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HOLLOMAN AIR FORCE BASE, NEW MEXICO

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MEMORANDUM FOR NEW MEXICO ENVIRONMENT DEPARTMENT

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Subject: July 2007 and January 2008 Semi-Annual Groundwater Monitoring Report
DP-30/SD-33 (SWMU 113B) and SS-39 (SWMUS 165, 167, 177, 179 and 181)
Holloman AFB NM EPA ID# NM6572124422

1. The subject report is hereby submitted to NMED for review and approval.
2. I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.
3. If you have any questions or require additional information, please feel free to contact Mr. David Scruggs at (575) 572-5395.

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Attachment:
Semi-Annual Groundwater Monitoring Report

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**JULY 2007 AND JANUARY 2008 SEMI-ANNUAL
GROUNDWATER MONITORING REPORT
DP-30/SD-33 (SWMU 113B) AND
SS-39 (SWMUs 165, 167, 177, 179, AND 181)
HOLLOMAN AIR FORCE BASE, NEW MEXICO
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**Air Force Center for Engineering and the Environment
Brooks City-Base, Texas**

May 2008

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HOLLOMAN AIR FORCE BASE, NEW MEXICO
EPA ID# NM6572124422**

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GROUNDWATER MONITORING REPORT,
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Deborah Hartell
Chief, Restoration Section

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This July 2007 and January 2008 Semi-Annual Groundwater Monitoring Report documents the results of the third and fourth semi-annual groundwater sampling events conducted at Holloman Air Force Base (AFB) Environmental Restoration Program (ERP) sites DP-30/SD-33 (Solid Waste Management Unit [SWMU] 113B, the Grease Trap/Cooking Grease Disposal Pits) and SS-39 (SWMUs 165, 167, 177, 179, and 181, the Missile Fuel Spill Area). These SWMUs, with the exception of SWMUs 165 and 167, are identified in Holloman AFB's Hazardous Waste Facility Resource Conservation and Recovery Act (RCRA) Permit No. NM6572122244 as SWMUs Requiring Corrective Action on Appendix 4-A Table A. SWMU 165, the Building 1176 Pond, and SWMU 167, the Test Sled Area Collection Basin, are on Appendix 4-A Table B, SWMUs Not Currently Requiring Corrective Action. According to the table, SWMU 165 was "no further actioned (NFA'd) in February 2001", and SWMU 167 was identified by the U.S. Environmental Protection Agency (U.S. EPA) "in 1988 as a SWMU without requiring further corrective action".				
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EXECUTIVE SUMMARY

The July 2007 and January 2008 Semi-Annual Groundwater Monitoring Report documents the results of semi-annual groundwater sampling events 3 and 4 conducted at Holloman Air Force Base (AFB) Environmental Restoration Program (ERP) sites DP-30/SD-33 (Solid Waste Management Unit [SWMU] 113B) and SS-39 (SWMUs 165, 167, 177, 179, and 181). These SWMUs, with the exception of SWMUs 165 and 167, are identified in Holloman AFB's Hazardous Waste Facility Resource Conservation and Recovery Act (RCRA) Permit No. NM6572122244 Appendix 4-A Table A, SWMUs Requiring Corrective Action. SWMU 165, the Building 1176 Pond, and SWMU 167, the Test Sled Area Collection Basin, are on Appendix 4-A Table B, SWMUs Not Currently Requiring Corrective Action. According to the Appendix 4-A Table B, SWMU 165 was "no further actioned (NFA'd) in February 2001", and SWMU 167 was identified by the U.S. Environmental Protection Agency (U.S. EPA) "in 1988 as a SWMU without requiring further corrective action". This report has been prepared by HydroGeoLogic, Inc. (HGL) under contract to the Air Force Center for Engineering and the Environment (AFCEE), Contract No. F41624-03-D-8602, Task Order No. 037, in accordance with the New Mexico Environment Department (NMED) Hazardous and Radioactive Materials Bureau position paper on *General Reporting Requirements for Routine Groundwater Monitoring at RCRA Sites* (NMED, 2003).

In the 1990s, remedial investigations (RFIs) were conducted at DP-30/SD-33 and SS-39 followed by biennial Long Term Monitoring (LTM). A supplemental RCRA Facility Investigation (RFI) work plan (HGL, 2005a) was submitted to NMED in July 2005 to address additional characterization requirements at these sites. Upon review of the RFI work plan, NMED responded (NMED, 2006) that semi-annual groundwater monitoring would be required at DP-30/SD-33, and a minimum of two years of semi-annual groundwater monitoring would be required at SS-39 in addition to the supplemental RFI activities proposed in the work plan. The supplemental RFIs were conducted at DP-30/SD-33 and SS-39 in 2005 and 2006 with the results submitted in RFI reports to NMED in July 2007 (HGL, 2007). The results of the first two semi-annual groundwater monitoring events for both sites, completed in July 2006 and January 2007, were included within these reports, which are currently under NMED review.

During the July 2007 and January 2008 sampling events, all groundwater purging and sampling activities were conducted in accordance with the RFI work plan (HGL, 2005a), Holloman AFB standard operating procedures, and historic work practices. Groundwater samples were collected from all 5 DP-30/SD-33 monitoring wells, and from 10 of the 11 SS-39 monitoring wells. SS-39 monitoring well MW-39-03 was not sampled during the July 2007 and January 2008 since vegetation was previously observed within the well, indicating the well casing has been compromised. In accordance with the NMED RFI work plan notice of deficiency letter (NMED, 2006), DP-30/SD-33 groundwater samples were analyzed for volatile organic compounds (VOCs), total and dissolved target analyte list (TAL) metals, and total dissolved solids (TDS); SS-39 groundwater samples were analyzed for VOCs, aniline, unsymmetrical dimethylhydrazine (UDMH), total and dissolved eight RCRA metals, perchlorate, and TDS.

Natural TDS levels in the plume areas of these two sites are above 10,000 mg/L, and are thus above the threshold at which U.S. EPA Maximum Contaminant Levels (MCLs) and New Mexico Groundwater Quality (NMGWQ) standards would apply. MCLs and NMGWQ standards are used for comparison purposes only in the data tables to identify constituents that are potential contaminants that require evaluation, in order to ascertain whether plume stabilization/reduction is occurring.

DP-30/SD-33 (SWMU 113B)

Of the analytes detected, trichloroethene (TCE) was the only analyte detected at concentrations exceeding U.S. EPA Maximum Contaminant Level (MCL) (5 micrograms per liter [$\mu\text{g/L}$]) during either of the two sampling events. In July 2007, TCE exceeded the U.S. EPA MCL of 5 $\mu\text{g/L}$ in MW30&33-03 (5.8 $\mu\text{g/L}$), MW30&33-04 (11 $\mu\text{g/L}$), and MW30&33-05 (49 $\mu\text{g/L}$). In January 2008, TCE U.S. EPA MCL exceedances occurred in MW30&33-04 (8 $\mu\text{g/L}$) and MW30&33-05 (43 $\mu\text{g/L}$). The January 2008 TCE distribution is similar to that observed in July 2006 and January 2007, at slightly lower concentrations. TCE concentrations have continued to decrease since semi-annual monitoring activities began during the July 2006 sampling event with the exception of MW30&33-02, where they have been stable and below the MCL. The continual decrease of TCE concentrations in the groundwater at MW30&33-05 demonstrates that the residual material is not acting as a continuous source of groundwater contamination. Groundwater water level measurements collected during LTM events indicate that groundwater flow is primarily in a southerly direction along a very low hydraulic gradient. Both the southerly flow direction and low hydraulic gradient explains the minimal migration of TCE beyond the extent of SD-33.

TDS groundwater concentrations beneath DP-30/SD-33 range from 21,000 milligrams per liter (mg/L) (MW30&33-05) to 32,000 mg/L (MW30&33-03) in July 2007 and 18,000 mg/L (MW30&33-05) to 29,000 mg/L (MW30&33-02 and MW30&33-03) in January 2008. The TDS results for both events are consistent with historic results.

Based on the collected data, cessation of LTM is proposed. There is no site-related groundwater contamination, with the exception of TCE. TCE concentrations in the groundwater (maximum historical concentration of 150 $\mu\text{g/L}$) have been decreasing since LTM began in 1995. The data show that the plume has stabilized and is decreasing, indicating that DP-30 is not acting as a continuing source of groundwater contamination. Natural TDS concentrations of the groundwater are well above 10,000 mg/L, the threshold at which groundwater standards no longer apply.

SS-39 (SWMUs 165, 177, 179, and 181)

During the July 2007 and January 2008 sampling events, TCE, perchlorate, arsenic, and selenium were detected at concentrations exceeding screening criteria. TCE, arsenic, and selenium exceeded New Mexico Groundwater Quality (NMGWQ) standards and/or U.S. EPA MCLs. In July 2007, TCE exceeded the NMGWQ standard (100 $\mu\text{g/L}$) and/or the U.S. EPA MCL (5 $\mu\text{g/L}$) in MW-39-02 (29 $\mu\text{g/L}$), MW-39-05 (26 $\mu\text{g/L}$), MW-39-06 (440 $\mu\text{g/L}$), MW-39-06D (470 $\mu\text{g/L}$), MW-39-08 (30 $\mu\text{g/L}$), and MW-39-11 (25 $\mu\text{g/L}$). In January 2008, TCE

NMGWQ and/or U.S. EPA MCL exceedances occurred in MW-39-02 (17 $\mu\text{g/L}$), MW-39-05 (17 $\mu\text{g/L}$), MW-39-06 (120 $\mu\text{g/L}$), MW-39-06D (92 J $\mu\text{g/L}$), MW-39-08 (26 $\mu\text{g/L}$), and MW-39-12 (12 $\mu\text{g/L}$). A slight increase in TCE concentrations was observed during the July 2007 semi-annual event; however, the January 2008 TCE distribution is similar to that observed in July 2006 and January 2007 but at slightly lower concentrations.

Dissolved arsenic and selenium were detected in several of the monitoring wells at concentrations exceeding NMGWQ standard (selenium, 50 $\mu\text{g/L}$) and/or U.S. EPA MCL (arsenic, 10 $\mu\text{g/L}$, and selenium, 50 $\mu\text{g/L}$). Both arsenic and selenium have been detected previously above screening criteria; however the exceedances have been sporadic between monitoring wells, between sampling events, and between original and associated duplicate samples. The distribution of the metals exceedances suggest the presence of arsenic and selenium at concentrations greater than the screening criteria is associated with the naturally occurring high TDS concentrations and not site related.

Aniline was not detected in the groundwater samples during the July 2007 and January 2008 semi-annual events. Due to severe matrix interference, the UDMH results for July 2007 were rejected. UDMH was not detected in the January 2008 groundwater samples. The lack of aniline and UDMH in the site groundwater during the two sampling events is consistent with the historic results.

Perchlorate was detected above the U.S. EPA Region VI 2007 Human Health Medium Specific Screening Level (HHMSSL) (24.5 $\mu\text{g/L}$). In July 2007, perchlorate concentrations exceeded the screening value in MW-39-05 (31 $\mu\text{g/L}$), MW-39-06 (38 $\mu\text{g/L}$), MW-39-06D (34 $\mu\text{g/L}$), MW-39-07 (91 $\mu\text{g/L}$), MW-39-08 (99 $\mu\text{g/L}$), MW-39-09 (160 $\mu\text{g/L}$), MW-39-10 (86 $\mu\text{g/L}$), MW-39-11 (120 $\mu\text{g/L}$), and MW-39-12 (230 $\mu\text{g/L}$). In January 2008, perchlorate exceedances were detected in MW-39-06 (27 $\mu\text{g/L}$), MW-39-06D (32 $\mu\text{g/L}$), MW-39-07 (741 $\mu\text{g/L}$), MW-39-08 (84 $\mu\text{g/L}$), MW-39-09 (180 $\mu\text{g/L}$), MW-39-10 (220 $\mu\text{g/L}$), MW-39-11 (100 $\mu\text{g/L}$), and MW-39-12 (80 $\mu\text{g/L}$). Perchlorate results are also provided on Figure 3.5. July 2007 and January 2008 perchlorate analytical concentrations are similar to historic results. As previously reported in the SS-39 RFI (HGL, 2007), perchlorate concentrations increase closer to the Lost River drainage basin; indicating the source of the perchlorate in this area appears to be the Lost River drainage basin and not SS-39.

As requested by NMED, four rounds of semi-annual monitoring have been conducted at SS-39. Based on the analytical data, cessation of UDMH, aniline, perchlorate, and metals (total and dissolved) monitoring is recommended. In addition, it is also recommended that SS-39 LTM activities be suspended pending NMED review of the supplemental RFI report.

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LIST OF ACRONYMS, SYMBOLS AND ABBREVIATIONS

%	percent
µg/L	micrograms per liter
AFB	Air Force Base
AFCEE	Air Force Center for Engineering and the Environment
bgs	below ground surface
DPT	direct push technology
DQO	data quality objective
ERP	Environmental Restoration Program
HGL	HydroGeoLogic, Inc.
HHMSSL	Human Health Medium Specific Screening Level
IRFNA	inhibited red fuming nitric acid
IWFNA	inhibited white fuming nitric acid
LTM	long term monitoring
MCL	maximum contaminant level
mg/L	milligrams per liter
NFA	no further action
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NMGWQ	New Mexico Groundwater Quality
PCE	tetrachloroethene
PVC	polyvinyl chloride
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RFI	RCRA Facility Investigation
SSL	soil screening levels
SWMU	Solid Waste Management Unit
TAL	target analyte list
TCE	trichloroethene
TDS	total dissolved solids
TRPH	total petroleum hydrocarbons

LIST OF ACRONYMS, SYMBOLS AND ABBREVIATIONS (continued)

UDMH	unsymmetrical dimethylhydrazine
USACE	U.S. Army Corps of Engineers
USAF	U.S. Air Force
USDA	U.S. Department of Agriculture
U.S. EPA	U.S. Environmental Protection Agency
VOC	volatile organic compound

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1.0 INTRODUCTION

This July 2007 and January 2008 Semi-Annual Groundwater Monitoring Report documents the results of the third and fourth semi-annual groundwater sampling events conducted at Holloman Air Force Base (AFB) Environmental Restoration Program (ERP) sites DP-30/SD-33 (Solid Waste Management Unit [SWMU] 113B, the Grease Trap/Cooking Grease Disposal Pits) and SS-39 (SWMUs 165, 167, 177, 179, and 181, the Missile Fuel Spill Area). These SWMUs, with the exception of SWMUs 165 and 167, are identified in Holloman AFB's Hazardous Waste Facility Resource Conservation and Recovery Act (RCRA) Permit No. NM6572122244 as SWMUs Requiring Corrective Action on Appendix 4-A Table A. SWMU 165, the Building 1176 Pond, and SWMU 167, the Test Sled Area Collection Basin, are on Appendix 4-A Table B, SWMUs Not Currently Requiring Corrective Action. According to the table, SWMU 165 was "no further actioned (NFA'd) in February 2001", and SWMU 167 was identified by the U.S. Environmental Protection Agency (U.S. EPA) "in 1988 as a SWMU without requiring further corrective action".

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Holloman AFB is situated in south-central New Mexico, in the northwest-central part of Otero County, about 75 miles northeast of El Paso, Texas, and about seven miles west of Alamogordo, New Mexico. The Base occupies about 50,000 acres in the northeast quarter of section Township 17 South, Range 8 East. Additional land extending northward is occupied by the White Sands Missile Range testing facilities. A facility location map is provided as Figure 1.1. The locations of DP-30/SD-33 and SS-39 with respect to the surrounding area, are shown on Figure 1.2.

1.1 PURPOSE/TYPE OF MONITORING

In the 1990s, remedial investigations (RIs) were conducted at DP-30/SD-33 and SS-39 followed by biennial Long Term Monitoring (LTM). A supplemental RCRA Facility Investigation (RFI) work plan (HGL, 2005a) was submitted to NMED in July 2005 to address additional characterization requirements at these sites. Upon review of the RFI work plan, NMED responded (NMED, 2006) that semi-annual groundwater monitoring would be required

at DP-30/SD-33, and a minimum of two years of semi-annual groundwater monitoring would be required at SS-39 in addition to the supplemental RFI activities proposed in the work plan. The supplemental RFIs were conducted at DP-30/SD-33 and SS-39 in 2005 and 2006 with the results submitted in RFI reports to NMED in July 2007 (HGL, 2007). The results of the first two semi-annual groundwater monitoring events for both sites, completed in July 2006 and January 2007, were included within these reports, which are currently under NMED review.

1.2 SITE BACKGROUND INFORMATION

1.2.1 DP-30/SD-33 (SWMU 113B)

ERP sites DP-30 (Grease Trap Disposal Pits) and SD-33 (Cooking Grease Disposal Pits) are located in the southeastern portion of Holloman AFB, northwest of the airfield and Sabre Road and west of the fire department training area. DP-30 and SD-33 are located on opposite sides of an unpaved and unnamed service road, approximately 15 feet apart. The unnamed service road connects the two sites to Sabre Road and provides vehicle access. The area North of DP-30/SD-33 is restricted. Several highly restricted buildings are located near the two sites; consequently, unauthorized access to the DP-30/SD-33 area is prohibited.

DP-30 and SD-33 are currently unpaved, undeveloped, and moderately vegetated with shrubs, grasses, and cacti. An aerial photograph of the two sites is presented as Figure 1.3. DP-30 is located immediately north of the unpaved service road and encompasses approximately 0.76 acres. Several linear depressions, most likely remnants of former disposal and site investigation trenches, cross the site in primarily northwest-southeast and secondary northeast-southwest orientations. SD-33 is located south of the unpaved service road and encompasses approximately 0.17 acres. A semi-circular shaped soil berm, approximately 4 feet high and 50 feet long and composed primarily of reworked native soil, is located along the northern edge of SD-33. Several metal signs indicate the area was a former disposal unit. As with ERP site DP-30, several linear depressions, most likely remnants of former disposal and site investigation trenches, cross the site in a northwest-southeast orientation.

From 1972 to 1979, shallow trenches were dug at DP-30 and reportedly received wastes from base grease traps and oil/water separators, as well as grit from the wastewater treatment system. The personnel who conducted disposal activities from 1980 to 1988 indicated that the pits were used for oil-water separator sludge disposal. Bioenvironmental Engineering personnel identified site SD-33 as the disposal site for cooking grease from base kitchens.

The RFI currently under NMED review concluded that the waste residual at DP-30, now dessicated, contains oil and grease, some metals, PCB1254, trichloroethene (TCE), and xylenes above NMED Soil Screening Levels (SSLs). Toxicity characteristic leaching potential analysis of the waste residual indicated it was non-hazardous. Groundwater beneath and immediately downgradient of the site has been impacted with TCE, most likely originating from several trenches within the south-central portion of DP-30. TCE concentrations in the groundwater (maximum historical concentration of 150 micrograms per liter [$\mu\text{g/L}$]) have been decreasing since LTM began in 1995, indicating that DP-30 is not acting as a continuing source of groundwater contamination. Natural total dissolved solid (TDS) concentrations of

the groundwater are well above 10,000 milligrams per liter (mg/L), the threshold at which groundwater standards no longer apply.

At SD-33, only oil and grease were detected above SSLs in the desiccated waste residual, indicating that the material was likely composed solely of cooking grease.

1.2.2 SS-39 (SWMUs 165, 167, 177, 179, 181)

Site SS-39, the Missile Fuel Spill Area, is located in the central portion of Holloman AFB at the test sled launch area, at Building 1176, and along the northern slope of the Lost River drainage basin. A site layout map is provided as Figure 1.4.

The central portion of the slope to the Lost River is moderately hummocky in topography. Steeply incised rills and drainage swales are present throughout the area, trending in a north-south orientation toward the Lost River. Vegetation consisting of salt cedars, shrubs, grasses, and cacti are present throughout this area. Near the base of the slope, the slope dip decreases until nearly flat with an overall southerly dip toward the center of the drainage basin. Vegetation, primarily grasses and shrubs, are present to the edge of the basin. The edge of the basin typically marks the high water level during and immediately after heavy rainstorms. An unpaved service road parallels the basin edge providing access to the lower portion of the site.

The launch pad at the south end of the sled test track was constructed with a concrete collection basin (SWMU 167) and a water deluge system. Spilled oxidizers and fuels were delivered to separate drains, diluted with water, and flushed into the Lost River. In 1975, catch basins were installed to collect the spilled liquid fuels (Discharge Box, SWMU 179). Oxidizer vent lines from the engines were also installed and designed to discharge into the catch basins. Since 1975, no propellants have been intentionally released to the open drains. Surface and groundwater samples were collected from the Lost River in the vicinity of the test track in July of 1979. The results indicated that the test track had no observable impact upon the Lost River water quality. Waste propellants are currently collected, treated, and disposed in the treatment system located in Building 1176.

Fueling activities for tests at the Alpha Pad were completed on the track at the Alpha Pad before each sled launch. The fuels were brought on location by truck, because no fuels were stored at the launch facility. Before sleds were removed from the track, the fuels were emptied from the sleds into the proper storage container (a process called de-tanking) and then the sleds were taken to Building 1176 where the remainder of the fuel was purged from the engines. Throughout the history of the test track, fuels have included at least the following: JP-4 (jet fuel); unsymmetrical dimethylhydrazine (UDMH); aniline; inhibited red fuming nitric acid (IRFNA); inhibited white fuming nitric acid (IWFNA); liquid oxygen; JPX (1:1 mixture of JP-4 and UDMH); dyes; solid rocket propellants; and other compounds. In addition to these fuels, solvents such as TCE were commonly used for sled maintenance in Building 1176. The drainage systems for the Alpha Pad and Building 1176 were designed to prevent accidents in the event of a fuel spill during the fueling and/or de-tanking activities. Extreme precautions were necessary when handling fuels because of the reactive nature of potentially incompatible fuel types and the stringent safety precautions associated with the launch operations in general.

Thus, the drainage systems separately collected and drained spilled oxidizers and propellants. At the test track, fueling and de-tanking of oxidizers were all completed on the east half of the track, and the same was done for propellants on the west half of the track. At Building 1176, two concrete-lined, 1-foot wide drainage troughs (SWMU 181, Drainage Troughs) extend south-southeast and southwestward from the southern corners of the building and discharge to separate sumps (SWMU 177, Drainage Sumps).

The RFI currently under NMED review concluded that shallow soils within and downslope of the Discharge Box, SWMU 179, have been impacted by total petroleum hydrocarbons (TRPH) above NMED SSLs. Soils within the Discharge Box also contained arsenic and lead above SSLs. Soils at depth at SWMU 177, the Drainage Sumps, contain elevated concentrations of TCE, tetrachloroethene (PCE), and TRPH. This is the source of a TCE groundwater plume that extends from this area to the Lost River Basin, the primary subject of this monitoring. Maximum TCE concentrations in the plume are below 500 $\mu\text{g/L}$. Natural TDS concentrations of the groundwater are well above 10,000 mg/L (sometimes upwards of 140,000 mg/L), the threshold at which groundwater standards no longer apply.

FIGURES



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 Site location.mxd
 Revised: 03/19/08 PD
 Map Source: Holloman AFB

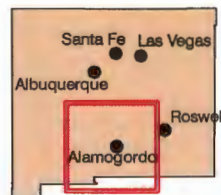
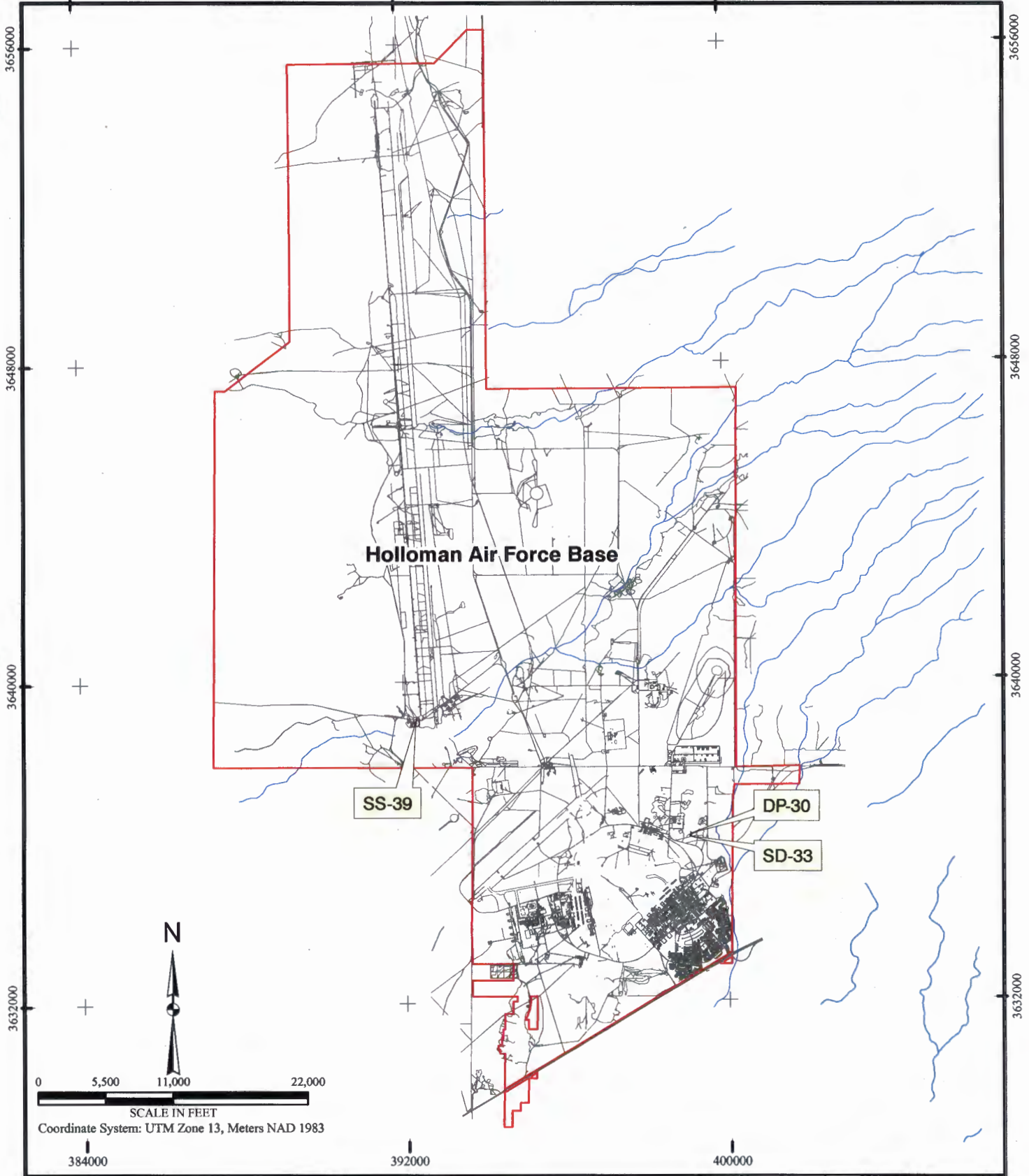


Figure 1.1
Facility Location Map
Holloman AFB



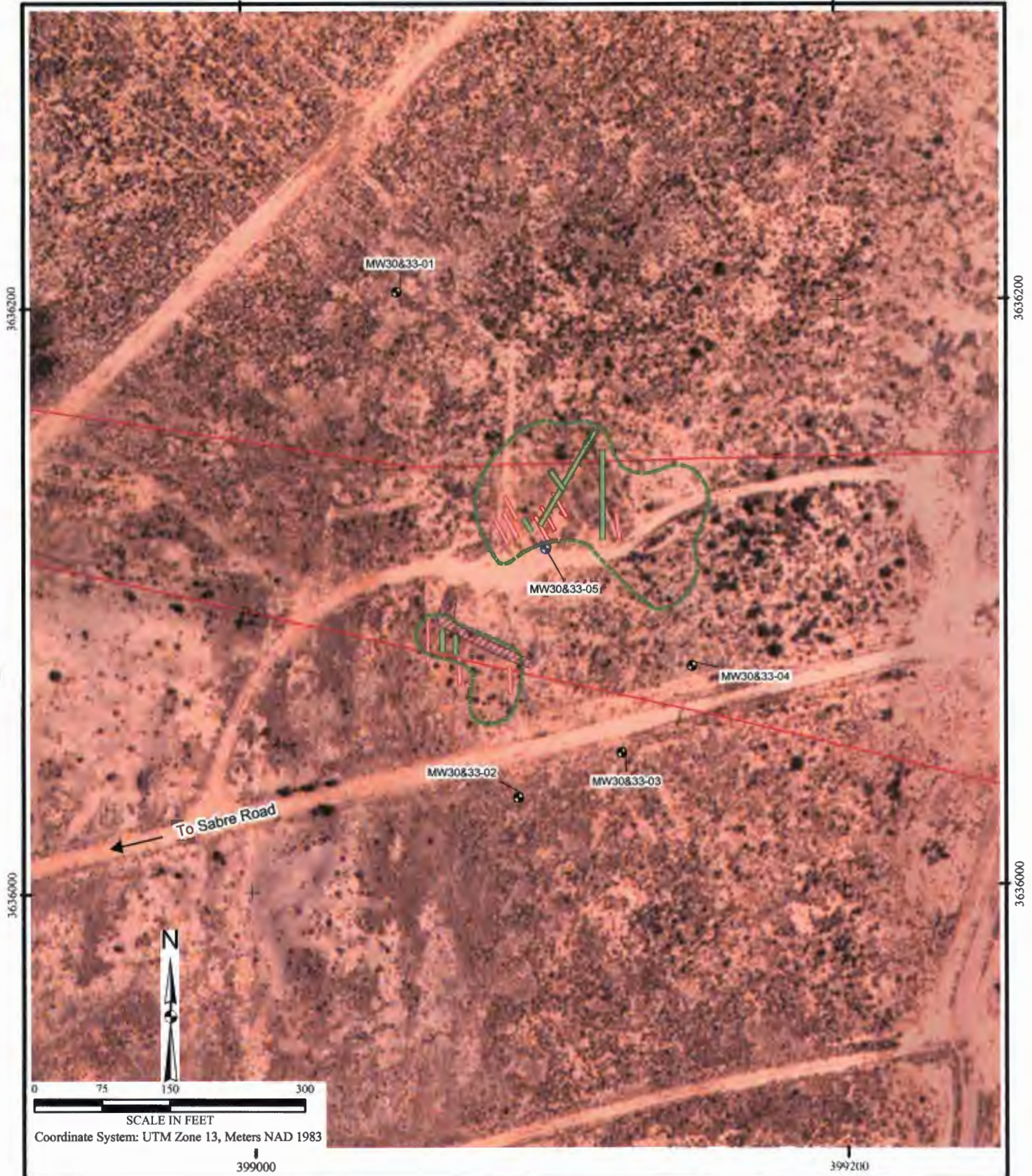
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 Map Source: Holloman AFB



Legend

- Holloman AFB Boundary
- Building/Structure
- Operable Unit Boundary (Approx.)

Figure 1.2
Facility Layout Map
Holloman AFB

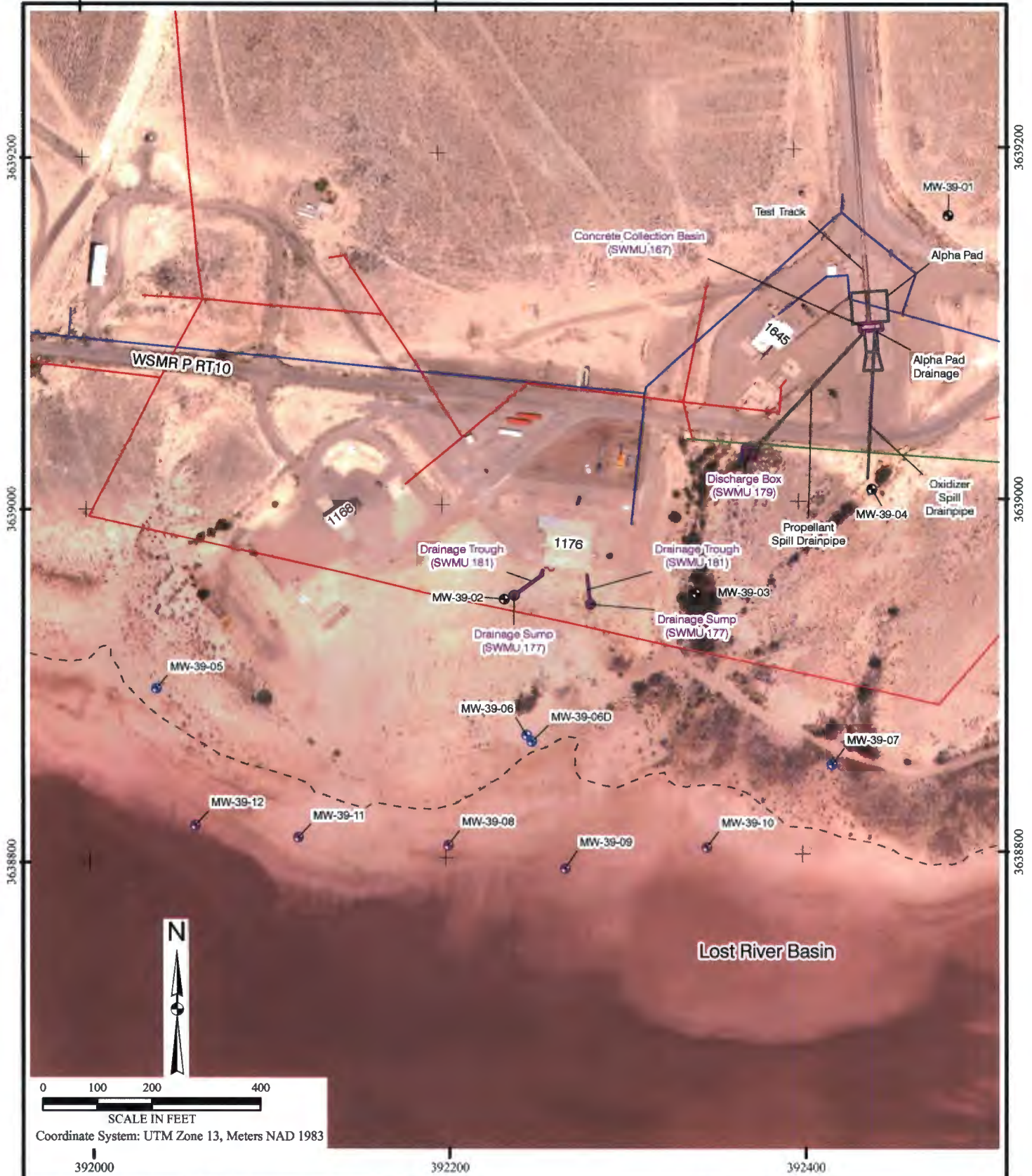


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Legend	
	Supplemental RFI Observed Trenches
	RI Observed Trenches
	Soil Berm
	Buried electric line
	Unit Boundary Implied by Geophysics
	Monitoring Well (Existing)
	Permanent Monitoring Well (Supplemental RFI)

Figure 1.3
DP-30/SD-33
Layout Map



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Legend	
---	Lost River Drainage Basin Boundary
— (red)	Buried electric line
— (blue)	Potable Water
— (green)	Waste Water
— (purple)	SWMU Boundary
● (black)	Monitoring Well (Existing)
● (blue)	Permanent Monitoring Well (Supplemental RFI)
● (purple)	Pre-Pack Monitoring Well (Supplemental RFI)

Figure 1.4
SS-39
Layout Map