelly sandy loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, friable, nonsticky, nonplastic; violently effervescent, moderately alkaline (pH 8.2).
- C2 15 - 51 cm -Light gray (10YR 7/2) gravelly sandy loam, brown (10YR 4/3) moist; weak fine subangular structure; soft, friable, nonsticky, nonplastic; violently effervescent, moderately alkaline (pH 8.4).
- C3 51 - 114 cm -Pale brown (10YR 6/3) gravelly loamy sand, yellowish brown (10YR 5/4) moist; single grain; loose dry and moist, nonsticky, nonplastic; violently effervescent, strongly alkaline (pH 8.6).
- C4 114 - 152 cm -White (10YR 8/2) gravelly sandy loam, yellowish brown (10YR 5/4) moist; weak fine subangular blocky structure; soft, friable, nonsticky, nonplastic; violently effervescent, strongly alkaline (pH 9.0). Lime-silica nodules throughout this horizon.

The #112 soil is on smooth, nearly level and gently sloping alluvial fans with slope gradients of 1 to 4 percent. Eroded area has very slight convex ridges and concave swales. The soil is formed in gravelly loamy

alluvium from rhyolite, quartzite, limestone, and tuffs. This soil is well-drained, with slow runoff, and moderately rapid to rapid permeability (2.50 to 10.00 inches per hour). Slight water erosion is evident. The principal vegetation is shadscale, bud sagebrush, horsebrush, shockley goldenhead, Indian ricegrass, and fluffgrass. Total plant density is about 10 percent. This soil is used for livestock grazing and wildlife.

DOUBLE TRACK

Profile #113

This soil is of the Aridisol Order.

Typifying Pedon: gravelly loam.

The soil surface is about 90 percent covered with a weakly developed gravel desert pavement.

- A2 0 - 8 cm -Light gray (10YR 7/2) gravelly loam, brown (10YR 4/3) moist; strong thick platy structure; soft, friable, nonsticky, nonplastic; many fine and medium vesicular pores; violently effervescent, strongly alkaline (pH 8.8).
- B21 8 - 30 cm -Light reddish brown (5YR 6/4) gravelly sandy loam, reddish brown (5YR 4/3) moist; moderate medium subangular blocky structure; firm, friable, nonsticky, nonplastic, violently effervescent, strongly alkaline (pH 9.0).
- B22 30 - 61 cm -Light reddish brown (5YR 6/4) very gravelly sand, reddish brown (5YR 4/3) moist; single grain; loose dry and moist, nonsticky, nonplastic; violently effervescent, moderately alkaline (pH 8.4).
- C1cm 61⁺ cm -Lime-silica hardpan.

The #113 soil is on smooth, gently sloping alluvial fans and low terraces with slope gradients of 2 to 4 percent. Eroded area has very slight convex ridges and concave swales. The soil is formed in gravelly loamy alluvium from mixed rock sources high in lime and siliceous

material. The soil has been influenced somewhat by volcanic ash, pyroclastic material, and tuff. The soil is well-drained to the lime-silica hardpan, very slow drainage below the hardpan, with medium runoff, and moderate permeability to the hardpan and very slow below the hardpan (0.80 to 2.50 inches per hour to the hardpan and less than 0.05 inches per hour through the hardpan). Slight water and wind erosion is evident. The vegetation is 95 percent shadscale, about 3 percent wolfberry, and 2 percent bud sagebrush. Total plant density is about 5 percent. This soil is used for livestock grazing and wildlife.

Profile #201

Typifying Pedon: gravelly sandy loam.

- The #201 soil occurs on level to nearly level, low terraces and old alluvial fans with slope gradients of 1 to 2 percent. The soil is formed in alluvium from limestone, basalt, quartzite, and rhyolite. The soil is

well to somewhat excessively drained, with slow runoff, and rapid to moderately rapid permeability (2.50 to 10.00 inches per hour). Slight to moderate wind and water erosion is evident. The vegetation consists of white bursage, creosotebush, shadscale saltbush, Nevada ephedra, and Indian ricegrass. The total plant density is about 10 percent.

Profile #202

Typifying Pedon: cobbly sandy loam.

- The #202 soil is on smooth, level, or nearly level, alluvial fans with slope gradients of 1 to 2 percent. Eroded area has shallow stream channels and low wind hummocks around the brush. The soil is formed in gravelly and cobbly alluvium from limestone, basalt, quartzite and

rhyolite. The soil is excessively drained, with very slow runoff and rapid to very rapid permeability (5.00 to over 10.00 inches per hour). Moderate wind and water erosion is evident. The principal vegetation is white bursage, creosotebush, shadscale saltbush, and Indian ricegrass. The total plant density is about 5 percent.

Profile #203

Typifying Pedon: gravelly sandy loam.

- The #203 soil is on smooth, level to nearly level, alluvial fans with slope gradients of 1 to 2 percent. Eroded area has shallow stream channels and low wind hummocks around the brush. The soil is formed in gravelly and cobbly alluvium from limestone, basalt, quartzite and rhyolite. The soil is well to somewhat excessively drained, with slow runoff, and moderately rapid to rapid permeability (2.50 to 10.00 inches per hour). Slight to moderate wind and water erosion is evident. The dominant vegetation is white bursage, creosotebush, shadscale saltbush, and Nevada ephedra. The total plant density is about 10 percent.

AREA 11 - PLUTONIUM VALLEY

Profile #301

This soil is of the Aridisol Order.

Typifying Pedon: stony clay loam.

- A2 0 - 8 cm -Light gray (10YR 7/2) stony clay loam, brown (10YR 4/3) moist, strong very coarse platy structure; hard, friable; sticky, plastic; many fine and medium vesicular pores; violently effervescent, strongly alkaline (pH 8.6). Clear smooth boundary (4 to 8 inches thick.)
- B1 8 - 20 cm -Light reddish brown (5YR 6/3) loam, reddish brown (5YR 5/4) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; strongly effervescent, moderately alkaline (pH 8.4).
- Clcam 20⁺ cm -Silica-lime hardpan.

The #301 soil is on gently sloping to moderately sloping high terraces. The soil is formed in material weathered from tuff, basalt, and limestone. Slopes range from 2 to 8 percent. The soil is well-drained to hardpan, with medium runoff, and slow permeability (0.05 to 2.00 inches per hour). Slight water and wind erosion is evident. The natural vegetation is mainly Nevada ephedra, wolfberry, pale wolfberry, shockley goldenhead, spiny menodora, winterfat, Indian ricegrass, bottlebrush squirreltail, cattle saltbush, bud sagebrush, shadscale, pricklypear, and joshuatree yucca. Total plant density is 10 percent. This soil supports good winter grazing for livestock and wildlife.

AREA 11 - PLUTONIUM VALLEY

Profile #302

This soil is of the Entisol Order.

Typifying Pedon: very gravelly sandy loam.

- C1 0 - 15 cm -Light gray (10YR 7/2) very gravelly sandy loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; soft, friable, nonsticky, nonplastic; violently effervescent, moderately alkaline (pH 8.2).
- C2 15 - 38 cm -Light gray (10YR 7/2) gravelly sandy loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; soft, friable, nonsticky, nonplastic; violently effervescent, moderately alkaline (pH 8.4).
- C3 38 - 53 cm -Light gray (10YR 7/2) gravelly sandy loam, brown (10YR 5/3) moist, weak fine subangular blocky structure; soft, friable, nonsticky, nonplastic; violently effervescent, strongly alkaline (pH 8.6).
- C4 53 - 66⁺ cm -White (10YR 8/2) very gravelly sandy loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; soft, friable, nonsticky, nonplastic; violently effervescent, strongly alkaline (pH 8.8).

The #302 soil is on alluvial fans with the dominant slope gradient of 4 to 8 percent. Some slope gradients are 4 to 12 percent. This soil is formed in material weathered from tuff, basalt, and limestone.

The soil is excessively drained, with slow runoff, and rapid permeability

(5.00 to 10.00 inches per hour). Slight water and wind erosion is evident. The natural vegetation is predominantly wolfberry, fourwing saltbush, winterfat, shockley goldenhead, spiny menodora, Indian ricegrass, bottlebush squirreltail, horsebrush, and joshuatree yucca. The total plant density is 5 percent. This soil supports good winter grazing for livestock and wildlife.

AREA 11 - PLUTONIUM VALLEY

Profile #303

This soil is of the Aridisol Order.

Typifying Pedon: very stony loam.

- AI 0 - 8 cm -Light yellowish brown (10YR 6/4) very stony loam,
dark grayish brown (10YR 4/2) moist; weak fine
platy structure; soft, friable, nonsticky, non-
plastic; few fine, micro, and medium roots;
violently effervescent, moderately alkaline
(pH 8.0). Abrupt wavy boundary.
- C1 8 - 20 cm -Very pale brown (10YR 7/3) gravelly sandy loam,
brown (10YR 7/3) moist; weak fine subangular
blocky structure; soft, friable, nonsticky, non-
plastic; many fine, micro, and medium roots;
violently effervescent, moderately alkaline (pH 8.2).
- R 20⁺ cm -Tuff bedrock.

The #303 soil occurs on moderately sloping to steep sloping hillsides with slope gradient of 8 to 30 percent. The soil is formed in alluvium from tuffs, basalt, and limestone. The soil is well-drained to the bedrock, with rapid runoff because of the slope, and moderate permeability (0.80 to 2.50 inches per hour). Slight to moderate water erosion is evident. The principal vegetation is blackbush, fourwing saltbush, shadscale, Indian ricegrass, Nevada ephedra, and joshuatree yucca. The total plant density is 5 percent. This soil supports good winter grazing for livestock and wildlife.

AREA 11 - PLUTONIUM VALLEY

Profile #304

This soil is of the Aridisol Order.

Typifying Pedon: very gravelly loam.

- C1 0 - 15 cm -Pale brown (10YR 6/3) very gravelly loam, dark grayish brown (10YR 4/2) moist; weak fine platy structure; soft, friable, slightly sticky, slightly plastic; few fine and medium roots; slightly effervescent, moderately alkaline (pH 8.2). Clear smooth boundary (8 to 20 cm thick).
- C2 15 - 30 cm -Light gray (10YR 7/2) gravelly sandy loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, friable, nonsticky, nonplastic; plentiful micro, fine, and medium roots; violently effervescent, moderately alkaline (pH 8.4). Clear smooth boundary (10 to 20 cm thick).
- C3 30 - 41 cm -Very pale brown (10YR 7/3) gravelly loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; soft, friable, slightly sticky, slightly plastic; few fine and medium roots; violently effervescent, moderately alkaline (pH 8.4).
- C4cam 41⁺ cm -Silica-lime hardpan.

The #304 soil is on gently to moderately sloping alluvial fans. The soil is formed in material weathered from tuff, basalt, and limestone.

The #304 soil is on gentle to moderate sloping alluvial fans with slope gradients of 4 to 8 percent. The soil is well-drained to the hardpan, with medium runoff, and moderate permeability (0.80 to 2.50 inches per hour). Slight wind and water erosion is evident. The natural vegetation is mainly wolfberry, fourwing saltbush, winterfat, Nevada ephedra, bud sagebrush, Indian ricegrass, joshuatree yucca, and bottlebrush squirreltail. The total plant density is 10 percent. This soil supports good winter grazing for livestock and wildlife.

AREA 11 - PLUTONIUM VALLEY

Profile #305

This soil is of the Aridisol Order.

Typifying Pedon: gravelly loam.

- A2 0 - 13 cm -Very pale brown (10YR 7/3) gravelly loam, brown (10YR 4/3) moist, strong coarse platy structure; soft, friable, sticky, plastic; many fine and medium vesicular pores; violently effervescent, strongly alkaline (pH 8.8). Abrupt smooth boundary (0.5 to 20 cm thick).
- B2 13 - 31 cm -Light reddish brown (5YR 6/4) clay loam, reddish brown (5YR 4/3) moist; strong coarse subangular blocky structure; hard, friable, sticky, plastic; many fine and medium tubular pores; slightly effervescent, strongly alkaline (pH 8.6). Clear smooth boundary (10 to 40 cm thick).
- C1 31 - 41 cm -Very pale brown (10YR 7/3) gravelly sandy loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; hard friable, nonsticky, non-plastic; violently effervescent, strongly alkaline (pH 8.6).
- C2cam 41⁺ cm -Silica-lime hardpan.

The #305 soil is on gently sloping alluvial fans. The soil is formed in material weathered from tuff, basalt, and limestone. Slope gradients range from 2 to 4 percent. The soil is moderately well-drained to the

silica hardpan, with medium runoff, and moderate permeability (0.80 to 2.50 inches per hour). Slight to moderate wind erosion is evident. The natural vegetation is mainly horsebrush, shockley goldenhead, winterfat, spiny menodora, bud sagebrush, Nevada ephedra, fourwing saltbush, shadscale, wolfberry, bottlebrush squirreltail, and globemallow. The total plant density is 20 percent. This soil supports good winter grazing for livestock and wildlife.

AREA 11 - PLUTONIUM VALLEY

Profile #306

This soil is of the Aridisol Order.

Typifying Pedon: gravelly sandy loam.

- C1 0 - 15 cm -Very pale brown (10YR 7/3) gravelly sandy loam, brown (10YR 4/3) moist, weak fine subangular blocky structure; soft, friable, nonsticky, nonplastic; strongly effervescent, moderately alkaline (pH 8.2).
- C2 15 - 36 cm -Very pale brown (10YR 7/3) gravelly sandy loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, friable, nonsticky, nonplastic; violently effervescent, moderately alkaline (pH 8.4).
- C3 36 - 61 cm -Light gray (10YR 7/2) cobbly and gravelly loamy sand, brown (10YR 4/3) moist; single grain; loose dry and moist, nonsticky, nonplastic; violently effervescent, strongly alkaline (pH 8.6).
- C4cam 61⁺ cm -Silica-lime hardpan.

The #306 soil occurs on gently sloping alluvial fans and floodplains with slope gradients of 2 to 4 percent. The soil is formed in alluvium from tuff, basalt and limestone. The soil is well-drained to the hardpan, with slow runoff, and rapid permeability (5.00 to 10.00 inches per hour). Moderate wind and water erosion is evident. The principal vegetation is horsebrush, rabbitbrush, wolfberry, winterfat, Nevada ephedra, fourwing saltbush, bud sagebrush, Indian ricegrass, joshuatree yucca, spiny

menodora, bottlebrush squirreltail, shockley goldenhead, coyote tobacco, and buckwheat. The total plant density is 10 percent. This soil supports good winter grazing for livestock and wildlife.

AREA 11 - PLUTONIUM VALLEY

Profile #307

This soil is of the Entisol Order.

Typifying Pedon: gravelly loamy sand.

- C1 0 - 31 cm -Light gray (10YR 7/2) gravelly loamy sand, dark grayish brown (10YR 4/2) moist; single grain; loose dry and moist, nonsticky, nonplastic; strongly effervescent, moderately alkaline (pH 8.2).
- C2 31 - 91 cm -Very pale brown (10YR 7/3) gravelly sand, brown (10YR 4/3) moist; single grain; loose dry and moist; nonsticky, nonplastic; violently effervescent, moderately alkaline (pH 8.4).
- C3cam 91⁺ cm -Silica-lime hardpan.

The #307 soil occurs on gently sloping alluvial fans, floodplains and in drainage ways (washes). The slope gradients range from 2 to 4 percent. The soil is formed in alluvium from tuff, basalt, and limestone. The soil is excessively drained to the hardpan, with slow runoff, and rapid to very rapid permeability (5.00 to more than 10.00 inches per hour). Moderate water and slight wind erosion is evident. The natural vegetation is mainly shockley goldenhead, rabbitbrush, coyote tobacco, wolfberry, Indian ricegrass, spiny menodora, and joshuatree yucca. The total plant density is less than 5 percent. This soil supports spring and autumn grazing for livestock and wildlife.

AREA 11 - PLUTONIUM VALLEY

Profile #308

This soil is of the Aridisol Order.

Typifying Pedon: gravelly loam.

- A2 0 - 10 cm -Very pale brown (10YR 7/3) gravelly loam, brown (10YR 4/3) moist; strong coarse platy structure; soft, friable, sticky, plastic; many fine and medium vesicular pores; violently effervescent, strongly alkaline (pH 8.8). Abrupt smooth boundary (5 to 20 cm thick).
- B2 10 - 26 cm -Light reddish brown (5YR 6/4) clay loam, reddish brown (5YR 4/3) moist; strong coarse subangular blocky structure; hard, friable, sticky, plastic; many fine and medium tubular pores; slightly effervescent, strongly alkaline (pH 8.6). Clear smooth boundary (10 to 40 cm thick).
- C1 26 - 38 cm -Very pale brown (10YR 7/3) gravelly sandy loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; hard, friable, nonsticky, nonplastic; violently effervescent, strongly alkaline (pH 8.6).
- C2cam 38⁺ cm -Silica-lime hardpan.

The #308 soil occurs on gentle sloping alluvial fans. The soil is formed in material weathered from tuff, basalt, limestone. Slope gradients range from 2 to 4 percent. The soil is moderately well-drained

to the silica hardpan, with medium runoff, and moderate permeability (0.80 to 2.50 inches per hour). Slight to moderate wind and water erosion is evident. The natural vegetation is mainly horsebrush, winterfat, spiny menodora, bud sagebrush, Nevada ephedra, fourwing saltbush, wolfberry, bottlebrush squirreltail, and globemallow. The total plant density is 20 percent. This soil supports good grazing in the spring and autumn for livestock and wildlife.

Profile #401

Typifying Pedon: sandy loam.

- The #401 soil occurs on level, or nearly level, alluvial fans and floodplains with slope gradients of 0 to 2 percent. The soil is formed in alluvium from quartzite, rhyolite, basalt and limestone. The soil is well-drained, with medium runoff, and moderate permeability

(0.80 to 2.50 inches per hour). Slight to moderate wind and water erosion is evident. The vegetation consists of cattle saltbush, winterfat, bud sagebrush, Indian ricegrass, fourwing saltbush, and horsebrush. The total plant density is about 10 percent. This soil supports good winter grazing for livestock and wildlife.

Profile #402

This soil is of the Aridisol Order.

Typifying Pedon: gravelly sandy loam.

- | | |
|----|---|
| A2 | 0 - 10 cm -Light gray (10YR 7/2) gravelly sandy loam; brown (10YR 4/3) moist; strong coarse platy structure; slightly hard, friable, slightly sticky, slightly plastic; many fine and medium vesicular pores; violently effervescent, moderately alkaline (pH 8.0). |
| B2 | 10 - 30 cm -Reddish brown (5YR 5/4) clay loam, reddish brown (5YR 4/4) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky, plastic; strongly effervescent, mildly alkaline (pH 7.8). |
| C1 | 30 - 61 cm -Pale brown (10YR 6/3) gravelly sandy loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, friable, nonsticky, nonplastic; violently effervescent, moderately alkaline (pH 8.2). |
| C2 | 61 - 152 cm -Pale brown (10YR 6/3) very gravelly sand, brown (10YR 4/3) moist; single grain; loose dry and moist, nonsticky, nonplastic; violently effervescent, moderately alkaline (pH 8.4). |

The #402 soil occurs on level, or nearly level, floodplains, basins and alluvial fans. The slope gradients range from 0 to 2 percent. The soil is formed by alluvium derived from quartzite, rhyolite, basalt, and limestone. The soil is well-drained, with medium runoff, and moderate

permeability (0.80 to 2.50 inches per hour). Slight to moderate wind and water erosion is evident. The vegetation consists of cattle saltbush, shockley goldenhead, bud sagebrush, fourwing saltbush, shadscale, winterfat, and bottlebrush squirreltail. The total plant density is about 10 percent. This soil supports good winter range.

AREA 13

Profile #403

This soil is of the Entisol Order.

Typifying Pedon: gravelly sandy loam.

- A1 0 - 8 cm -Light gray (10YR 7/2) gravelly sandy loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; soft, friable, nonsticky, nonplastic; slightly effervescent, moderately alkaline (pH 8.0).
- C1 8 - 61 cm -Very pale brown (10YR 7/4) sandy loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, friable, nonsticky, nonplastic; strongly effervescent, moderately alkaline (pH 8.0).
- C2 61 - 152 cm -Very pale brown (10YR 7/4) gravelly loamy sand, brown (10YR 4/3) moist; single grain; loose dry and moist; nonsticky, nonplastic; strongly effervescent, moderately alkaline (pH 8.2).

The #403 soil is on smooth, level to nearly level, sloping alluvial fans and floodplains with slope gradients of 0 to 2 percent. Eroded area has very slight wind hummocks around the brush. The soil is formed in gravelly loamy alluvium from quartzite, rhyolite, basalt and limestone. The soil is excessively drained, with very slow runoff, and rapid permeability (5.00 to 10.00 inches per hour). Slight wind erosion is evident. The principal vegetation is fourwing saltbush, horsebrush, and Indian ricegrass. The total plant density is about 5 percent. This soil supports good winter grazing for livestock and wildlife.

AREA 13

Profile #404

This soil is of the Aridisol Order.

The #404 soil profile is similar to #401 soil profile (Area 13) except that the dominant vegetation is wolfberry. All other soil profile characteristics are the same.

AREA 13

Profile #405

This soil is of the Aridisol Order.

The #405 soil profile is similar to #401 soil profile (Area 13) with the following exceptions, (1) the surface soil in #405 soil is a clay loam, (2) the dominant vegetation is mainly winterfat, and (3) more severe wind and water erosion is evident. All other soil profile characteristics are the same.

IV. CAPABILITY GROUPS OF SOILS

In the capability system all kinds of soils are grouped by three levels: class, subclass, and unit. The class is designated by Roman numerals I through VIII indicating progressively greater limitations and narrower choices for practical use ⁽⁵⁾.

Class VII--Soils have very severe limitations that make them unsuited to cultivation and restrict the use largely to grazing, woodland, or wildlife.

Subclasses are soil groups within one class. The subclass is designated by adding a small letter such as c, s, or w to the class numeral. The letter c indicates the climate is too cold or too dry; the letter s indicates shallow, droughty, or stony soil; and the letter w indicates degree of wetness of the soil, varying in depth from shallow to deep.

Units are soil groups within subclasses. The unit class is designated by adding a number or a capital letter such as 4, 7, 8, K, or F to the class numeral. The number 4 indicates low water holding capacity, number 7 indicates stoniness or rockiness, number 8 indicates depth limitation (over hardpan or bedrock), K indicates rainfall insufficient for reseeding perennial grass, and F indicates occasional overflow (standing water). Examples of the soil groups used are as follows ⁽⁵⁾.

VII_s-4 Low water-holding capacity

VII_s-7 Stoniness or rockiness

VII_c-K Rainfall insufficient for reseeding perennial grass

VII_s-8 Depth limitation (over hardpan or bedrock)

VIII_w-F Occasional overflow (standing water)

V. CAPABILITY UNITS

Capability Unit VII_s-4 Dryland

This unit generally consists of moderately coarse textured soils that have low to moderate available water-holding capacity and are somewhat droughty. These soils occupy nearly level to strongly sloping alluvial fans. They are more than 110 cm deep and are well drained or somewhat excessively drained. Some of the soils have a gravelly, very gravelly, or stony surface layer, and some areas are covered with material that washed from higher lying soils during high-intensity rainstorms. Runoff is slow or very slow. Permeability generally is moderate or moderately rapid, but it ranges from slow to rapid. Natural fertility is low to high. Water erosion is a hazard on the stronger slopes and on the milder slopes that receive runoff from higher soils. The risk of soil blowing is slight to severe.

Included in the unit are soils in which the surface layer is coarse textured and the water-holding capacity is moderate or high.

This unit includes soil #302 a very gravelly loam, 4 to 8 percent slopes; #306 a gravelly sandy loam, 2 to 4 percent slopes; #307 a gravelly loamy sand, 2 to 4 percent slopes; #201 and #203 are a gravelly sandy loam, 1 to 2 percent slopes; and #111 and #112 are a gravelly sandy loam, 1 to 4 percent slopes at Double Track.

All the soils of this unit are in range, but their use for grazing is limited because rainfall is low.

Capability Unit VII_s-7 Dryland

In this unit, soils are rocky to extremely rocky, very stony or extremely stony, moderately coarse textured or medium textured that are on gently sloping to extremely steep alluvial fans, foothills, and mountains. The soils generally are very shallow to moderately deep over bedrock or over a silica-lime cemented hardpan, and they are well drained or somewhat excessively drained. In most places their permeability is very slow, but it may range to moderate in soils overlying bedrock. The water-holding capacity is very low or low and the hazard of erosion is slight to severe.

Included in the unit are soils #202 a cobbly sandy loam, 1 to 2 percent slopes; #301 a stony and gravelly clay loam, 2 to 8 percent slopes; and #303 a very stony loam, 8 to 30 percent slopes.

The soils in this unit have sparse stands of desert plants that provide limited grazing for livestock and habitat for upland wildlife. Grazing is further limited by stones and rock outcrops. The soils are unsuitable for cultivation.

Capability Unit VII_c-K

This unit consists of medium textured and moderately coarse textured soils that are more than 153 cm deep and are well drained or moderately well drained. These soils occupy nearly level or gently sloping alluvial fans and floodplains in areas where rainfall is insufficient for seeding perennial grass. Some of the soils are gravelly. Permeability is moderate to moderately slow, and the water-holding capacity and natural fertility are high. Runoff is slow or very slow. The hazard of erosion is slight or moderate. Some areas are covered with material deposited by concentrated runoff from higher lying soils.

Included in the unit are soils #401 a sandy loam, 0 to 2 percent slopes; #402 gravelly sandy loam, 0 to 2 percent slopes; #403 gravelly sandy loam, 0 to 2 percent slopes; #404 sandy loam, 0 to 2 percent slopes; #405 clay loam, 0 to 2 percent slopes in Area 13; and #101, #103, #104, #105, #106, #107, #108, #109, and #110 in Tonopah Test Range.

The soils in this unit are suitable for limited grazing of livestock and habitat for wildlife. If water were available for irrigation, the soils would be well suited to cultivated crops.

Capability Unit VII_s-8 Dryland

The soils in this unit generally are underlain by a layer which is indurated with silica or lime to form a hardpan. The soils occupy nearly level to strongly sloping areas on alluvial fans, and the soils are well drained or somewhat excessively drained. Most of the soils are shallow or very shallow and are moderately coarse textured or medium textured. Some of them have gravel, cobblestones, or stones on the surface or in the surface layer. Permeability is very slow, the water holding capacity is very low, and the inherent fertility is very low or low. Runoff is generally very slow to medium, and the hazard of erosion is slight or moderate.

Soils included in the unit are soils #113, #304, #305, and #308 a gravelly loam, 2 to 4 percent slopes.

The soils of this unit support good stands of desert plants that provide limited grazing for livestock and habitat for upland wildlife. The soils are unsuitable for cultivation.

Capability Unit VIII_w-F Dryland

This unit describes the soils of the playa, a land type that is nearly level and slightly concave. Playa consists of fine-textured poorly drained soil material, 152 cm in depth, subject to overflow, and affected by salts and alkali. The playa can become a lake when rainfall is abnormally heavy. As the water evaporates from this lake, a burden of salts is deposited. Erosion on the playa is very slight.

Although a few salt and alkali tolerant plants grow along the margin, playas are generally barren and not suitable as irrigated cropland or as grazing land.

This unit includes soil #102 loam, 0 to 1 percent slopes at Clean Slate #1.

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Table I. Soil Legends and Capability Units for Clean Slate #1, #2, and #3 and Double Track

Soil Area	Soil No.	Soil Legend	Capability Units
	GZ	Ground zero	
Clean Slate #1	101	Gravelly sandy loam, 0 to 2 percent slopes	VII _C -K
	102	Loam, 0 to 1 percent slopes	VIII _W -F
	103	Gravelly sandy loam, 0 to 4 percent slopes	VII _C -K
Clean Slate #2	104	Gravelly sandy loam, 1 to 4 percent slopes	VII _C -K
	105	Gravelly sandy loam, 0 to 2 percent slopes	VII _C -K
	106	Sandy loam, 0 to 2 percent slopes	VII _C -K
	107	Gravelly sandy loam, 1 to 4 percent slopes	VII _C -K
Clean Slate #3	108	Gravelly sandy loam, 0 to 2 percent slopes	VII _C -K
	109	Sandy loam, 0 to 2 percent slopes	VII _C -K
	110	Gravelly loam, 0 to 2 percent slopes	VII _C -K
Double Track	111	Gravelly sandy loam, 1 to 4 percent slopes	VII _S -4
	112	Gravelly sandy loam, 1 to 4 percent slopes	VII _S -4
	113	Gravelly loam, 2 to 4 percent slopes	VII _S -8

Table II. Soil Legends and Capability Units for Area 5, GMX

29	Soil No.	Soil Legend	Capability Units
	201	Gravelly sandy loam, 1 to 2 percent slopes	VII _s -4
	202	Cobbly sandy loam, 1 to 2 percent slopes	VII _s -7
	203	Gravelly sandy loam, 1 to 2 percent slopes	VII _s -4

Table III. Soil Legends and Capability Units for Area 11, Plutonium Valley

Soil No.	Soil Legend	Capability Units
301	Stony and gravelly clay loam, 2 to 8 percent slopes	VII _s -7
302	Very gravelly sandy loam, 4 to 8 percent slopes	VII _s -4
303	Very stony loam, 8 to 30 percent slopes	VII _s -7
304	Very gravelly loam, 4 to 8 percent slopes	VII _s -8
305	Gravelly loam, 2 to 4 percent slopes	VII _s -8
306	Gravelly sandy loam, 2 to 4 percent slopes	VII _s -4
307	Gravelly loamy sand, 2 to 4 percent slopes	VII _s -4
308	Gravelly loam, 2 to 4 percent slopes	VII _s -8

Table IV. Soil Legends and Capability Units for Area 13

Soil No.	Soil Legend	Capability Units
401	Sandy loam, 0 to 2 percent slopes	VII _c -K
402	Gravelly sandy loam, 0 to 2 percent slopes	VII _c -K
403	Gravelly sandy loam, 0 to 2 percent slopes	VII _c -K
404	Sandy loam, 0 to 2 percent slopes	VII _c -K
405	Clay loam, 0 to 2 percent slopes	VII _c -K

Table V. List of Scientific and Common Names of the
Vegetation on the Survey Areas*

<u>Scientific Name</u>	<u>Common Name</u>
<i>Acanthopappus shockleyi</i>	Shockley goldenhead
<i>Artemisia spinescens</i>	Bud sagebrush
<i>Artemisia tridentata</i>	Big sagebrush
<i>Atriplex canescens</i>	Fourwing saltbush
<i>Atriplex confertifolia</i>	Shadscale
<i>Atriplex polycarpa</i>	Cattle saltbush
<i>Chrysothamnus teretifolius</i>	Rabbitbrush
<i>Coleogyne ramosissima</i>	Blackbrush
<i>Ephedra nevadensis</i>	Nevada ephedra
<i>Eriogonum fasciculatum</i>	Buckwheat
<i>Eurotia lanata</i>	Winterfat
<i>Franseria dumosa</i>	White bursage
<i>Hilaria jamesii</i>	Galleta grass
<i>Larrea divaricata</i>	Creosotebush
<i>Lycium andersonii</i>	Wolfberry
<i>Lycium pallidum</i>	Pale wolfberry
<i>Menodora spinescens</i>	Spiny menodora
<i>Nicotiana attenuata</i>	Coyote tobacco
<i>Opuntia basilaris</i>	Pricklypear
<i>Oryzopsis hymenoides</i>	Indian ricegrass
<i>Sitanion hystrix</i>	Bottlebrush squirreltail
<i>Sphaeralcea emoryi</i>	Globemallow

Table V. List of Scientific and Common Names of the
Vegetation on the Survey Areas* (Continued)

<u>Scientific Name</u>	<u>Common Name</u>
<i>Stipa speciosa</i>	Desert needlegrass
<i>Tetradymia glabrata</i>	Horsebrush
<i>Tridens pulchellus</i>	Fluffgrass
<i>Yucca brevifolia</i>	Joshuatree yucca

* The common name only will be used in the text.

Table VI. Summary of Dominant Factors of the Five Areas

	Clean Slate #1, #2, & #3	Double Track	Area 5	Area 11	Area 13
Surface soil	gravelly sandy loam	gravelly sandy loam	gravelly sandy loam	gravelly loam	gravelly sandy loam
Horizons	A ₂ , B ₂ , B ₃ , C ₁	C ₁ , C ₂	A ₁ , C ₁ , C ₂	A ₂ , B ₂ , C ₁ , C _{2cam}	A ₂ , B ₂ , C ₁ , C ₂
Capability Units	VIII _C -K, VIII _W -F	VII _S -4, VII _S -8	VII _S -4, VII _S -7	VII _S -4, VII _S -7, VII _S -8	VII _C -K
Surface structure	platy	subangular blocky	platy	platy	platy
Erosion (water & wind)	moderate wind, slight water	slight water	slight to moderate wind and water	slight wind	slight to moderate wind and water
Range in pH	7.0 to 8.8	8.2 to 9.0	8.0 to 8.8	8.0 to 8.8	7.8 to 8.4
Water perme- ability (inch/h)	moderate 0.80 to 2.50	rapid 5.00 to 10.00	rapid 2.5 to 10.00	moderate 0.80 to 2.50	moderate 0.80 to 2.50
Soils by index number within each area and percentage	#101 through #110 (soils ~ same %)	#112 - 40 #113 - 40 #111 - 20	#201 - 40 #203 - 40 #202 - 20	#308 - 25 #301 #305 - 25 #302 #304 - 25 #303 #306 #307 } 25	#403 - 25 #401 - 20 #404 - 25 #405 - 5 #402 - 25
Slope (percentage)	level 0 to 2	gently sloping 0 to 4	level 0 to 2	level to steep hilly 2 to 30	level 0 to 2
Dominant vegetation (species)	fourwing saltbush	shadescale	white bursage	wolfberry	fourwing saltbush

APPENDICES

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APPENDIX I. GLOSSARY

Alluvial fan. A fan-shaped deposit of sand, gravel, and fine material dropped by a stream where its gradient lessens abruptly.

Alluvium. Fine material, such as sand, silt, or clay, that has been deposited on land by streams.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold dilute hydrochloric acid.

Complex soil. A mapping unit consisting of different kinds of soils that occur in such small individual areas or in such an intricate pattern that they cannot be shown separately on a publishable soil map.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

Loose. Noncoherent; will not hold together in a mass.

Friable. When moist, crushed easily under gentle to moderate pressure between thumb and forefinger and can be pressed together into a lump.

Firm. When moist, crushed under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic. When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a wire when rolled between the thumb and forefinger.

Sticky. When wet, adheres to other material; tends to stretch somewhat and pull apart, rather than pull free from other material.

Hard. When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Cemented. Hard and brittle; little affected by moistening.

Erosion. The wearing away of land surface by wind, running water, and other geological agents.

1. Slight wind erosion: the wind has removed from the soil a sufficient amount of the A horizon that ordinary tillage will bring up and mix the B horizon.
2. Moderate wind erosion: the wind has removed all of the A horizon and a part of the B or other lower lying horizon.
3. Slight water erosion: the soil has a few rills or places with thin A horizons that give evidence of accelerated erosion, but not to an extent to alter greatly the thickness and character of the A horizon.
4. Moderate water erosion: the soil has been eroded to the extent that ordinary tillage implements reach through the remaining A horizon, or well below the depth of the original plowed layer in soils with thin A horizons.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material may be sandy or clayey, and it may be cemented by iron oxide, silica, calcium carbonate, or other substances.

Horizon, soil. A layer of soil, approximately parallel to the surface that has distinct characteristics produced by soil-forming processes. The relative position of the several soil horizons in a typical soil profile, and their nomenclature, are as follows:

- A₀ Organic debris, partly decomposed or matted.
- A₁ A dark-colored horizon having a fairly high content of organic matter mixed with mineral matter.
- A₂ A light-colored horizon, often representing the zone of maximum leaching where podzolized; absent in wet, dark-colored soil.
- A₃ Transitional to B horizon but more like A than B; sometimes absent.
- B₁ Transitional to B horizon but more like B than A; sometimes absent.
- B₂ A usually darker colored horizon, which often represents the zone of maximum illuviation where podzolized.
- B₃ Transitional to C horizon.

The A horizons make up a zone of eluviation, or leached zones. The B horizons make up a zone of illuviation, in which clay and other materials have accumulated. The A and B horizons, taken together, are called the solum, or true soil.

Munsell notation. A system for designating color by degrees of the three simple variables--hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with a hue of 10YR, value of 6 and a chroma of 4.

Natural drainage. Refers to moisture conditions that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Several different classes of natural drainage are: Excessively drained soils are commonly very porous and rapidly permeable and have a low water-holding capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well-drained soils commonly have a slow permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and have mottling in the lower B and the C horizons.

Imperfectly or somewhat poorly drained soils are wet for significant periods but not all the time, and in podzolic soils commonly have mottlings below 6 to 16 inches, in the lower A horizon and in the B and C horizons.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Parent material (soil). The horizon of weathered rock or partly weathered soil material from which soil has formed; horizon C in the soil profile.

Particle size of soils:

Gravel = greater than 2.0 mm

Very coarse sand = 2.0 to 1.0 mm

Coarse sand = 1.0 to 0.5 mm

Medium sand = 0.5 to 0.25 mm

Fine sand = 0.25 to 0.10 mm

Very fine sand = 0.10 to 0.05 mm

Silt = 0.05 to 0.002 mm

Clay = <0.002 mm

Ped. An individual natural soil aggregate, such as a crumb, a prism or a block in contrast to a clod.

Pedon. A pedon is the smallest volume that can be called "a soil."

Plant density. Plant density values essentially describe that portion of the study area canopied by vegetation. These values, as described here, are somewhat influenced by the judgement of the investigator. However, the line-of-sight transects utilized in this study were randomly checked with actual measurements and were observed to be in close agreement.

Reaction, soil. The degree of acidity or alkalinity of a soil expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction, because it is neither acid nor alkaline.

In words the degrees of acidity or alkalinity are expressed thus:

	pH		pH
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	above pH 9

Rhyolite. A type of volcanic rock containing much silica and resembling granite in composition but having a texture that shows flow.

Slope. Slope refers to the incline of the surface of a soil area.

The area is neither flat nor level but is rising or falling land.

Soil survey. A systematic examination, description, classification, and mapping of soils in an area. Soil surveys are classified

accordingly to intensity of field examination as exploratory reconnaissance, or detailed.

Soil textures:

1. Sands. Soil material that contains 85 percent or more of sand; percentage of silt, plus 1 1/2 times the percentage of clay, shall not exceed 15.
 - Coarse sand: 25 percent or more very coarse and coarse sand, and less than 50 percent any other one grade of sand.
 - Sand: 25 percent or more very coarse, coarse, and medium sand, and less than 50 percent fine or very fine sand.
 - Fine sand: 50 percent or more fine sand (or) less than 25 percent very coarse, coarse, and medium sand and less than 50 percent very fine sand.
 - Very fine sand: 50 percent or more very fine sand.
2. Loamy sands. Soil material that contains at the upper limit 85 to 90 percent sand, and the percentage of silt plus 1 1/2 times the percentage of clay is not less than 15; at the lower limit it contains not less than 70 to 85 percent sand, and the percentage of silt plus twice the percentage of clay does not exceed 30.
 - Loamy coarse sand: 25 percent or more very coarse and coarse sand, and less than 50 percent any other one grade of sand.
 - Loamy sand: 25 percent or more very coarse, coarse, and medium sand, and less than 50 percent fine or very fine sand.
 - Loamy fine sand: 50 percent or more fine sand (or) less than 25 percent very coarse, coarse, and medium sand and less than 50 percent very fine sand.

Loamy very fine sand: 50 percent or more very fine sand.

3. Sandy loams. Soil material that contains either 20 percent clay or less, and the percentage of silt plus twice the percentage of clay exceeds 30, and 52 percent or more sand; or less than 7 percent clay, less than 50 percent silt, and between 43 percent and 52 percent sand.

Coarse sandy loam: 25 percent or more very coarse and coarse sand and less than 50 percent any other one grade of sand.

Sandy loam: 30 percent or more very coarse, coarse, and medium sand, but less than 25 percent very coarse sand, and less than 30 percent very fine or fine sand.

Fine sandy loam: 30 percent or more fine sand and less than 30 percent very fine sand (or) between 15 and 30 percent very coarse, coarse, and medium sand.

Very fine sandy loam: 30 percent or more very fine sand (or) more than 40 percent fine and very fine sand, at least half of which is very fine sand and less than 15 percent very coarse coarse, and medium sand.

4. Loam. Soil material that contains 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand.
5. Silt loam. Soil material that contains 50 percent or more silt and 12 to 27 percent clay (or) 50 to 80 percent silt and less than 12 percent clay.
6. Silt. Soil material that contains 80 percent or more silt and less than 12 percent clay.
7. Sandy clay loam. Soil material that contains 20 to 35 percent clay, less than 28 percent silt, and 45 percent or more sand.

8. Clay loam. Soil material that contains 27 to 40 percent clay and 20 to 45 percent sand.
9. Silty clay loam: Soil material that contains 27 to 40 percent clay and less than 20 percent sand.
10. Sandy clay: Soil material that contains 35 percent or more clay and 45 percent or more sand.
11. Silty clay: Soil material that contains 40 percent or more clay and 40 percent or more silt.
12. Clay: Soil material that contains 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Stones. Rock fragments greater than 10 inches in diameter if rounded, and greater than 15 inches along the longer axis if flat.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separate from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are platy, (laminated), prismatic, (vertical axis of aggregates longer than horizontal), columnar, (prisms with rounded tops), blocky, (angular or subangular), and granular. Structureless soils are (1) single grain (each grain by itself as in dune sand) or (2) massive (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Tuff. Porous rock, usually stratified, formed by consolidation of volcanic ashes, dust, etc.

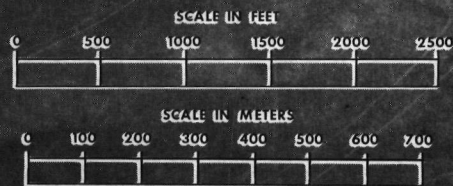
Value (color). One of three variables of color. Value increases as the relative intensity of reflected light increases. See Munsell notation⁽⁵⁾.

APPENDIX II. TEST RANGE COMPLEX SOIL SURVEY

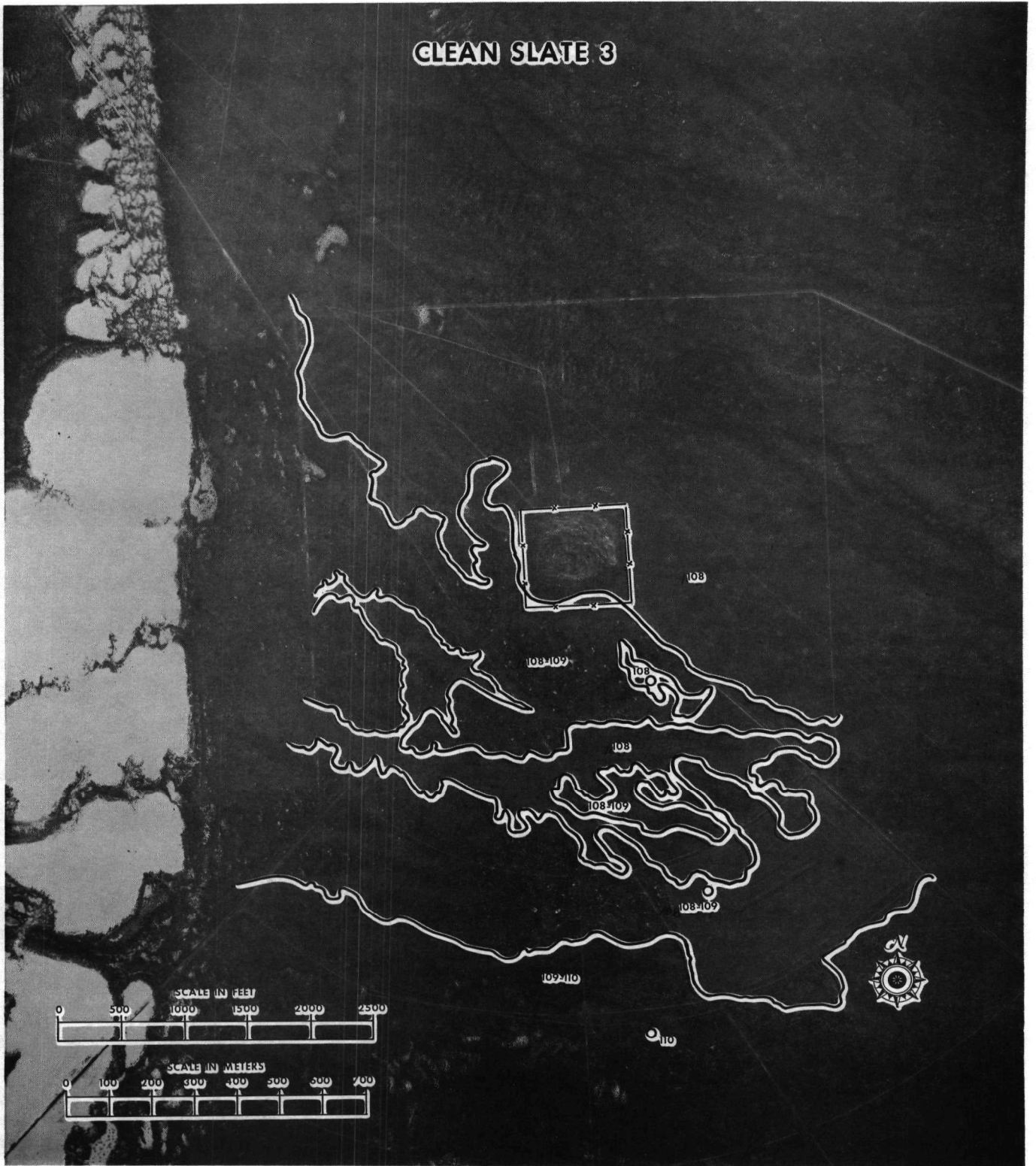
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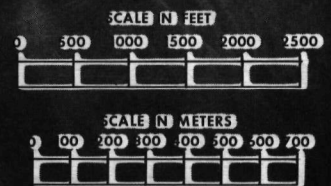
CLEAN SLATE 2



CLEAN SLATE 3



DOUBLE TRACK



AREA GMX

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202

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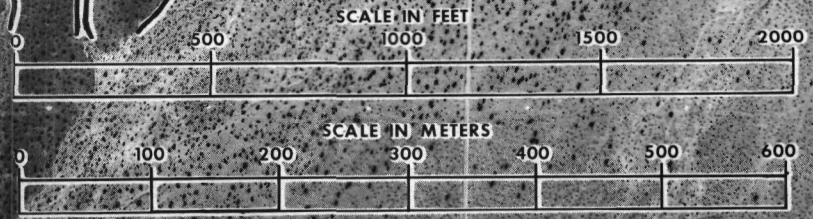
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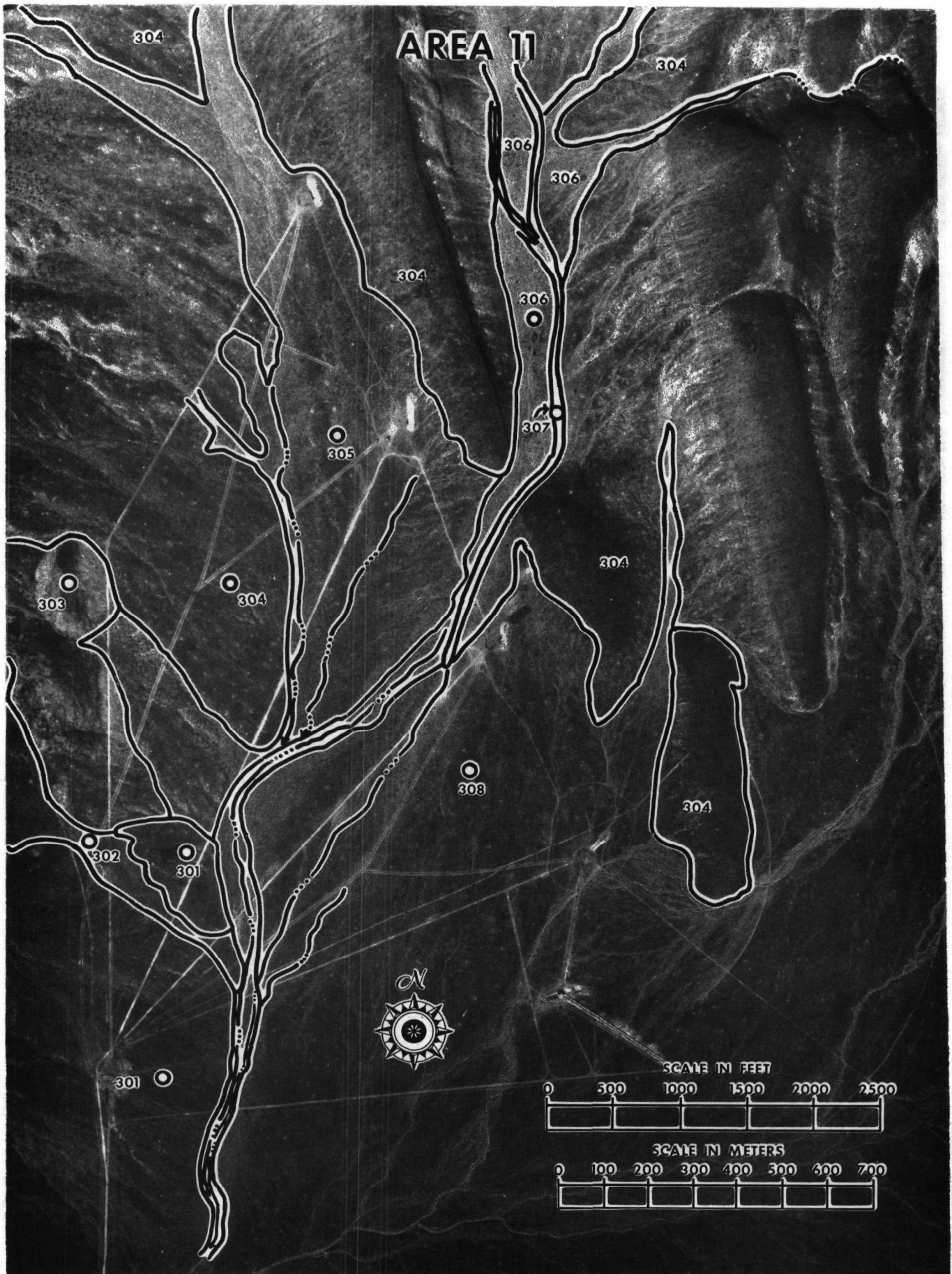
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AREA 11



AREA 13



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