
Wyoming State Geological Survey
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**WYOMING MULTI-HAZARD FLOOD
MAP MODERNIZATION STATE
BUSINESS CASE PLAN
FY 2004-2008**

By

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Prepared for:

Federal Emergency Management Agency
Wyoming Office of Homeland Security/Emergency Management
National Flood Insurance Program



WYOMING STATE GEOLOGICAL SURVEY

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Management**

National Flood Insurance Program

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1.0 Executive Summary

The Wyoming Multi-Hazard Flood Map Modernization Business Case Plan (2004-2008) defines the role of the State of Wyoming with Flood Map Modernization Program activities in the State. The State of Wyoming will begin participation in the Multi-Hazard Flood Map Modernization Program at a mid-level. With a mid-level of participation, the State will perform a majority of the mapping needs assessment and assist with outreach and community coordination on mapping projects. However, the State will not manage or perform any flood mapping activities. The FEMA Regional Office will manage all mapping activities based upon input provided by the State.

Nineteen counties have been proposed for Phase II map updates. FEMA has a goal of reducing the average age of FIRMs to 6 years. Currently, only 5% of all FIRMs are 6 years or less in age. Slightly more than 2% of unincorporated area FIRMs and approximately 21% of incorporated area FIRMs are six years or less in age. Total project costs for mapping (FFY2004-FFY2008) are \$ 5,665,000.

The Geologic Hazards Section at the Wyoming State Geological Survey will develop a Flood Mapping Coordination Program with funding provided by FEMA through the Wyoming Office of Homeland Security/Emergency Management. The Head of the Geologic Hazards Section will assume the responsibilities of program management as an assistant is trained. \$50,000 per year will be required for personnel, travel, supplies, and overhead. The State of Wyoming will provide up to a 25% in-kind match for the program. Total project costs for program management, website development, outreach, and coordination (FFY2004-FFY2008) are \$250,000.

Total FEMA project costs, if funded as proposed, are \$5,915,000.

2.0 Map Modernization History in Wyoming

2.1 History of State Involvement in Map Modernization

The State of Wyoming has had a minimal role in Flood Map Modernization activities until 2002, at which time the Wyoming State Geological Survey (WSGS) and the Wyoming Office of Homeland Security/Emergency Management (WOHS/EM), which was formerly the Wyoming Emergency Management Agency (WEMA), developed the Map Modernization Plan for Wyoming.

Prior to the development of the Map Modernization Plan, WOHS/EM would annually canvass all jurisdictions to determine mapping needs. The jurisdictions that felt they had a need for mapping would fill out a mapping request form and submit it to WOHS/EM for review. All acceptable mapping request forms were sent to FEMA. FEMA would then determine mapping priorities based upon agency knowledge of need and other factors, with input requested from the State and local jurisdictions as needed.

FEMA's Cooperating Technical Partners (CTP) program is designed to create partnerships between FEMA and participating NFIP communities. Currently, there are six CTP communities in Wyoming: Douglas (1998), Lincoln County (1999), Jackson (2000), Sundance (2001), Laramie County (2002), and Teton County (2003). The State of Wyoming is not yet a CTP. Historically, FEMA has negotiated directly with CTP communities on mapping projects, with minimal State involvement.

2.2 History of FIRM Mapping in Wyoming

There are currently 417 Flood Insurance rate Maps (FIRMs) in Wyoming, ranging in age from 1974 to 2002. An analysis of the number of FIRMs by the year printed on the FIRM is presented in Table 1. FEMA has a goal of reducing the average age of FIRMs to 6 years. Currently, only 5% of all FIRMs are 6 years or less in age. Slightly more than 2% of unincorporated area FIRMs and approximately 21% of incorporated area FIRMs are six years or less in age.

A 10-year history of FIRM mapping in Wyoming is presented in Table 2. Except for the Dubois, Casper, Evansville, and Mills area FIRMs, all maps were included in the analysis for the 2002 Map Modernization Plan for Wyoming. The Casper, Evansville, and Mills FIRMs have been completed and approved, and will be released in mid-2004.

Map Year	Number Incorporated Area FIRMS	Number Unincorporated Area FIRMS	Total Number FIRMS
2002	7	0	7
2001	1	0	1
2000	1	0	1
1999	3	0	3
1998	2	8	10
1997	0	0	0
1996	1	0	1
1995	0	0	0
1994	2	4	6
1993	0	0	0
1992	1	0	1
1991	0	32	32
1990	0	0	0
1989	2	33	35
1988	4	11	15
1987	3	17	20
1986	5	3	8
1985	1	0	1
1984	1	20	21
1983	1	0	1
1982	6	15	21
1981	0	0	0
1980	2	19	21
1979	2	4	6
1978	4	71	75
1977	1	113	114
1976	2	0	2
1975	7	0	7
1974	8	0	8
TOTAL	67	350	417

Table 1: Number of Flood Insurance Rate Maps by Map Age

Year FIRM Completed	Jurisdiction	Panel Number		
1994	Cheyenne	5600300010 5600300005		
	Laramie County	5600290660 5600290655 5600290520 5600290515		
	1996	Laramie	5600200005	
	1998	Rock Springs	5600510005	
		Sheridan County	5600470027 5600470020 5600470013 5600470012 5600470011 5600470005	
Cokeville			5600330001	
Lincoln County			5600320800 5600320785	
			1999	Ranchester
Thermopolis			5600260001	
	East Thermopolis	5600250001		
2000	Green River	5600500005		
2001	Sheridan	5600440005		
2002	Newcastle	5600570027 5600570026 5600570007		
		Dubois	5600183813 5600183794 5600183792 5600183791	
			2004	Casper
	Evansville			
	Mills			

Table 2. 10-Year FIRM History for the State of Wyoming

3.0 Vision for Supporting Multi-Hazard Flood Map Modernization

Historically, flooding is one of Wyoming’s most significant natural disasters. Although the State has had a minimal role in previous map modernization activities, the goal is to increase the level of participation in mapping activities. Enhanced coordination with local jurisdictions is of primary importance. Much of the coordination will be accomplished through enhanced data collection and delivery, effective program management, and an expanded and better informed user community. Better partnerships with local jurisdictions will be achieved through program management and improved communication.

3.1 Current Efforts

3.1.1 Mapping Needs Assessment / Flood Hazard Data

In August, 2002 the WSGS and WOHS/EM generated the Map Modernization Plan for Wyoming. All individual panels were analyzed and ranked based upon map age, mapping status (mapped or unmapped panel), repetitive loss, participation in NFIP, and approximate population increase within 250’, 500’, and 1000’ of each side of all streams in a panel or jurisdiction. A summary of ranking criteria is presented in Table 3.

Map Age		Repetitive Loss	
Age	Ranking	Category	Ranking
0 – 5	0	None	0
6 – 11	3	Loss	1
12 – 17	3.5	Participation in NFIP	
18 – 23	4	Category	Ranking
24 – 29	4.5	Participate	0.5
Unmapped Community		Non- Participate	0
Category	Ranking		
Unmapped	2		
Mapped	0		
Population Increase (by panel)			
Increase (Number of People)	250’ Buffer Distance Ranking	500’ Buffer Distance Ranking	1000’ Buffer Distance Ranking
1 – 20	0.75	0.5	0.25
21 – 50	1	0.75	0.5
51 – 100	1.5	1.25	1
101 – 500	2	1.75	1.5
501 – 1000	2.5	2.25	2
1000 +	3	2.75	2.5

Table 3. FIRM Panel Priority Ranking Scheme

After individual panels were ranked, FEMA determined that a ranking of Counties would be preferable. The WSGS developed a numeric County ranking scheme that was biased towards population. The population within panels ranked 4.75 and higher and within 500' of streams was summed for each county. This sum was used as the overall rank for the county, with the greatest population receiving the highest rank. The list of counties was then divided in three to create a high, medium, and low ranking as shown in Table 4. The next step in the process was to determine map upgrade levels, Level 1 or Level 2, within each county. Level 1 upgrades are improvements to existing maps with no new detailed flood hazard information, and can include converting the maps to a GIS-based digital format. Level 2 upgrades are improvements involving the development of new detailed flood hazard information. The levels were based upon individual panel ranks with various criteria applied to mapped incorporated areas, mapped unincorporated areas, unmapped incorporated areas, and unmapped unincorporated areas.

County Name	Priority Rank	Population within 500' of Streams in Critical Panels	Priority Category
Natrona	1	12,313	High
Teton	2	5,776	High
Laramie	3	5,207	High
Albany	4	3,589	High
Campbell	5	3,322	High
Fremont	6	3,246	High
Uinta	7	2,803	High
Park	8	2,530	High
Converse	9	1,442	Medium
Lincoln	10	1,328	Medium
Big Horn	11	1,221	Medium
Sweetwater	12	1,089	Medium
Sheridan	13	1,069	Medium
Sublette	14	954	Medium
Johnson	15	949	Medium
Platte	16	551	Medium
Goshen	17	471	Low
Carbon	18	402	Low
Washakie	19	338	Low
Crook	20	176	Low
Niobrara	21	169	Low
Hot Springs	22	0	Low
Weston	23	0	Low

Table 4. County Priority Rank

3.1.2 Flood Hazard Mapping

Currently, FEMA and their subcontractors have initiated or will soon initiate a number of mapping projects in Wyoming, as shown in Table 5 (Mr. John Liou, FEMA Region VIII, personal communication). The projects are listed by the Federal Fiscal Year (FFY) project initiation date.

FFY Project Initiation Date	Mapping Area
2001	Sundance (Sundance Creek)
2002	Laramie County (Allison Draw)
2003	Worland (Mary River) Worland (Sage Creek) Teton County (Flat Creek, Snake River)
2004	Kaycee (Powder River)
2004 (Proposed)	Albany County Fremont County Campbell County

Table 5. Current FIRM Mapping Projects by Federal Fiscal Year (FFY)

3.1.3 Probable Future Flood Hazard Mapping Projects (Current List)

FEMA has developed a list of probable future mapping projects for the State of Wyoming (Mr. John Liou, FEMA Region VIII, personal communication). The list was in part based upon the 2002 Wyoming Map Modernization Plan and in part upon analysis conducted by FEMA. The probable mapping projects are as follows:

- Cheyenne Area – Laramie County
- Kemmerer – Lincoln County
- Douglas – North Platte River – Converse County
- Hulett – Crook County
- Thermopolis Area – Hot Springs County

3.1.4 State and Local Activities That Meet or Exceed Minimum

As mentioned in Section 2.0, Wyoming has had minimal involvement with Flood Map Modernization activities. There are no State statutes or ordinances that specifically address floodplain management or map modernization. The following activities, however, meet or exceed the minimum.

Yearly Mapping Needs Questionnaire

The WOHS/EM canvasses all jurisdictions yearly in order to determine mapping needs. All needs are then submitted to FEMA for a final mapping determination

2002 Map Modernization Plan

The first significant effort, beyond soliciting a yearly mapping needs from all Wyoming jurisdictions (WOHS/EM) was the generation of the Map Modernization Plan for Wyoming (WSGS and WOHS/EM). The plan, which is summarized in Section 3, provides a digital and numeric assessment of mapping needs by FIRM panel and by county.

Cooperating Technical Partner Program (CTP)

Five NFIP communities participate in the CTP Program. The communities and the date they joined the program are listed below. A number of studies are in progress.

<u>Community</u>	<u>Date</u>
Douglas, Wyoming	1998
Lincoln County, Wyoming	1999
Jackson, Wyoming	2000
Sundance, Wyoming	2001
Laramie County, Wyoming	2002

Digitizing Existing FIRMs

The Wyoming State Geological Survey has completed scanning, rectifying, and digitizing all existing FIRMs in Wyoming. The digital FIRMs will be supplied to counties as soon as an assessment of digital map quality is completed. Some of the maps were found to have been generated on antiquated bases (15-minute quadrangles or older 7.5-minute quadrangle bases) or on bases that couldn't be recognized (Chugwater, for example). As a result, the digital FIRMs are all qualified with a quality statement.

Q3 FIRMs were re-digitized for all Wyoming counties where the data were available, as there appeared to be quality control problems associated with the existing Q3 data. For example, in the Laramie area, the Q3 flood boundaries did not coincide with Spring Creek. After the WSGS scanned, rectified, and redigitized the maps, digital boundaries and stream boundaries observed on digital topographic maps and digital orthophoto quarter quadrangles (DOQQs) were in much better agreement.

Digital Orthophoto Quarter Quadrangles (DOQQ)

Many older FIRMs are inadequate because they were developed on poor or inaccurate base maps, as mentioned above. In 1994, black and white DOQQs at a scale of 1:12,000 were flown for the State of Wyoming. Although the maps were not immediately available in a georectified format, they were slowly made available and served through many websites. Unfortunately, most current FIRMs in

Wyoming were generated long before the DOQQs were available, as can be seen in Table 1.

In 2000, the State of Wyoming, in cooperation with the US Geological Survey, the US Bureau of Land Management, and many Wyoming counties, funded another flight of Wyoming and the generation of Color Infrared DOQQ's at a scale of 1:12,000. The digital orthophotos should be available for use in mid-2004. The use of color infrared images will allow for ease in the delineation of flood boundaries. The photography will be served on State or University of Wyoming websites.

Floodplain Administrator Questionnaire

In October, 2003, the WSGS generated a questionnaire for all floodplain administrators that was designed to address the following items:

Contact Information

Computer and Software Capabilities

Business Plan Input

Need for Flood Map Coordinator Program

Need for Website of FIRMs, Flood Data, Community Profiles

Need for Website for Posting and Answering Questions

Current, Planned, and Wish-List Flood Mapping Projects

Workshop Needs

Flood Data Available

Flood Data Needs

All available floodplain administrators were contacted by phone, and there was a 74% response rate. In addition, the questionnaire was reviewed at the annual meeting of Wyoming Floodplain Administrators in November, 2003. A summary of responses to question relating to program direction and management are presented below.

Support Creation of Flood Map Coordinator Position:	Yes - 39%
	No - 30%
	Undecided - 31%

Support Creation of Website for Flood Data:	Yes - 79%
	No - 9%
	Undecided - 12%

Support Creation of Open Forum Website:	Yes - 79%
	No - 9%
	Undecided - 12%

A summary of current and proposed mapping projects, by county and community, is presented below in Table 6.

Table 6. Floodplain Administrator Questionnaire Responses – Mapping Projects and Data

County/Town	Current Flood Mapping Projects	Planned Flood Mapping Projects	Flood Mapping "Wish List"	Flood Data on Hand
Albany Co.	None	None	None	Hard Copy and Digitized FIRMs
Laramie	None	None	None	Hard Copy FIRM
Big Horn Co.	Working with the public to help them understand how maps from 1977 are current.		New maps	FIRM maps in both hard copy and digital.
Basin	None	Planning Needed	Basin and area mapping.	No FIRM
Lovell	None	None	None	Hard Copy FIRMs
Campbell Co	None	None	Revised FIRMs in digital format are needed ASAP	Hard Copy FIRMs
Carbon Co.	None	None	Platte River-I-80 to Seminole Res. Update Saratoga, Baggs, and Encampment Maps	Hard Copy FIRMs
Baggs	None	None	Unincorporated Areas	Hard Copy FIRMs
Dixon	None	None	None	Hard Copy FIRMs Stabilization Records for River around Water Facility.
Elk Mountain	None	None	FIRM with Base Flood Elevations	None
Converse Co.	None	Funding	Updated flood maps with elevations	Hard Copy FIRMs
Douglas		Gathering and entering data into GIS to identify each property parcel that is in a floodplain, along with current property elevation and floodplain elevation	Gathering and entering data into GIS to identify each property parcel that is in a floodplain, along with current property elevation and floodplain elevation	Hard Copy FIRMs
Glenrock	None	A new flood map study	A new flood map study	Hard Copy FIRMs Hard Copy COE Study Maps
CrookCo/ Hullett	None	None	None	Hard Copy FIRMs
Crook Co/ Moorcroft	None	None	None	Hard Copy FIRMs
Fremont Co.	None	None	Remap Lander area including Sinks Canyon up to State Park Boundary.	Hard Copy and Digitized FIRMs
Dubois	None	None	None	New DFIRM
Hudson	Clean and remove impediments in the major drainage ditch. Obtain a new map that clearly delineates flood zone areas. Bank stabilization project on the Popo Agie river that is a public health and safety issue. Rework ordinance for flood control if needed to obtain up-to-date forms for determining which structures are already or potentially within flood zone areas.			Hard Copy FIRMs Floodplain Ordinance 1980 Flood Hazard Mitigation Plan 2001
Lander	Properties have been annexed that are not on current FIRMs. Need updated FIRMs.			Hard Copy FIRMs
Shoshoni	None	None	None	Storm Drainage Installed
Goshen Co.	None	None	None	Hard Copy FIRMs
Lingle	Waiting for updated maps	None	None	No FIRM
Torrington	Storm water runoff	Photo mapping/contouring city and planning area	Zone A Study Needed	Storm Sewer Data
Hot Springs Co.	None	Big Horn River through Hot Springs County	Mapping of Owl Creek, Kirby Creek, Cottonwood Creek, and Gooseberry Creek	BOR Inundation Maps for Boysen Dam and Anchor Dam
East Thermopolis	None	None	None	New FIRM
Kirby	None	None	None	County FIRM Maps
Thermopolis	None	None	Hot Springs County	New FIRM

Johnson Co.	There are no maps currently available for Johnson county.	Clear Creek and Powder River	Johnson County	Hard Copy FIRMs for Buffalo and Kaycee
Buffalo	None	None	New city maps	Hard Copy FIRMs
Kaycee	Working with NRCS / COE to establish new updated flood map / watershed project	Have a workable flood map for the town of Kaycee	Flood maps to help prevent building in flood prone areas.	Hard Copy FIRM
Laramie Co.	Allison Draw	Allison Draw and Dry Creek	South Fork of Allison Draw Child Draw	Hard Copy and Digitized FIRMs
Cheyenne	None	Dry Creek and Crow Creek	None	Hard Copy and Digitized FIRMs
Pine Bluffs	None	None	Need floodplain re-evaluated	Hard Copy FIRM (old)
Lincoln Co.	Just finished lower reach of the Salt River in Star Valley, Cokeville, and Freedom.	Upper Reach of the Salt River Municipalities of South Lincoln (Kemmerer, Diamondville, LaBarge)	The remainder of the Green River drainage and the Bear River and South Fork Drainage.	Hard Copy and Digitized FIRMs
Afton	None	None	None	Hard Copy FIRMs
Cokeville	None	If new subdivisions are added, flood maps must be a part of planning	None	Hard Copy FIRMs (new)
Diamondville	None	None	New dikes and mapping	Hard Copy FIRM (old)
Natrona Co.	Natrona County and its jurisdictions are currently involved with FEMA to update the FIRMs	None	Incorporating the new FIRMs into our GIS system	New Digital FIRMs by mid-2004.
Casper	None	None	None	New Digital FIRMs by mid-2004.
Niobrara	Need updated FIRMs	Need updated FIRMs	Update flood maps for Lusk Try to get county signed up for the floodplain program	Hard Copy FIRMs (1986)
Park Co.	None		Add floodplain elevations and floodways to the maps	Hard Copy FIRMs
Cody	Need Cody Mapped	None	None	None
Powell	None	None	None	None
Platte County	Platte County adopted a Flood Ordinance in 2001. Enforcement underway.	Platte County adopted a Flood Ordinance in 2001. Enforcement underway.	More studied areas, specifically around the reservoirs and the town of Wheatland.	Hard Copy FIRMs
Sheridan Co./ Sheridan	None	None	Electronic overlay of the NFIP maps	Elevation certificates in files Hard Copy FIRMs (new)
Sheridan Co./ Dayton	Evacuation in areas in flood zones, evacuations plan	Classify all homes in areas affected by Tongue River	A detailed map that we could refer to when building is occurring in a floodplain	Hard Copy FIRMs (old)
Sublette Co.	None	None	New FIRMs for all Sublette Co.	Hard Copy and Digitized (WSGS) FIRMs
Big Piney	None	None	None	No FIRM
Sweetwater Co./ Rock Springs	Creating a large drainage diversion channel that follows along White Mountain. This will eliminate sheet flow flooding.	Creating a large drainage diversion channel that follows along White Mountain. This will eliminate sheet flow flooding.	Project that will reduce the impact of Bitter Creek on a large number of residential blocks of old houses. See more areas studied	Hard Copy FIRM
Teton Co.	Prepared and submitted digitized FIRMs to FEMA for review	None	None	Digitized FIRMs

Uinta Co.	Town of Mountain View, Bear River, & county surrounding Bear River	Remap the entire county	Remap the entire county	Hard Copy and Digitized FIRMs.
Bear River	None	None	Mapping Bear River bordering the Town of Bear River	Hard Copy Firm (old and inaccurate)
Evanston	None	Remap FIRMs for Bear River	Breach analysis for the Sulfur Creek Reservoir, through Uinta County and Evanston	Hard Copy FIRMs
Lyman	None	None	None	No FIRM
Mountain View	Just completed LOMR	None	Remap Mountain View and one mile around town.	Hard Copy FIRM
Washakie Co.	Big Horn River north and south of Worland. Sage Creek Drainage. Ten Sleep perimeter drainages.	Big Horn River north and south of Worland. Sage Creek Drainage. Ten Sleep perimeter drainages.	Big Horn River near irrigation works. Slick Creek from Big Horn River through Washakie Ten. Ten Sleep Creek from Ten Sleep to Bighorn National Forest.	One sectional map of the outlying area around the City of Worland. Mapping not consistent with Worland mapping.
Worland	Flood mitigation of Sage Creek. Flood Mitigation of Big Horn River.	Remap Sage Creek and Big Horn River.	Remap Sage Creek and Big Horn River.	Hard Copy and Digital FIRMs
Weston	No response			

This data was compiled through the use of a survey that was distributed to floodplain managers in the state of Wyoming over a four month time period. The response rate for this particular survey is 73.75 %. All counties returned at least one survey with the exception of Weston County, which returned none of its surveys.

3.2 Goals

The State of Wyoming will begin participation in the Multi-Hazard Flood Map Modernization Program at a mid-level. With a mid-level of participation, the State will perform a majority of the mapping needs assessment and assist with outreach and community coordination on mapping projects. However, the State will not manage or perform and flood mapping activities. The FEMA Regional Office will manage all mapping activities based upon input provided by the State. The State of Wyoming will strive to increase the level of participation in future years.

Mapping Coordination Program

The State of Wyoming will establish a Mapping Coordination Program at the Wyoming State Geological Survey, with funding for a position and travel supplied through FEMA and WOHS/EM. The Program will coordinate with WOHS/EM on all activities. The funded position will assist in the following items:

- Seek out and acquire, when feasible, flood data, new digital contour base maps, digital photography, and community profile information.
- Generate a digital base map inventory
- Utilize HAZUS MH to generate flood maps using available data

- Coordinate with all communities in Wyoming in regards to Map Modernization and flood data, and determine community mapping needs.
- Coordinate with FEMA on mapping needs.
- Build a partnership among state, federal, local, and private agencies and organizations in Wyoming that will enable Wyoming to accept greater responsibilities in the Map Modernization Program, and will encourage more communities to participate in the CTP Program.
- Establish and maintain a website and database of available flood and base map data.
- Organize and participate in outreach activities, to include mailings, meetings, and multi-media promotional activities.

FIRM Panel Mapping

The State of Wyoming will develop a revised panel and county ranking scheme yearly as needs change and panels are mapped. This Business Plan will be based upon a modification of the Map Modernization Plan for Wyoming. The Wyoming State Geological Survey and the Wyoming Office of Homeland Security/ Emergency Management generated the Map Modernization Plan for Wyoming in August 2002, as discussed in Section 3.1.1. Individual panels were ranked first, and they were then combined into County rankings. The disadvantage of solely using the County ranking scheme is that there may be a few high ranking incorporated area panels in a low or moderate ranking county.

A goal in future panel analysis is to reconsider incorporated area panels that were in a low to moderate ranking county in August 2002. For this reason, Table 7 presents a ranking of incorporated areas by panel rank and by population increase rank. First, incorporated areas were ordered by panel rank, and then all incorporated areas with a population increase rank of 0.0 were deleted from the ranking. In other words, if there were no population increases within 250', 500', or 1000' of streams in an individual panel, the panel was eliminated from further consideration at this time. Many of the panels eliminated from consideration were fairly old, and there may be quality issues associated with the panel that will bring it back into consideration at a later time.

Examples of high ranking individual panels that were incorporated with lower ranking counties are Wheatland (Platte County – Rank 16, Moderate) and Ten Sleep (Washakie County – Rank 19, Low).

The State of Wyoming still agrees with the County panel rankings presented in the Map Modernization Plan for Wyoming. There are some key areas that have been mapped, however, and those areas should be removed from current consideration. For example, key panels for Natrona County have been completed. As a result, Natrona County should no longer be the number one mapping priority for map modernization.

Panel	County Name	Community Name	Mapping Status	Map Date	Map Age (Years)	Average Map Age by County	Population Increase Rank	Panel Flood Map Priority Rank	County Flood Map Priority Rank
5600070005	Campbell	Gillette	Mapped	2/4/1988	14	17.8	2.00	7.00	5
Jackson	Teton	Jackson	Mapped	5/4/1989	13	13.5	2.75	6.75	2
5600300005	Laramie	Cheyenne	Mapped	3/2/1994	8	10.7	2.00	6.50	3
5600430005	Platte	Wheatland	Mapped	4/16/1979	23	24.8	1.50	6.50	16
560045	Sheridan	Dayton	Mapped	9/6/1974	28	9.3	1.50	6.50	13
5600540001	Uinta	Evanston	Mapped	1/15/1988	14	22.9	2.00	6.00	7
5600270001	Johnson	Buffalo	Mapped	4/3/1984	18	23.0	1.50	6.00	15
560041	Platte	Chugwater	Mapped	12/13/1974	28	24.8	1.00	6.00	16
5600050001	Big Horn	Greybull	Mapped	2/19/1980	22	25.0	1.25	5.75	11
5600060001	Big Horn	Manderson	Mapped	4/16/1979	23	25.0	0.75	5.75	11
560055	Washakie	Ten Sleep	Mapped	12/13/1974	28	24.0	0.75	5.75	19
5600190005	Fremont	Hudson	Mapped	7/17/1978	24	24.1	0.50	5.50	6
560059	Big Horn	Cowley	Mapped	9/19/1975	27	25.0	0.75	5.25	11
5600200005	Fremont	Lander	Mapped	1/19/1982	20	24.1	0.75	5.25	6
5600020005	Albany	Laramie	Mapped	10/16/1996	6	24.4	1.50	5.00	4
5600740005	Niobrara	Lusk	Mapped	3/18/1986	16	16.0	1.00	5.00	21
5600130001	Converse	Douglas	Mapped	3/15/1983	19	14.6	0.50	5.00	9
560062	Platte	Glendo	Mapped	8/15/1975	27	24.8	0.50	5.00	16
5600090001	Carbon	Baggs	Mapped	8/16/1988	14	15.8	0.75	4.75	18
5600100001	Carbon	Dixon	Mapped	9/30/1987	15	15.8	0.75	4.75	18
5600660001	Carbon	Medicine Bow	Mapped	6/22/1982	20	15.8	0.75	4.75	18
5600140001	Converse	Glenrock	Mapped	11/15/1985	17	14.6	0.75	4.75	9
5600680005	Lincoln	Afton	Mapped	2/19/1986	16	19.8	0.75	4.75	10
5600950001	Sweetwater	Granger	Mapped	2/26/1980	22	22.0	0.75	4.75	12
5600540002	Uinta	Evanston	Mapped	1/15/1988	14	22.9	0.75	4.75	7
5600920001	Uinta	Mountain View	Mapped	7/4/1989	13	22.9	0.75	4.75	7
5600490001	Sublette	Pinedale	Mapped	3/18/1986	16	24.8	1.00	4.50	14
5600930001	Carbon	Elk Mountain	Mapped	11/4/1987	15	15.8	0.25	4.25	18
5600170001	Crook	Sundance	Mapped	9/30/1992	10	21.0	0.50	4.00	20
5600510005	Sweetwater	Rock Springs	Mapped	7/20/1998	4	22.0	2.75	3.25	12
5600500005	Sweetwater	Green River	Mapped	6/20/2000	2	22.0	2.50	3.00	12
5600440005	Sheridan	Sheridan	Mapped	1/19/2001	1	9.3	2.00	2.50	13
5600460001	Sheridan	Ranchester	Mapped	1/20/1999	3	9.3	1.25	1.75	13
5600250001	Hot Springs	East Thermopolis	Mapped	3/23/1999	3	3.0	1.00	1.50	22
5600570026	Weston	Newcastle	Mapped	4/2/2002	0	6.6	1.00	1.50	23
5600570027	Weston	Newcastle	Mapped	4/2/2002	0	6.6	1.00	1.50	23
5600330001	Lincoln	Cokeville	Mapped	9/21/1998	4	19.8	0.75	1.25	10

Table 7. Incorporated Area Panel Rankings for Panels with a Population Increase (1990 – 2000).

4.0 Needs and Plan/Strategy (for a 5-year period).

4.1 Project Description

The State of Wyoming will begin participation in the Multi-Hazard Flood Map Modernization Program at a mid-level. With a mid-level of participation, the State will perform a majority of the mapping needs assessment and assist with outreach and community coordination on mapping projects. However, the State will not manage or perform any flood mapping activities. The FEMA Regional Office will manage all mapping activities based upon input provided by the State.

The Geologic Hazards Section at the Wyoming State Geological Survey will develop a Flood Mapping Coordination Program with funding provided by FEMA through WOHS/EM. The Head of the Geologic Hazards Section will assume the responsibilities of program management as an assistant is trained. \$50,000 per year will be required for personnel, travel, supplies, and overhead. The State of Wyoming will provide up to a 25% in-kind match for the program.

The Flood Mapping Coordination Program will work in partnership with WOHS/EM and FEMA Region VIII on all aspects of the program. In addition, the WSGS will develop working supportive relationships with the Wyoming Department of Transportation, the Wyoming State Engineer's Office, the U.S. Geological Survey - Water Resources Division in Cheyenne, the Wyoming Water Resources Data System, the National Weather Service, and local engineers and floodplain administrators.

The following work items will be managed in the program:

- Update business plan yearly
- Conduct a survey of all cities and counties, and state and federal agencies, to determine status of digital base mapping, digital contour maps, and digital photography.
- Acquire or link to all possible base maps, contour maps, and digital photography.
- Acquire all possible flood data, flood histories, and community profile information.
- Serve map, history, flood data, and community profile on a WSGS website. A prototype website already has FIRM maps available for viewing, and digitized FIRMs will be available on the site by May, 2004.
- Coordinate with all communities in Wyoming in regards to Map Modernization, and determine community mapping needs. The Floodplain Administrator Questionnaire was the first step in this process. Site visits will be coordinated with administrators.
- Generate flood analyses and preliminary flood boundary maps using HAZUS MH. Compare generated maps with digitized FIRMs to determine quality of both products.
- Encourage community participation in the CTP Program.
- Work with WOHS/EM and FEMA on enhancing the education of floodplain administrators in regards to local hazards and the need for Map Modernization.
- Coordinate with FEMA on mapping needs, and provide input on priority areas.

- Assist FEMA with outreach and community coordination on mapping projects.
- Build a partnership among state, federal, local, and private agencies and organizations in Wyoming that will enable Wyoming to accept greater responsibilities in the Map Modernization Program, and will encourage more communities to participate in the CTP Program.
- Organize and participate in outreach activities, to include mailings, meetings, and multi-media promotional activities.
- Work towards a higher level of participation in the Map Modernization Program.

4.2 Justification

4.2.1 Goal Achievement

The primary goals of Map Modernization are as follows:

- Establish and Maintain a Premier Data Collection and Delivery System
- Achieve Effective Program Management
- Build and Maintain Mutually Beneficial Partnerships
- Expand and Better Inform the User Community

An analysis of how the goals will be achieved is presented below:

Establish and Maintain a Premier Data Collection and Delivery System

A data collection and delivery system is already under development at the Wyoming State Geological Survey. A website that allows users to view FIRMs selected from a Wyoming base map is in the final stages of construction. In addition, all FIRMs in Wyoming have already been scanned, georectified to a current base, and digitized. The digitized FIRMs will be delivered to all counties by mid-March, 2004.

Results of a survey on digital base maps, contour maps, and digital photography will be served on the website. In addition all acquired data will be served or the website will link to data. 1994 digital orthophoto quadrangles are already available online, as are Digital Raster Graphics of current topographic maps. By mid-2004, 2000-vintage digital orthophoto quadrangles should be available online for the entire State. The photography will be served through the Wyoming Geographic Information Advisory Council website and possibly through the Wyoming Geographic Information Science Center at the University of Wyoming.

All other flood data, such as flood histories, will be acquired and served on the website. Community profiles will be presented for all interested communities that wish to showcase their projects.

The Wyoming State Geological Survey has numerous personnel that are experienced with GIS, database management, and website development. The

Geologic Hazards Section has two contract employees, and one state funded (half time) employee experienced with GIS and database development.

Achieve Effective Program Management

Some floodplain administrators in Wyoming need assistance in developing their own programs and in developing local interest. The Flood Mapping Coordination Program will coordinate with all floodplain coordinators in Wyoming to determine mapping needs, encourage increased participation in flood mapping related activities, and encourage coordination with other established coordinators in Wyoming. The Floodplain Administrator Questionnaire was the first effort at encouraging program participation.

The program will be managed through the Wyoming State Geological Survey with strong coordination with WOHS/EM. WOHS/EM has prime responsibility for encouraging local participation in the National Flood Insurance Program, and as such has developed partnerships that will benefit both programs.

The WSGS is responsible for managing many outside programs, such as the Earthquake Program (FEMA) and Statemap (USGS).

Build and Maintain Mutually Beneficial Partnerships

The Flood Mapping Coordination Program will develop partnerships with key personnel at the Wyoming Department of Transportation, the Wyoming State Engineers Office, the US Geological Survey - Water Resources Division in Cheyenne, the Wyoming Water Resources Data System, the National Weather Service, the University of Wyoming, and local engineers and floodplain administrators. The state and federal agencies have already been contacted in regards to serving on an advisory board for Flood Map Modernization.

Communities have historically participated in the CTP Program with minimal coordination with the State of Wyoming. Some communities have expressed concern that a Flood Mapping Coordination Program may have a negative effect on their initiatives. It will be the responsibility of program participants to convince communities that we are there to assist if needed, but not to run local projects. All CTP participants will be encouraged to coordinate with the Flood Mapping Coordination Program in order to eliminate duplication of efforts, however. All communities will be encouraged to become CTP partners.

The Geologic Hazards Section at the WSGS has developed partnerships through other programs, such as the Earthquake Program (FEMA).

Expand and Better Inform the User Community

Outreach activities will be an important part of the Wyoming program. A brochure is already in early development stages. The websites will also serve to

expand and inform the user community. One website will be for data serving and community profiles, and the other will be a forum for questions and answers from floodplain administrators.

The Geologic Hazards Section at the Wyoming State Geological Survey has already developed valuable contacts with the press across Wyoming. Periodic updates to the press will be encouraged from all program participants.

4.2.2 Existing Shortfalls

The Wyoming State Geological Survey will need outside funding to adequately initiate and maintain the Flood Map Modernization Program. Without outside funding, key personnel can not be maintained.

Some floodplain administrators in Wyoming are new to the position, and some have held the position without any significant hands-on activity. Most floodplain administrators in Wyoming hold other positions within their communities, and as such their time to devote to the position and related activities is limited.

4.2.3 Agency Strategic Plan Support

The Wyoming State Geological Survey is a Separate Operating Agency working under the Executive Branch of State Government (W.S. 9-2-801, 9-2-803 through 9-2-810). The Geological Survey's purposes are (1) to study, examine, and seek an understanding of the geology, mineral resources, and physical features of the State; (2) to prepare, publish, and distribute (free or for sale) reports and maps of the State's geology, mineral resources, and physical features; and (3) to provide information, advice, and services related to the geology, mineral resources, and physical features of the State. The agency's stated mission is *to promote the beneficial and environmentally sound use of Wyoming's vast geologic, mineral, and energy resources while helping protect the public from geologic hazards*. By providing accurate information and expanding knowledge through the application of geologic principles, the Geological Survey contributes to economic growth and improvement in the quality of life for Wyoming's citizens.

The following are excerpts for the Agency Strategic Plan, which can be viewed at <http://wsgsweb.uwyo.edu/Admin/StrategicPlan.pdf>.

GOAL II: BETTER PROTECT WYOMING'S CITIZENRY, PROPERTY, AND NATURAL RESOURCES FROM HARM OR DAMAGE ASSOCIATED WITH GEOLOGIC PROCESSES OR GEOLOGIC HAZARDS AND INCREASE THE USE OF GEOLOGIC SCIENCE IN MEETING SOCIETAL NEEDS.

OBJECTIVE II.A: Raise awareness, knowledge, and understanding of the State's geology and geologic hazards, emphasizing ways to avoid or mitigate the potential harm or damage that may result as a consequence of living or developing on or near specific geological features, materials, or terrains.

Strategy II.A.1. Define the geology and geologic hazards in Wyoming and explain the geologic processes and materials that can have or have had an effect on the State's citizenry, property, and natural resources.

Strategy II.A.3. Work to incorporate a consideration of geology, geologic hazards, geohydrology, economic geology, and geologic processes in land management, land-use planning, preparedness, and mitigation documents, and in the siting and design of facilities.

Strategy II.A.4. Evaluate and alert the State and others to development activities where there are geologic or topographic aspects that may adversely affect people, property, and natural resources.

Strategy II.A.5. Enhance and (or) increase the transfer of information and technologies related to geology, geologic hazards, protection of the environment, land management, land-use planning, and the siting and design of facilities.

4.2.4 Identification of Mapping Projects by Year with Projected Costs

Mapping projects by year are derived and updated from the Map Modernization Plan (MMP) for Wyoming. Table 4 shows the County Priority Rank that was proposed in the 2002 MMP. There has been mapping progress, however, and the rankings are now updated to reflect the progress. Natrona County has been remapped, and there is an ongoing project in Teton County. The Teton County project does not include all mapped panels, but many of the panels not included in the current project contain private levees. Private levees can not be certified by FEMA, and as a result the existing panels will remain unchanged (Mr. Dan Carlson, FEMA Region VIII, personal communication). There is an ongoing project along Allison Draw in Laramie County, and the City of Cheyenne/ Laramie County have requested that mapping be accomplished through their CTP agreement with FEMA. As a result, revised County Mapping Priorities are in Table 8 below.

Mapping priorities will be evaluated yearly and incorporated into yearly updates of the Business Plan.

<u>County Name</u>	<u>Priority Rank</u>	<u>Population within 500' of Streams in Critical Panels</u>	<u>Priority Category</u>
Albany	1	3,589	High
Campbell	2	3,322	High
Fremont	3	3,246	High
Uinta	4	2,803	High
Park	5	2,530	High
Converse	6	1,442	Medium
Lincoln	7	1,328	Medium
Big Horn	8	1,221	Medium
Sweetwater	9	1,089	Medium
Sheridan	10	1,069	Medium
Sublette	11	954	Medium
Johnson	12	949	Medium
Platte	13	551	Medium
Goshen	14	471	Low
Carbon	15	402	Low
Washakie	16	338	Low
Crook	17	176	Low
Niobrara	18	169	Low
Hot Springs	19	0	Low
Weston	20	0	Low

Table 8. Revised County Mapping Priorities

As shown in Table 5, Albany, Campbell, and Fremont Counties are planned for mapping by FEMA in FY2004. A summary of county mapping priorities by date for FFY2004 - FFY2008 is presented in Tables 9a –9e below.

<u>County Name</u>	<u>Priority Rank</u>	<u>Priority Category</u>	<u>FEMA Total Cost</u>
Albany	1	High	\$ 801,750
Campbell	2	High	\$ 366,400
Fremont	3	High	\$ 183,200

Total FFY 2004: \$1,351,350

Table 9a. County Mapping Priorities / Costs for FFY 2004

<u>County Name</u>	<u>Priority Rank</u>	<u>Priority Category</u>	<u>FEMA Total Cost</u>
Uinta	4	High	\$ 526,850
Park	5	High	\$ 656,550
Converse	6	Medium	\$ 206,100
Lincoln	7	Medium	\$ 381,700

Total FFY 2005: \$1,771,200

Table 9b. County Mapping Priorities / Costs for FFY 2005

<u>County Name</u>	<u>Priority Rank</u>	<u>Priority Category</u>	<u>FEMA Total Cost</u>
Big Horn	8	Medium	\$ 717,750
Sweetwater	9	Medium	\$ 267,200
Sheridan	10	Medium	\$ 91,600
Sublette	11	Medium	\$ 664,350

Total FFY 2006: \$1,740,900

Table 9c. County Mapping Priorities / Costs for FFY 2006

<u>County Name</u>	<u>Priority Rank</u>	<u>Priority Category</u>	<u>FEMA Total Cost</u>
Johnson	12	Medium	\$ 45,800
Platte	13	Medium	\$ 206,100
Goshen	14	Low	\$ 68,700
Carbon	15	Low	\$ 206,150

Total FFY 2007: \$ 526,750

Table 9d. County Mapping Priorities / Costs for FFY 2007

<u>County Name</u>	<u>Priority Rank</u>	<u>Priority Category</u>	<u>FEMA Total Cost</u>
Washakie	16	Low	\$ 68,700
Crook	17	Low	\$ 68,700
Niobrara	18	Low	\$ 45,800
Hot Springs	19	Low	\$ 91,600

Total FFY 2008: \$ 274,800

Table 9e. County Mapping Priorities / Costs for FFY 2008

4.3 Project Plan

The project timeline with associated costs for FEMA subcontractor mapping is presented above, in Tables 9a-9e. The costs were derived from the 2000 Map Modernization Plan for Wyoming. Those costs reflect Level 1 and Level 2 Panel Upgrades. The Wyoming State Geological Survey has digitized all FIRMs, and if they are found to be acceptable by FEMA to meet the Level 1 Upgrade standards, costs will be reduced in Albany, Uinta, Park, Lincoln, Big Horn, Sweetwater, Sublette, and Carbon Counties.

The Geologic Hazards Section at the Wyoming State Geological Survey will develop a Flood Mapping Coordination Program with funding provided by FEMA through WOHS/EM. The Head of the Geologic Hazards Section will assume the responsibilities of program management as an assistant is trained. \$50,000 per year will be required from FEMA for personnel, travel, supplies, and overhead. The State of Wyoming will provide up to a 25% in-kind match for the funds sullied to the WSGS. Quarterly progress and financial reports will be submitted.

The timeline for work items is based upon the assumption that funds are currently available. Adjustments will have to be made if project initiation date is shifted. The project timelines for work items at the Wyoming State Geological Survey are as follows:

Work Item: Conduct a survey of all cities and counties, and state and federal agencies, to determine status of digital base mapping, digital contour maps, and digital photography.
Timeline: March – April, 2004
Deliverables: Printed survey summary.

Work Item: Acquire or link to all possible base maps, contour maps, and digital photography.
Timeline: May – July, 2004
Deliverables: Website with links.

Work Item: Acquire all possible flood data, flood histories, and community profile information.
Timeline: August – December, 2004
Deliverables: Summary report

Work Item: Serve map, history, flood data, and community profile on a WSGS website. A prototype website already has FIRM maps available for viewing, and digitized FIRMs will be available on the site by May, 2004.
Timeline: January – March, 2005
Deliverables: Website

Work Item: Coordinate with all communities in Wyoming in regards to Map Modernization, and determine community mapping needs. The Floodplain Administrator Questionnaire was the first step in this process. Site visits will be coordinated with administrators.
Timeline: Continuous, Initiating June, 2004.
Deliverables: Summary reports of visits.

- Work Item: Generate flood analyses and preliminary flood boundary maps using HAZUS MH. Compare generated maps with digitized FIRMs to determine quality of both products.
 Timeline: March, 2004 – May, 2005
 Deliverables: Summary reports.
- Work Item: Encourage community participation in the CTP Program.
 Timeline: Continuous, Initiating June, 2004
 Deliverables: Depends on community interest.
- Work Item: Work with WOHS/EM and FEMA on enhancing the education of floodplain administrators in regards to local hazards and the need for Map Modernization.
 Timeline: Annual Floodplain Administrator's Meeting and site visits
 Deliverables: Meetings summaries.
- Work Item: Coordinate with FEMA on mapping needs, and provide input on priority areas.
 Timeline: Coincides with mapping projects in Tables 9a-9e.
 Deliverables: Documentation of coordination.
- Work Item: Assist FEMA with outreach and community coordination on mapping projects.
 Timeline: Coincides with mapping projects in Tables 9a-9e.
 Deliverables: Documentation of meetings.
- Work Item: Build a partnership among state, federal, local, and private agencies and organizations in Wyoming that will enable Wyoming to accept greater responsibilities in the Map Modernization Program, and will encourage more communities to participate in the CTP Program.
 Timeline: Continuous, Initiated in July, 2004.
 Deliverables: Advisory board established by December, 2004.
- Work Item: Organize and participate in outreach activities, to include mailings, meetings, and multi-media promotional activities.
 Timeline: Brochure completed by March, 2005. Approved Business Plan submitted to all Floodplain Administrators by December, 2004.
 Deliverables: Brochure and documentation of news articles.
- Work Item: Work towards a higher level of State participation in the Map Modernization Program.
 Timeline: The State of Wyoming will reconsider the level of participation in March, 2006.
 Deliverables: Possible change in level of participation.
- Work Item: Provide yearly updates of the Business Plan, including revised analyses of mapping priorities.
 Timeline: Yearly updates will be generated.
 Deliverables: Updated Business Plans.

5.0 Performance Goals/Cost and Schedule Measures (tracking)

5.1 Performance Measures

Delivery of products will be used as a performance measure for work items above. FEMA has suggested other performance measures as Sub-Program Element Performance Measures. Those measures as applied to Wyoming are presented below in Table 10.

Performance Measure	Targets					
	2004	2005	2006	2007	2008	2009
Percentage of population (communities) having Digital GIS flood hazard Data available online	20	50	65	75	85	100
Percentage of population (communities) having adopted modernized GIS flood maps	1	5	10	20	40	60
Leveraged effort towards Digital GIS flood hazard Data	20	30	40	45	50	55
Percentage of Map Mod Funding put through to CTPs (State and local)	20	25	30	40	50	60

Table 10. Sub-Program element performance Measures

5.2 Tracking System

FEMA will provide a web-based system for tracking and reporting cost, schedule, and performance. The personnel hired by the WSGS will be trained in data entry into the system, and will enter data as provided by the WSGS Office Manager and the Head of the Geologic Hazards Section.

6.0 Alternatives/Varying Funding Levels

If the Wyoming State Geological Survey does not receive a funding base level of \$50,000 per year, participation will not be feasible. Full time personnel are required to accomplish the required duties, such as database development and website development. Travel can be curtailed if funding levels were to drop a few thousand dollars.

If funding were to drop for mapping activities, the schedules presented in Tables 9a-9e will have to be realigned to reflect current funding levels. The WSGS will still develop a FIRM and digital FIRM website to serve data to interested parties, but development may take two years as time permits.

6.1 Shortfalls

FEMA funds will allow the WSGS to hire personnel to assist with the program and with database development. In addition, funds will allow for coordination between communities and the State of Wyoming.

6.2 Match

The Wyoming State Geological Survey will provide in-kind match up to 25% of funds provided to WSGS. The match will be derived from State-funded salaries of participating WSGS personnel.

6.3 Project Cost Summary

Nineteen counties have been proposed for Phase II map updates. Total FEMA project costs for mapping (FFY2004-FFY2008) are \$ 5,665,000.

The Geologic Hazards Section at the Wyoming State Geological Survey will develop a Flood Mapping Coordination Program with funding provided by FEMA through the Wyoming Office of Homeland Security/Emergency Management. \$50,000 per year (not including match) will be required for personnel, travel, supplies, and overhead. Total FEMA project costs for program management, website development, outreach, and coordination (FFY2004-FFY2008) are \$250,000.

Total FEMA Project Costs by FFY

FFY2004

Mapping Costs:	\$1,351,350
<u>WSGS Costs:</u>	<u>\$ 50,000</u>
Total Costs:	\$1,401,350

Note: WSGS Costs do not include WSGS Match

FFY2005

Mapping Costs:	\$1,771,200
<u>WSGS Costs:</u>	<u>\$ 50,000</u>
Total Costs:	\$1,821,200

Note: WSGS Costs do not include WSGS Match

FFY2006

Mapping Costs:	\$1,740,900
<u>WSGS Costs:</u>	<u>\$ 50,000</u>
Total Costs:	\$1,790,900

Note: WSGS Costs do not include WSGS Match

FFY2007

Mapping Costs:	\$ 526,750
<u>WSGS Costs:</u>	<u>\$ 50,000</u>
Total Costs:	\$ 576,750

Note: WSGS Costs do not include WSGS Match

FFY2008

Mapping Costs:	\$ 274,800
<u>WSGS Costs:</u>	<u>\$ 50,000</u>
Total Costs:	\$ 324,800

Note: WSGS Costs do not include WSGS Match

Total FEMA Project Costs FFY2004-FFY2008: \$5,915,000