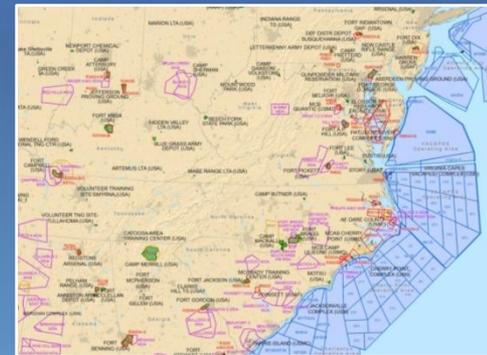
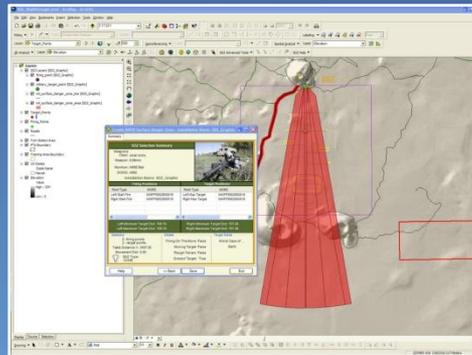
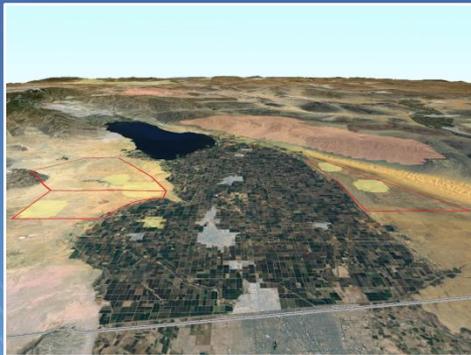


RANGE SUSTAINABILITY

GIS APPLICATIONS AND ENTERPRISE IMPLEMENTATIONS



May 4, 2009

Gabe Lovasz, Geospatial Analyst, ManTech SRS

Molly Rodriguez, Geospatial Analyst, ManTech SRS

-In Support of-

The Office of the Secretary of Defense

Report Documentation Page

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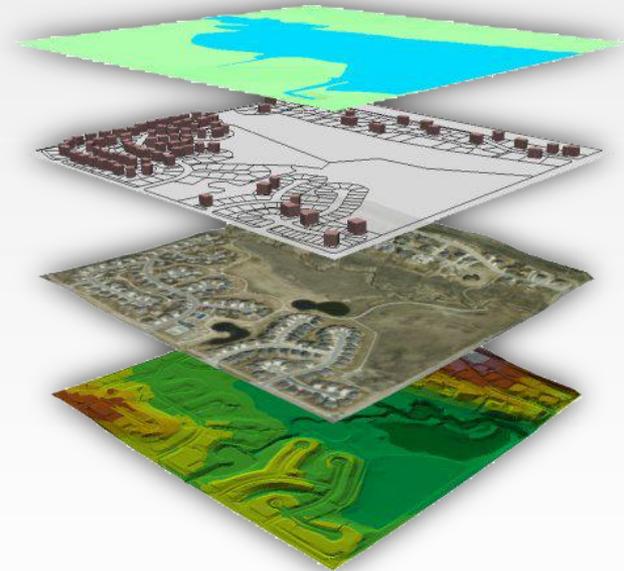
AGENDA

- What is GIS?
- GIS tools for the Range Planner/Operator
- Encroachment Concerns
- Regional Partnerships
- Range Sustainment Efforts (GIS Components)

WHAT IS GIS?

“A geographic information system (GIS) integrates hardware, software, and data for capturing, managing, analyzing, and displaying all forms of geographically referenced information.”

*Environmental Systems Research Institute
(ESRI)*



GIS TOOLS FOR THE RANGE PLANNER / OPERATOR

Desktop Applications

- ESRI's ArcGIS Desktop Suite (Arview, ArcEditor, ArcInfo)
- ESRI's ArcGlobe
- "Spatial Analyst" and "3D Analyst" extensions
- Range Managers Toolkit (RMTK) ArcGIS extension

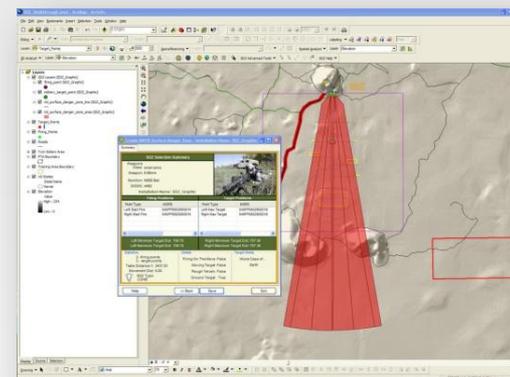
Web-Based GIS

- ArcGIS Server (Army Range Mapper)
- Range Managers Toolkit (RMTK) extension
- Google Earth

RANGE MANAGERS TOOLKIT (RMTK)

Surface Danger Zone (SDZ) Tool

- “Wizard” driven
- Army and Marine Corps weapons inventory
- Supports creation of combined live fire exercise/combined arms exercise ranges

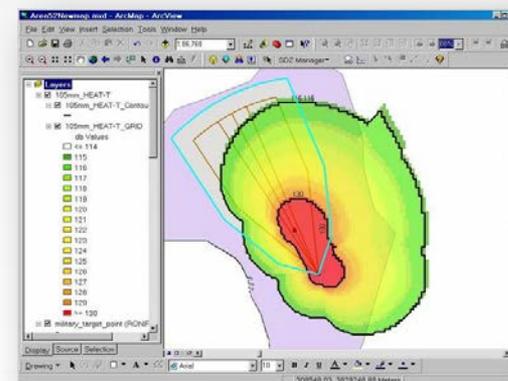


Noise Tool

- Model noise contours based on weapon, munitions, location, and atmospheric condition
- Helps support situational awareness

Weapons Danger Zone (WDZ) Tool

- Air to ground weapons platforms
- Supports rotary, fixed-wing, and unmanned aerial systems



RANGE SUSTAINMENT CONSIDERATIONS

*“The Office of the Deputy Under Secretary of Defense (Installations and Environment) Sustainable Ranges Initiative is charged to develop a comprehensive response to **encroachment** in order to preserve DoD's capability to train and test on its land and sea ranges, operating areas, and airspace.”*

-Sustainable Ranges Initiative

Encroachment Concerns

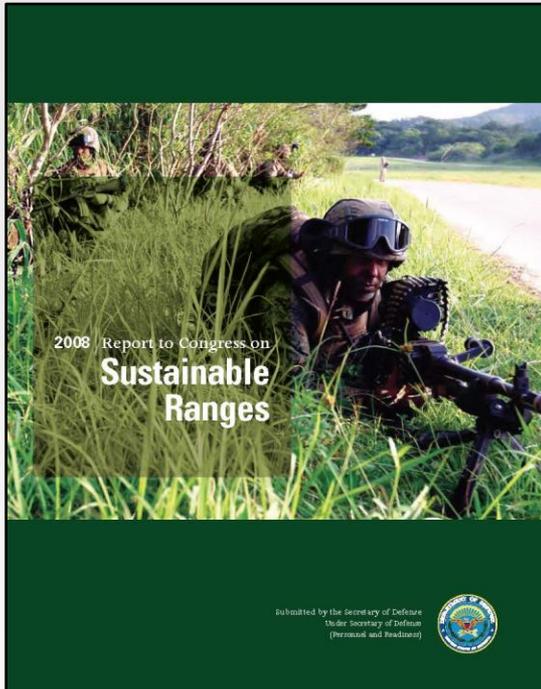
Threatened & Endangered Species/Critical Habitat	Cultural Resources
Airspace	Wetlands
Noise Restrictions	Water Quality/Supply
Adjacent Land Use	Range Transients

REGIONAL PARTNERSHIP EFFORTS

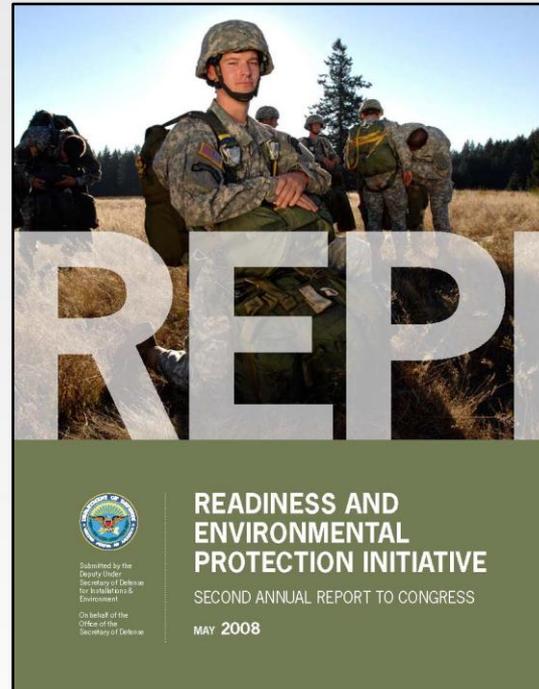
- Encroachment
 - Most encroachment activities outside of DoD fence line.
 - Addressing encroachment difficult to manage and sometimes beyond DoD's reach.
- Value of Regional Partnerships
 - Share GIS and decision-support information.
 - Link efforts with other stakeholders and federal agencies.
 - Support community-driven planning and compatible land use.
 - Promote rural landscapes and working lands at regional scale.
 - Support of readiness mission.



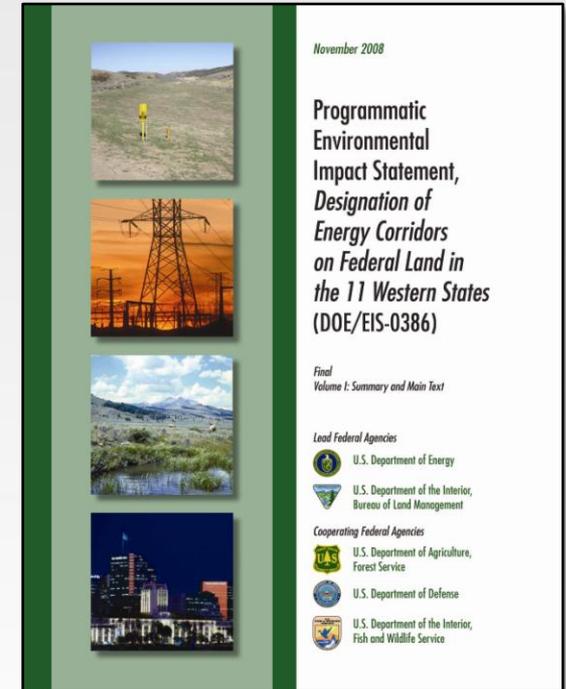
RANGE SUSTAINMENT AND GIS



Report to Congress on Sustainable Ranges



Readiness and Environmental Protection Initiative (REPI)



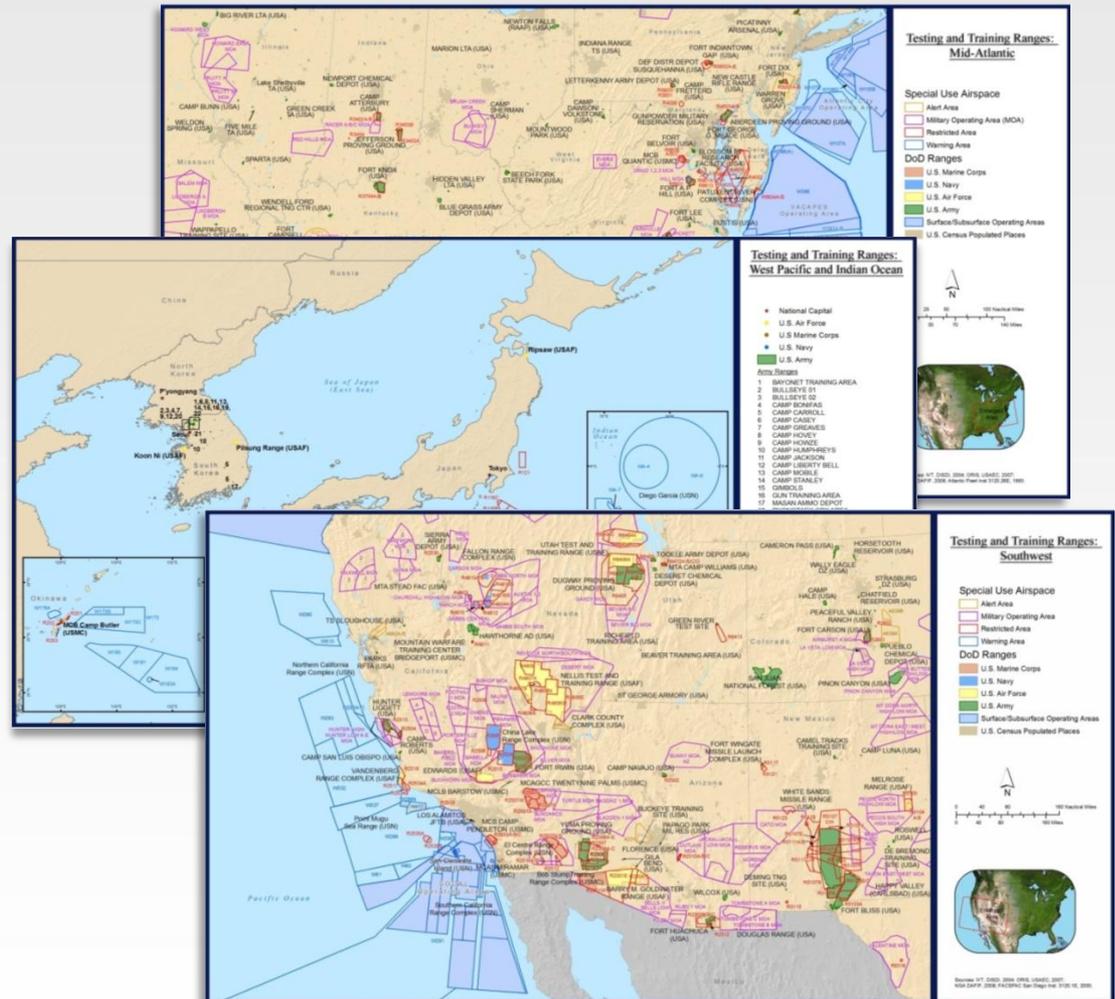
West-wide Energy Corridor PEIS

REPORT TO CONGRESS ON SUSTAINABLE RANGES

- Report Addresses Two Congressional Reporting Requirements Under National Defense Authorization Act (NDAA):
 - Develop a comprehensive plan to address training constraints (FY2003 NDAA, Section 366)
 - Report on the impacts of encroachment (FY2004 NDAA, Section 320)
- GIS Component is the Report Inventory
 - Regional Range and Special Use Airspace (SUA) Maps
 - Tabular Range Inventory
 - SUA Inventory
 - Military Training Route (MTR) Inventory

RANGE AND SPECIAL USE AIRSPACE REGIONAL MAPS

- Maps Include Land Ranges, Airspace, and Ocean Surface/Subsurface Operating Areas
- Land Range GIS data (footprints) from Services
- Airspace GIS data
 - National Geospatial Intelligence Agency (NGA)
 - Digital Aeronautical Flight Information File (DAFIF)

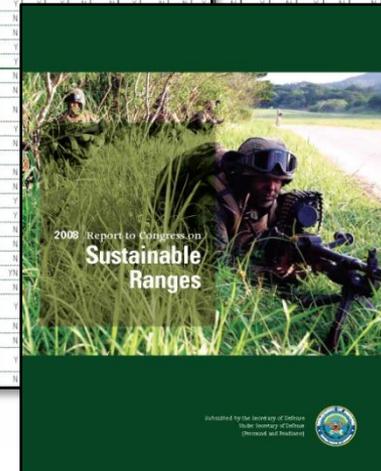


RANGE INVENTORY

- Range Inventory is Compiled from Service Inventories and Geodatabases
- Organized by Service and Contains:
 - Name of range or range complex
 - State/country
 - Size information
 - Range type (air-to-air, air-to-ground)

Military Service	Range Complex	United States (US) or Overseas (OS)	State or Country	Command/Component	Range Description										Range Type																	
					Land Area for Range (acres)		Special Use (Impervious sq. mi)		Sea Surface Area (sq. mi)		Underwater Training Area (sq. mi)		Air to Air or Air to Surface		Air to Ground		Land Impact Area		Land Imp. Range		CZ/VEW		Ocean Operating Area		MDUT		Underwater Training Range		Amphibious Area		Other	
					Land Area	Special Use	Sea Surface	Underwater	Air to Air	Air to Surface	Air to Ground	Land Impact	Land Imp. Range	CZ/VEW	Ocean Operating	MDUT	Underwater	Amphibious	Other													
	Fort Gordon	US	GA	TRADOC	49,149	0	0	0	0	0	N	N	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	Y					
	Camp Grafton	US	ND	TRADOC	11,380	0	0	0	0	0	N	N	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	Y					
	Camp Guernsey	US	WY	ARNG	35,062	46	0	0	0	0	N	N	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	Y					
	Hustler-Light	US	CA	USARC	153,872	113	0	0	0	0	N	N	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	Y					
	Kanikihana MIL RES	US	HI	ARNG	434	0	0	0	0	0	N	N	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	Y					

Military Service	Range Complex	United States (US) or Overseas (OS)	State or Country	Command/Component	Range Description										Range Type																	
					Land Area for Range (acres)		Special Use (Impervious sq. mi)		Sea Surface Area (sq. mi)		Underwater Training Area (sq. mi)		Air to Air or Air to Surface		Air to Ground		Land Impact Area		Land Imp. Range		CZ/VEW		Ocean Operating Area		MDUT		Underwater Training Range		Amphibious Area		Other	
					Land Area	Special Use	Sea Surface	Underwater	Air to Air	Air to Surface	Air to Ground	Land Impact	Land Imp. Range	CZ/VEW	Ocean Operating	MDUT	Underwater	Amphibious	Other													
Marine Corps	MCS Quantico	US	VA	MCDC	68,000	278	0	0	0	0	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	Y				
	MCS Albany	US	GA	MATCOM	4	0	0	0	0	0	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y				
	MCS Barrow	US	CA	MATCOM	2,438	0	0	0	0	0	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y				
	MCMAWTC Bridgeport	US	CA	TECOM	16,888	0	0	0	0	0	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y				
	MCRC Parris Island	US	SC	TECOM	1,309	0	0	0	0	0	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y				
	Atlantic City	US	NJ	CFRC	0	5,585	4,413	4,413	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y				
Navy	Atlantic Test Range (Patuxent River)	US	MD, VA	NAVAIR	5,700	3,461	330	0	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y				
	Atlantic Undersea Test and Evaluation Center (AUTEC)	OS	Bahamas	NAVSEA	0	670	1,320	195	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y				
	Bottom	US	MA	CFRC	12,440	16,099	13,494	13,494	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y				
	Cherry Point	US	NC	CFRC	0	18,719	18,718	18,718	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y				
	China Lake	US	CA	NAVAIR	1,141,200	13,861	0	0	0	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y				
	Daegu Garcia	OS	BIOT	CFR	0	32,662	0	0	0	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y				
	El Centro	US	CA	CFRC	43,948	256	0	0	0	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y				
	Fallow	US	NV	CFRC	232,481	14,182	0	0	0	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y				
	Guantanamo	OS	Cuba	CFRC	0	13,175	13,118	13,118	Y	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y				
	Gulf of Mexico	US	FL, MS, TX	CFRC	10,067	36,365	0	489	17,489	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y				
	Hawaiian Islands	US	HI	CFR	309	55,542	214,638	214,638	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y				
	Jacksonville	US	FL, GA	CFRC	17,229	37,443	158,098	158,098	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y				
	Japan	OS	Japan	CFR	0	16,616	0	0	0	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y				
	Key West	US	FL	CFRC	1	24,812	8,262	8,262	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y				
	Mariana Islands	OS	CMR, Swin	CFR	24,884	8,728	8,698	8,698	Y	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y				
	Naragansett	US	RI	CFRC	0	13,085	27,288	27,288	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y				
	Northern California (NOCA)	US	CA	CFRC	0	19,622	0	0	0	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y				
	Northwest Training Range Complex	US	CA, OR, WA	CFRC	49,674	42,714	128,353	128,353	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y				
Okinawa	OS	Japan	CFR	0	25,050	0	0	0	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y					

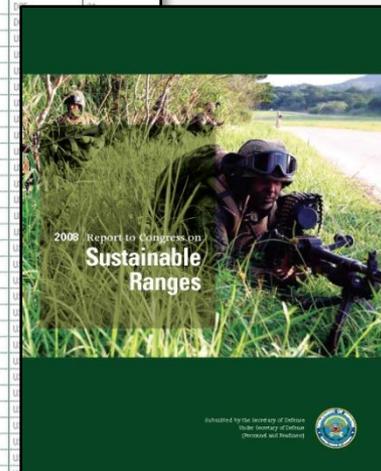


AIRSPACE INVENTORIES

- Special Use Airspace (SUA) and Military Training Route (MTR) Inventories
 - Information comes directly from National Geospatial Intelligence Agency's (NGA) Digital Aeronautical Flight Information File (DAFIF)
 - Service inventories list the airspace names

Military Training Route	Originating Agency*	Scheduling Agency*	Effective Times	Length (NM)**
IR046	347 Rescue Wing, Detachment 1/RO, 8707 North Golf Course St., MacDill AFB, FL 33	347 Rescue Wing, Detachment 1/ROA, 8707 North Golf Course St., MacDill AFB, FL 3	0700-2400 local, daily	171
IR047	347 Rescue Wing, Detachment 1/RO, 8707 North Golf Course St., MacDill AFB, FL 33	347 Rescue Wing, Detachment 1/ROA, 8707 North Golf Course St., MacDill AFB, FL 3	0700-2400 local, daily	67
IR048	347 Rescue Wing, Detachment 1/RO, 8707 North Golf Course St., MacDill AFB, FL 33	347 Rescue Wing		
IR049	347 Rescue Wing, Detachment 1/RO, 8707 North Golf Course St., MacDill AFB, FL 33	347 Rescue Wing		
IR050	347 Rescue Wing, Detachment 1/RO, 8707 North Golf Course St., MacDill AFB, FL 33	347 Rescue Wing		
IR051	347 Rescue Wing, Detachment 1/RO, 8707 North Golf Course St., MacDill AFB, FL 33	347 Rescue Wing		
IR053	347 Rescue Wing, Detachment 1/RO, 8707 North Golf Course St., MacDill AFB, FL 33	347 Rescue Wing		
IR055	347 WG, Detachment 1/RO, 8707 North Golf Course St., MacDill AFB, FL 33621-5205	347 WG, Detachment 1/ROA, 8707 North Golf Course St., MacDill AFB, FL 3		
IR056	347 WG, Detachment 1/RO, 8707 North Golf Course St., MacDill AFB, FL 33621-5205	347 WG, Detachment 1/ROA, 8707 North Golf Course St., MacDill AFB, FL 3		
IR057	16 OSS/DOAA, Harburt Field, FL 32544 DSN 579-7409, C850-884-7409	16 OSS/DOO, Harburt Field, FL 32544 DSN 579-7409, C850-884-7409		
IR059	16 OSS/DOAA, Harburt Field, FL 32544 DSN 579-7409, C850-884-7409	16 OSS/DOO, Harburt Field, FL 32544 DSN 579-7409, C850-884-7409		
IR062	CDMSTRKFRIGHTWINGLANT, Oceana NAS, Virginia Beach, VA 23460 DSN 433-4013, C757-43	FACSFAC VACAP		
IR068	14 OSS/OSOP, Columbus AFB, MS 38910 DSN 742-7560/7633, C862-434-7560/7633	48 FTS, Columbus		
IR067	14 OSS/OSOP, Columbus AFB, MS 38910 DSN 742-7560/7633, C862-434-7560/7633	48 FTS, Columbus		
IR068	14 OSS/OSOP, Columbus AFB, MS 38910 DSN 742-7560/7633, C862-434-7560/7633	48 FTS, Columbus		
IR070	14 OSS/OSOP, Columbus AFB, MS 38910-5000 DSN 742-7560/7633, C862-434-7560/7633	48 FTS, Columbus		
IR077	FACSFAC, Pensacola, FL 32508-5217 DSN 922-2735, C850-452-2735	Same as Originat		
IR078	FACSFAC, Pensacola, FL 32508-5217 DSN 922-2735, C850-452-2735	Same as Originat		
IR079	FACSFAC, Pensacola, FL 32508-5217 DSN 922-2735, C850-452-2735	Same as Originat		
IR080	FACSFAC, Pensacola, FL 32508-5217 DSN 922-2735, C850-452-2735	Same as Originat		
IR081	FACSFAC, Pensacola, FL 32508-5217 DSN 922-2735, C850-452-2735	Same as Originat		
IR082	FACSFAC, Pensacola, FL 32508-5217 DSN 922-2735, C850-452-2735	Same as Originat		
IR083	FACSFAC, Pensacola, FL 32508-5217 DSN 922-2735, C850-452-2735	Same as Originat		

2007 SUA Name	Controlling Agency	Range Complex/Installation Name	Upper Altitude	Lower Altitude	Military Service*	Area (nm ²)
R480N	FAA, LOS ANGELES ARTCC	Nellis AFB	UNTD	SURFACE	DOE	1,280
R480S	FAA, LOS ANGELES ARTCC	Nellis AFB	UNTD	SURFACE	DOE	1,280
R480F	FAA, LOS ANGELES ARTCC	Nellis AFB	UNTD	SURFACE	DOE	1,280
R4001A	FAA, WASHINGTON DC ARTCC	Aberdeen Proving Ground	UNTD	SURFACE	US	
R4001B	FAA, WASHINGTON DC ARTCC	Aberdeen Proving Ground	010000AMSL	SURFACE	US	
R2101	FAA, ATLANTA ARTCC	Anniston Army Depot	000000AMSL	SURFACE	US	
R2101	FAA, SALT LAKE CT Y ARTCC	Boise	FL20	SURFACE	US	
R2300	FAA, CAFFE APP	Camp Edwards	000000AMSL	SURFACE	US	
R4201A	FAA, MINNEAPOLIS ARTCC	Camp Grayling	FL20	SURFACE	US	
R4201B	FAA, MINNEAPOLIS ARTCC	Camp Grayling	000000AMSL	SURFACE	US	
R4201C	FAA, MINNEAPOLIS ARTCC	Camp Grayling	000000AMSL	SURFACE	US	
R7000A	FAA, DENVER ARTCC	Camp Gurnsey	000999AMSL	SURFACE	US	
R7000B	FAA, DENVER ARTCC	Camp Gurnsey	022500AMSL	08000AMSL	US	
R7000C	FAA, DENVER ARTCC	Camp Gurnsey	FL300	23500AMSL	US	
R605	FAA, ATLANTA ARTCC	Camp Merrill	000700AGL	SURFACE	US	
R4301	FAA, MINNEAPOLIS ARTCC	Camp Riley	FL270	SURFACE	US	
R2504	FAA, OAKLAND ARTCC	Camp Roberts	015000AMSL	SURFACE	US	
R2401A	FAA, MEMPHIS ARTCC	Chaffee	FL300	SURFACE	US	
R2401B	FAA, MEMPHIS ARTCC	Chaffee	FL300	SURFACE	US	
R2401C	FAA, MEMPHIS ARTCC	Chaffee	FL300	SURFACE	US	
R4012A	FAA, BOSTON ARTCC	Devens Reserve Forces Training Area	000999AMSL	SURFACE	US	
R4012B	FAA, BOSTON ARTCC	Devens Reserve Forces Training Area	000999AMSL	02000AMSL	US	
R2300A	FAA, ALBUQUERQUE ARTCC	Florence Training Site	010000AMSL	SURFACE	US	
R2300B	FAA, ALBUQUERQUE ARTCC	Florence Training Site	017000AMSL	10000AMSL	US	
R2300C	FAA, ALBUQUERQUE ARTCC	Florence Training Site	FL350	17000AMSL	US	
HILL MDA, VA	FAA, POTOMAC APP	Fort A P Hill	003000AMSL	SURFACE	US	
R6601	FAA, RICHMOND TWR	Fort A P Hill	000500AMSL	SURFACE	US	
BENNING MDA, GA	FAA, COLUMBUS TWR	Fort Benning	000800AMSL	00500AGL	US	
R3002A	FAA, ATCT, COLUMBUS	Fort Benning	004000AMSL	SURFACE	US	
R3002B	FAA, ATCT, COLUMBUS	Fort Benning	000800AMSL	04000AMSL	US	
R3002C	FAA, ATCT, COLUMBUS	Fort Benning	014000AMSL	08000AMSL	US	
R3002D	FAA, ATCT, COLUMBUS	Fort Benning	000800AMSL	SURFACE	USA	79

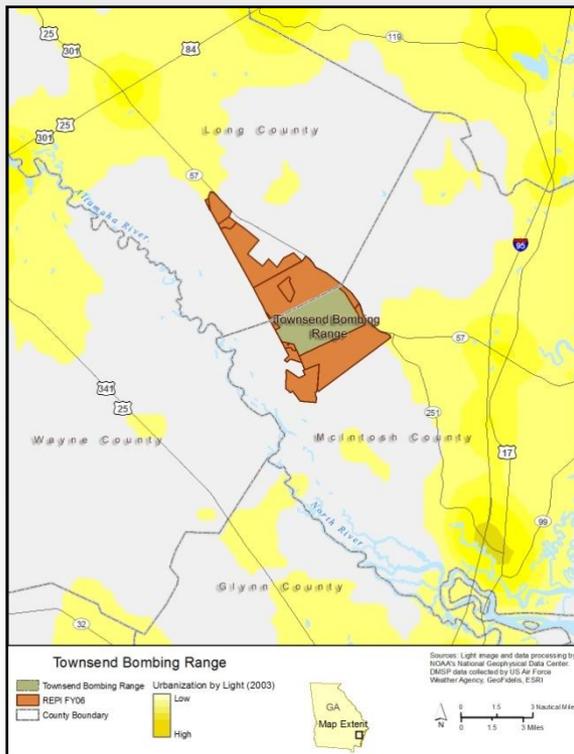


READINESS ENVIRONMENTAL PROTECTION INITIATIVE (REPI)

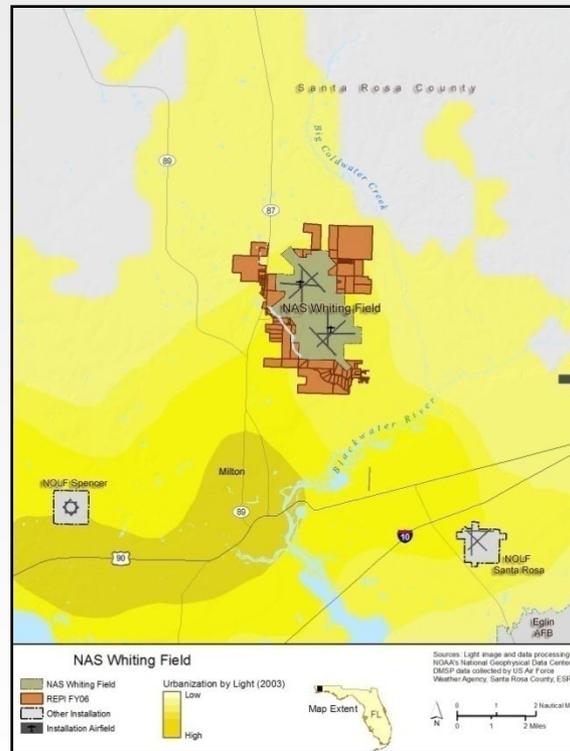
- Supports Compatible Land Use and Conservation Initiatives at Ranges and Installations
- Section 2864(a) FY2004 NDAA
 - Allows the Services to enter into agreements with private conservation organizations or with state and local governments
 - Allows the Services to cost-share acquisition of restrictive/conservation easements from willing sellers
- Serves Several Purposes
 - Protect land for conservation purposes
 - Limit incompatible development around ranges and installations

USE OF GIS IN THE REPI REPORT

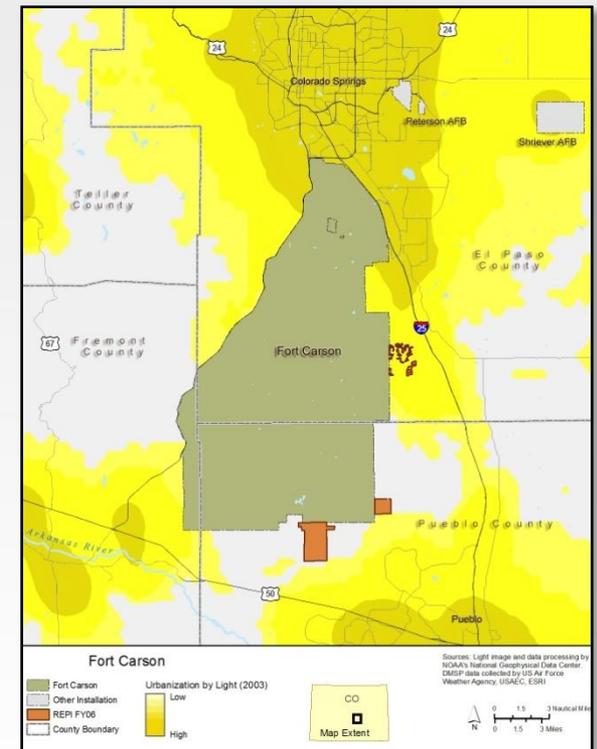
- GIS Component
 - Maps of the installation/range and the parcels acquired with REPI funds



Townsend Bombing Range USMC

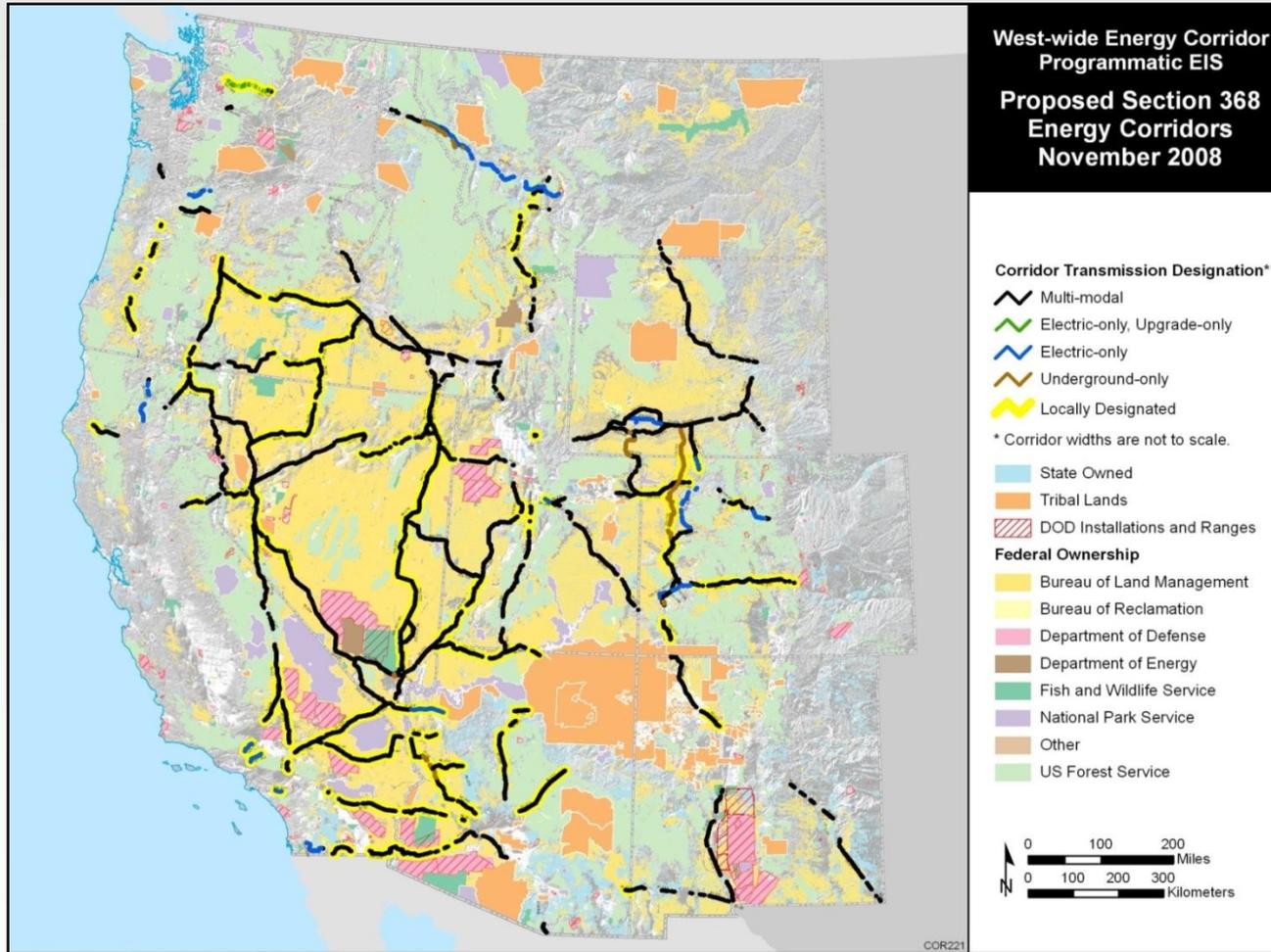


NAS Whiting Field (USN)



Fort Carson (USA)

WEST-WIDE ENERGY CORRIDOR PEIS



Energy Act 2005
Section 368:

- Designation of energy corridors on federal land in 11 Western states
- Oil, gas, hydrogen pipelines & electrical transmission lines

WEST-WIDE ENERGY CORRIDOR PEIS

- GIS was an Integral Part of Energy Corridor Designation Process
 - Used to plan location of proposed corridors

- Range Sustainment Perspective
 - Corridor locations relative to ranges and installations
 - Cross low-level (1,000ft) Special Use Airspace (SUA) and Military Training Routes (MTRs)

- Provided GIS Data to Dept. of Energy
 - DoD ranges and installation boundaries
 - Low-level Special Use Airspace and Military Training Routes

ENERGY CORRIDOR GIS ANALYSIS

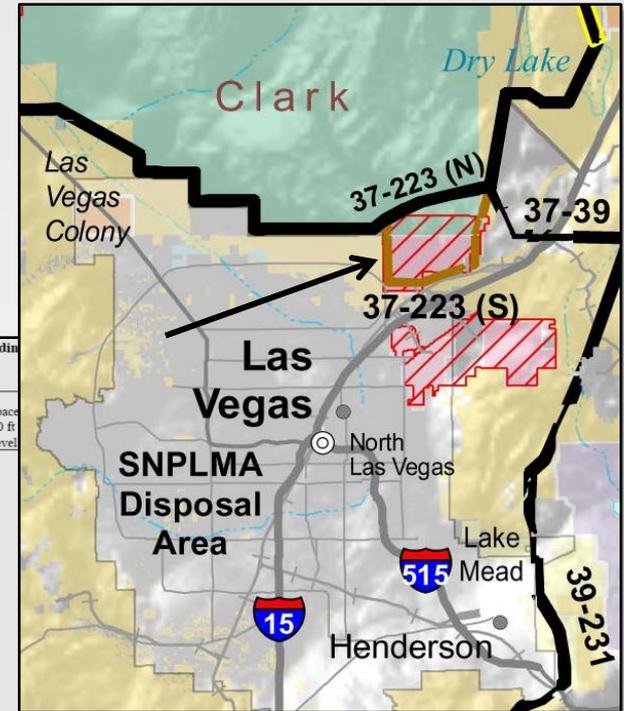
- Identified Intersections
 - Energy corridor and range/installation boundaries, and low-level airspace
 - Is training impacted?

- Land Intersections
 - Worked with Services

- Airspace Intersections
 - DoD comments in
 - GIS attribute table
 - Appendix L of Final EIS

TABLE L-1 Proposed Energy Corridors That Would Require DOD Coordination
Project Planning^a

State	Corridor	Military Training Route with Floor <1,000 ft above Ground Level	Special Use Airspace with Floor <1000 ft above Ground Level			
Arizona	30-52	X				
	41-46	X				
	46-269	X				
	46-270	X				
	61-207	X				
	62-211	X				
	68-116	X				
	113-116	X				
	115-208	X				
	115-238	X				
	116-206	X				
California	234-235	X				
	3-8	X				
	6-15	X				
	8-104	X				
	15-104	X			X	
	16-104	X			X	
	18-23	X		X	X	
	23-25	X		X	X	
	23-106	X		X	X	
	27-41	X		X	X	
	27-225	X		X	X	
	27-266				X	X
	30-52	X				X
	101-263	X				
108-267	X					
115-238	X				X	
261-262	X					
264-265	X					
Colorado	87-277	X				
	29-36				X	
Idaho	36-228		X		X	
	49-112	X				
Nevada	15-17	X				
	15-104	X				



Nellis Small Arms Range

MORE INFORMATION

Environmental Systems Research Institute (ESRI)

<http://www.esri.com/>

Western Regional Partnership (WRP)

<http://www.wrpinfo.org>

Southeast Regional Partnership for Planning and Sustainability

<http://www.serppas.org/>

2008 Readiness Environmental Protection Initiative (REPI) Report and 2008 Report to Congress on Sustainable Ranges

<https://www.denix.osd.mil/portal/page/portal/denix/range/Home>

West-Wide Energy Corridor PEIS

<http://corridoreis.anl.gov/>

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