

## Map Modernization Business Plan

# Washington State



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**WASHINGTON STATE MAPPING BUSINESS PLAN OUTLINE**

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## **I. Executive Summary**

### **A. Introduction and Executive Summary**

Floods are the nation's most common and costly natural disaster. Up until the 1960s, floods were dealt with in this Country primarily through structural means, including dams, levees, seawalls, etc. In the 1960s, Congress recognized that structural measures alone were not working, were becoming very costly and were not serving the environment well. A major change in how we deal with floods occurred with passage of the National Flood Insurance Act of 1968, which emphasized a nonstructural regulatory approach. Congress then passed the Flood Disaster Protection Act in 1973, which required that the Federal Government identify every flood-prone community in the Country. This required issuance of a map to some 22,000 communities in the period of less than two years. This was accomplished through publication of Flood Hazard Boundary Maps. These maps were placeholders that were later superseded by preparation of detailed Flood Insurance Studies in the late 1970s to mid-1980s. After that, FEMA went into a Map Maintenance mode, whereby all costs of the NFIP were borne by ratepayers, leaving a lesser amount of funding to do the detailed mapping. In FY 2003, Congress provided the first funding since 1986 that was outside of funds derived from ratepayers, to implement the Flood Map Modernization Plan that was geared to updating and revising maps that had become outdated through the years.

FEMA recognizes that while flood hazard mapping is a federal responsibility it is important to involve state, regional and local governments in this initiative to ensure that the flood hazard maps produced are adequate to meet the needs. In the summer of 2003, FEMA requested states to develop state map modernization plans. This past October, FEMA provided a funding opportunity to states (\$30,000 each) to upgrade these plans and develop state "Business Plans".

This is the Map Modernization plan for Washington State.

This plan was prepared to assist in the development of a comprehensive national strategy for modernizing FEMA's inventory of Flood Insurance Rate Maps (FIRMs). It identifies mapping priorities for the State of Washington and outlines an approach for addressing these mapping needs. In accordance with FEMA guidelines and Department of Homeland Security objectives, this plan is designed to accomplish the following:

- Express the need for Washington State to have updated Flood Hazard Maps
- Prioritize the States needs for Flood Hazard Mapping
- Demonstrate how Department of Ecology (DOE) will manage the effort
- Detail a strategy for producing new Flood Hazard Maps
- Outline performance goals, project tracking, and management tools
- Provide mapping metrics and cost indices
- Plan for several budget scenarios
- Itemize flooding sources for remapping
- Develop schedules for digital conversions

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**To fulfill the requirements and responsibilities of the mapping program DOE has in-place and will dedicate various resources to ensure a successful program.**

**DOE's primary resources include:**

- Three regional floodplain specialists and one GIS coordinator with over 100 combined years of experience in floodplain management in Washington State including the NFIP, ordinance and policy expertise, information technology, geology and geography, and extensive knowledge of the State's flood-prone communities.
- A contract with a industry-leading multi-disciplinary team of consultants that provides the State with superior capacities in hydrologic and hydraulic engineering, digital data conversions, LIDAR technology, and many years of experience with FEMA flood hazard mapping programs.
- The State is building on an established partnership with the WA State Dept. of Transportation, WA Dept. of Fish and Wildlife, US Army Corps of Engineers, the US Geological Survey and others to coordinate on flood hazard reduction projects, flood hazard data, and engineering applications.
- Capacity to perform several due process and outreach activities including scoping workshops, interim and final meetings, web-based guidance materials, and in-house technical and policy expertise easily accessible by the local communities, and extensive knowledge of the issues and concerns of Washington's flood prone communities. DOE will also provide outreach activities through public and organizational workshops, NORFMA, ASFPM, professional organizations, and inter-agency coordinated efforts.
- The State's Flood Control Assistance Account Program (FCAAP). Beginning in July of 2005, DOE intends to dedicate one million dollars each biennium in matching funds towards implementation and completion of the Map Modernization Program and leverage more dollars of in-kind contributions.

**DOE's Identified Shortfalls:**

The Department of Ecology's primary shortfall is funding for a Flood Mapping Coordinator. This position is critical to performing most of the Map Modernization activities described in this plan. The State will pay staff time and overhead for the Flood Mapping Coordinator for the year 2004 as a match. A secondary shortfall is DOE's inability to provide direct cash match until July 2005. The agency does however intend to utilize its FCAAP grants program to focus on Map Modernization priorities.

**DOE's Proposal**

DOE is proposing that FEMA provide full-time employees (FTE's) to perform mapping coordination and administrative activities for years 2005 - 2009.

## **B. Why Map Modernization in Washington State**

Washington is one of the most flood-prone States in the Country. In the 27 year period from 1970 through 1997, Washington had 25 Presidentially-declared flood disasters, ranking it only below the States of California, Texas, Oklahoma and Louisiana in that category during that time. In 1997, Washington had the highest number of Presidentially-declared disasters in the Country. Washington ranks high in terms of policies, claims and number of participating communities. In addition, in Region X, Washington State has 45 percent of the Regional policies, 62 percent of the claims and 39 percent of the participating communities.

Updating the FIRMs is of the highest priority to the Washington Department of Ecology and the citizens of Washington State. The FEMA FIRM maps are not just a flood insurance rating tool, but in Washington State, they are also the primary tool on which a host of land-use and natural resource decisions are based, including:

- Compliance with the State's Shoreline Management Act (SMA) that requires streamside and coastal buffers;
- Compliance with the State's Critical Areas/Resource Lands Ordinance (CAO) provisions that regulates floodplain development and protects wetlands;
- Compliance with Washington's Growth Management Act (GMA) that seeks to limit urban sprawl into floodplains; and, finally,
- Compliance with Salmon habitat preservation requirements throughout the majority of the State in which most Salmonid Species are listed as threatened or endangered.
- Capital Project Planning for State and local infrastructure.

### **The State should take the lead**

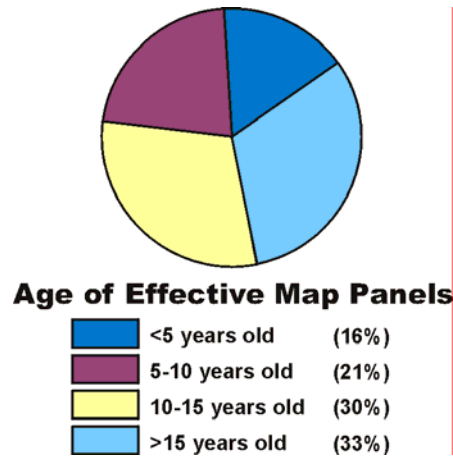
The problems of inaccurate floodplain mapping usually extend across political boundaries. Many streams in the State flow in unincorporated county lands, through multiple cities, across county lines, through federal lands, tribal lands, and private property. The floodplains that parallel these streams likewise affect numerous interests. Given the multitude of stakeholders for a given stream system, it would be difficult for all stakeholders to come together in a timely and constructive manner to accomplish cost-effective mapping improvements.

The state of Washington is the most logical entity that has the technical, financial, and political resources to enact significant statewide floodplain mapping improvements on a consistent basis. The state agencies best suited to lead the effort include the Departments of Ecology, Transportation, Fish and Wildlife, and Natural Resources. With consulting expertise secured, they have the technical knowledge and information management capacity to collectively manage the data needs, modeling, map production, and stakeholder coordination that must occur. In addition, these agencies manage much of the land and infrastructure that is affected by flooding.

Local government agencies and other local stakeholders, as well as other state departments, need to participate in this process to define priorities and enable meaningful and accurate improvements to Washington's floodplain maps. These state agencies will engage all interested parties at the local, state, and federal level in a collaborative process of data gathering, hydrologic and hydraulic modeling, floodplain map production, floodplain map maintenance, and floodplain regulation and associated decision-making.

### C. Background and Purpose of Plan

The Federal Emergency Management Agency’s (FEMA’s) flood hazard maps are one of the essential tools for flood hazard mitigation in Washington State and in the United States in general. As shown in the figure below, most of the flood hazard maps in the nation have become outdated.



In many cases, the older maps reflect outdated flood hazard information that limits their utility for insurance and floodplain management purposes. Additionally, most of the maps were prepared using now outdated road network information and manual cartographic techniques, which make the maps difficult for State and local customers to use and expensive for FEMA and the State of Washington to maintain.

This Plan was prepared to assist FEMA in the development of regional and national plans for implementing the FEMA Map Modernization Program. This Plan summarizes the role that Washington will play in completing the desired mapping activities and how these activities will be managed and performed. This Plan identifies mapping priorities, explains how mapping priorities were established for each county in Washington, and outlines an approach for addressing these mapping priorities.

In accordance with Government Performance Results Act (GPRA) performance measures suggested for the Map Modernization Program by the Office of Management and Budget and the Atlanta criteria which further focuses on heavy populated and rapidly developing areas the details of this Plan have been developed with consideration given to FEMA accomplishing the following goals and “measurements of success”:

#### Region X goals

- New DFIRMS for Each Community
- County-wide Maps
- Accurate Study Information
- Maximize State/Local Participation (CTP)
- Utilize Best Available Data

**D. Staff and Budget Overview**

Staff costs for Map Modernization are estimated as Full-Time Employees (FTE's). Costs include indirect and other payroll expenses unless noted.

**Flood Mapping Coordinator (FMC) - \$90,000/year for a dedicated Coordinator (1 FTE).**  
**Administrative Assistant – \$45,000/year for administrative assistance (½ FTE).**

**Budget Scenarios and Levels of Participation**

	Year	Year	Year	Year	Year	Year
Level of Participation	2004	2005	2006	2007	2008	2009
Option A - 2 FTE's	\$75,000	\$180,000	\$180,000	\$180,000	\$180,000	\$180,000
Option B - 1.5 FTE	\$50,000	\$135,000	\$135,000	\$135,000	\$135,000	\$135,000
Option C - **	\$50,000	**	**	**	**	**
** Refers to 10% of Mapping dollars awarded to the State (given at least \$500,000 per year)						

CAP/MAP Activities performed		
Option A	Option B	Option C
Project Scoping	Project Selection	Project Selection
Project Selection	Outreach	Needs Assessment
Outreach	Needs Assessment	IT Systems (Repository)
Needs Assessment	Digital Base Map Sharing	
Digital Base Map Sharing	Contract Management	
Contract Management	IT Systems (Repository)	
Due Process Activities		
IT Systems (Repository)		

**Other Expenses:**

\* **Outreach Activities - \$5000/year;** this is to cover the costs of DOE hosted workshops and/or training sessions.

\* **Travel - \$7,000/year** for FMC and Regional Specialists to attend scoping meetings, workshops, and local conferences.

\* **Website and GIS Support - \$5,000/year** for web application development and maintenance

\* **IT Systems - \$5,000/year** for repository development and maintenance.

\* Required expenditures for all years and all levels of the program.

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## **CAP/MAP Activity Descriptions:**

**Project Scoping** - Project Scoping begins after community mapping needs have been prioritized and FEMA has decided to initiate a flood map update project. The foundation for Project Scoping is the assessment of community mapping needs (flood data update, map maintenance, and/or digital conversion) completed during the Mapping Needs Assessment Process. During Project Scoping, all aspects of the project are considered and planned for, and a tailored scope of work for is developed. Project Scoping ends when activities for Map Production (which includes engineering analysis, floodplain mapping, DFIRM production, and legal due processing) have been assigned to the Project Team members.

**Project Selection** – Project Selection is the process by which all of the potential Map Modernization projects are identified, prioritized, and compiled into a Mapping Business Plan. Annual updates and review are required.

**Outreach** – Outreach activities are detailed in IV.E.10. This includes but not limited to: Preparation and distribution of guidance documents and newsletters, hosting workshops and training sessions, and providing technical assistance.

**Needs Assessment** –A detailed community-by-community assessment of mapping needs for every mapped (including flood data updates and map maintenance) and unmapped NFIP community within its jurisdiction and submits the results of the assessment to FEMA for inclusion in the MNUSS database.

**Digital Base Map Sharing** - Supply base mapping for use in producing DFIRM's. The base map will comply with FEMA minimum accuracy requirements and be distributable by FEMA to the public in hardcopy and electronic formats.

**Contract Management** - Contract administration and record keeping, notification requirements, review procedures, competition, methods of procurement, and cost and pricing analysis. The State has in-house staff capable of monitoring the contractor and approving the products developed by the contractor.

**Due Process Activities** – Includes Time and Cost meetings, intermediate meetings, final meetings, process appeals, printing and distribution.

**IT Systems (Repository)** - House and distribute DFIRM data sets. The State is NOT expecting to perform DFIRM maintenance or house associated data. The primary responsibility of the State will be to store and distribute flood hazard data generated from the Map Modernization Program.

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## **II. Washington State Floodplain Management**

### **A. NFIP in Washington**

#### **1. Washington State Flooding and NFIP Participation**

Flooding occurs throughout Washington State on floodplains of rivers, streams, lakes, wetlands, closed depressions, and tidal areas. Flooding often results in considerable damage to personal property, loss of lives, and damage to public facilities such as roads, bridges and levees. Since 1971 there have been 25 federally declared major flooding disasters in Washington State, with 11 declared disasters since 1990. Damages in Washington State from flooding are considerable. For example, damage estimates for the floods of 1990 have reached approximately \$250 million, while region wide (Washington, Oregon, Idaho) damage estimates from the February 1996 flood have reached approximately \$800 million. Western Washington is particularly vulnerable to repetitive flooding events due to its geographic location, topography, and climate. Major river systems are located in both western and eastern Washington, but those in western Washington are more prone to flooding. In addition, western Washington also has experienced the greatest watershed urbanization resulting in many urban streams that are prone to flooding.

Current, accurate flood hazard maps are a critical component in reducing flood damage and potential loss of life and property, and in protecting the beneficial ecological values of the floodplain. Updating flood hazard maps is important because changes in a watershed influence the hydrologic cycle and can affect flood levels. Watershed urbanization generally results in increased impervious surfaces (e.g. roads and roofs) and reduced forest cover, both of which can increase the volume of storm runoff, thereby increasing flood discharge volumes and the floodplain area. Therefore, watersheds experiencing development need updated flood hazard maps to accurately show the extent of the floodplain to allow for accurate floodplain management decisions. A recent study in North Carolina determined that in counties experiencing watershed development, use of 1975-era Flood Insurance Rate Maps underestimated the current potential flood damage by over 50 percent. Similar results have been found in the Puget Sound area.

In Washington State, 286 communities currently participate in the National Flood Insurance Program, of which 280 are in the regular program and 76 are in the emergency program. Of the communities in the regular program, FEMA has identified 19 communities as having no special flood hazard area and 27 as having only a minimal flood hazard. Of the communities in the emergency program, FEMA has identified four as having a special flood hazard area. There are 11 communities not in the National Flood Insurance Program where FEMA has identified a special flood hazard area. Flood hazard maps have been produced for 260 of the communities in the regular program. However, many flood hazard maps are 10 to 20 years old and need to be updated to accurately represent changing watershed conditions. According to FEMA (2001b), approximately 30 percent of Washington state flood insurance rate maps are greater than 20 years old, 70 percent are greater than 10 years old, and 75 percent are greater than 5 years old.

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## **2. Washington State Floodplain Management**

Washington has long been a leader among States in the realm of floodplain management. In 1935, the State Legislature enacted one of the first State floodplain management laws in the Country, which began a program that gave the State authority to issue permits for construction in designated Flood Control Zones (FCZ). The Flood Control Zones covered about one-third of the flood prone communities in the State. Adoption of the 1935 law followed severe flooding in 1933, a pattern that became common with many subsequent legislative initiatives. In 1969, the State enacted a prohibition on construction of residential structures in floodways, which applied only to the State Flood Control Zones. Because few of these zones had floodways depicted on maps at the time, structures were built in what are now floodways, and permit issuance under the FCZ program was spotty and varied widely by Region. Program modified in 1989?? And no longer are their FCZ's. What now? The State not only has its own statutes, but also has a State-supported funding mechanism for flood hazard mitigation, and is considered a participating community in the NFIP.

## **3. Ecology's Current State Floodplain Management Program**

The Department of Ecology administers the FCAAP (fully described in E. 1.) and, in addition, is the Governor's designated State Coordinating Agency for the NFIP. As the State Coordinating Agency, Ecology receives an annual grant from FEMA to perform a broad range of floodplain management activities throughout the State. In the last two years, additional amounts have been provided to assist the State in gearing up for a bigger role in floodplain mapping through FEMA's Map Modernization initiative. Thus, floodplain management assistance and floodplain mapping form the backbone of Ecology's current State program, in addition to the FCAAP activities described above. The floodplain management assistance activities are outlined in FEMA's Community Assistance Program, State Support Services Element (CAP-SSSE), and includes the following major categories:

- Community Assistance Visits (CAVs)
- Community Assistance Contacts (CACs)
- Floodplain Ordinance Assistance
- Regional-State Program Coordination Meetings
- Local Officials Workshops
- Newsletters
- General Technical Assistance

Another major activity is the technical assistance function whereby Ecology is available to meet with community officials at their request regarding specific floodplain management matters. There are 286 communities that participate in the NFIP and that have floodplain ordinances. Frequently, community officials encounter problems that are difficult to resolve, and can benefit from State staff who may be able to assist based on experiences from other communities that have had similar issues. There were 82 technical assistance meetings during the previous year.

The FEMA Map Modernization initiative spurred considerable activity. Ecology initiated a collaborative process among State and Federal agencies, and with involvement of local officials, in an effort to identify and prioritize study needs throughout the State. Ecology apprised FEMA that the State would become a “mapping State,” i.e., that it would actually perform mapping activities in the Map Modernization effort (the only State in the Northwest to do this). Accordingly, Ecology developed a State Implementation Plan identifying study needs for the next three years, including the level of study, timing and approximate mileage involved in each community for which study was recommended. This basic document has been greatly refined, but the product is still a statewide listing of floodplain study needs as best they are known.

Ecology advertised and went through the process of hiring a private firm to perform flood studies through an RFQQ process. A firm was selected through this process, and because the State is a “Cooperating Technical Partner” with FEMA, that firm may perform work for the State when funding becomes available. The objective of the State is to update and improve flood maps throughout the State. The significant change relates to the move to a digital map environment. This will involve integration and maintenance of the new digital data with the State’s existing data framework and GIS structure. The maps are not just viewed as a flood insurance rating tool or as the basis for proper construction in floodplains. In Washington State, they are also the only tool on which a host of land use and natural resource decisions are based, including:

- Compliance with the State’s Shoreline Management Act (SMA) that requires identification of streamside and coastal buffers;
- Compliance with the State’s Critical Areas Ordinance (CAO) provisions that regulate floodplain development, protect wetlands and offer a basis for establishment of Fish and Wildlife Habitat Conservation Areas;
- Compliance with Washington’s Growth Management Act (GMA) that seeks to limit urban sprawl into floodplains; and
- Compliance with Salmon habitat preservation requirements throughout the majority of the State in which most Salmonid species are listed as threatened or endangered under the Endangered Species Act (ESA).

#### **4. Floodplain Management Practices in Washington**

Washington is one of the most flood-prone States in the Country. In the 27 year period from 1970 through 1997, Washington had 25 Presidentially-declared flood disasters, ranking it only below the States of California, Texas, Oklahoma and Louisiana in that category during that time. In 1997, Washington had the highest number of Presidentially-declared disasters in the Country. Washington State also ranks high in terms of policies, claims and number of participating communities. Washington has more flood insurance policies than any other State west of the Mississippi, with the exception of California and Texas. It has more policies than all the Midwestern States except for Illinois and Ohio.

To cope with our flooding problems, there have been numerous innovations by local governments in the field of floodplain management, efforts that exceed the minimum requirements established by the NFIP regulations. A few of these local efforts will be highlighted below, as will some current issues of a statewide nature.

**Freeboard.** Freeboard is the term given for requiring structures to be built higher than the Base Flood Elevation (BFE). FEMA regulations only require that buildings be elevated to the BFE, not above it. The most prevalent freeboard standard is the requirement to build new structures one foot above the BFE. However, a few communities exceed the one-foot freeboard standard; e.g., Everett requires two feet of freeboard, and Chelan County requires three feet. It is estimated that over 75 percent of the State's communities have a freeboard requirement. This is a safety factor, it accommodates the one-foot rise that is built into FEMA's maps when encroachment occurs, and it results in significantly lower insurance rates.

**Cumulative Substantial Improvement Rule.** If a structure is to be improved over 50 percent of its market value (a substantial improvement), FEMA requires that the structure be elevated to or above BFE (or flood-proofed if nonresidential). If, however, an applicant applies for permits in successive years that are each below 50 percent, they are not required to meet the FEMA standards even if they cumulatively exceed the 50 percent. Snohomish County's ordinance tracks improvements from the date they entered the Regular Program of flood insurance. If a second or third, etc., improvement finally exceeds the 50 percent, they are required to elevate, even though the current permit proposed an improvement that was less than 50 percent.

**Channel Migration Zones.** CMZs have become increasingly important with their inclusion in the State's new Shoreline Management Act regulations. However, well before enactment of the SMA regulations, many communities were actively delineating CMZs (some of these communities included Lewis County, Yakima County, King County, the Town of Winthrop, Pierce County, Clallam County, Whatcom County, and Walla Walla County among others). Although there is obviously active mapping of CMZs throughout the State, King County (North Bend may also) is the only known local government that has a specific ordinance controlling uses in mapped CMZs. They adopted Chapter 21A-24 of their rules and regulations entitled "Sensitive Areas: Alterations Within Channel Migration Areas" on June 14, 1999. This document discusses how CMZs were developed and prescribes uses within the moderate and severe channel migration areas on the maps.

**Deep and Fast Flowing Waters.** Pierce County's flood ordinance has the standard language controlling uses in floodways, but exceeds the minimal FEMA definition of floodway by also including lands subject to deep and/or fast flowing waters. Deep and/or fast flowing waters are derived from a table in the ordinance that gives depths and velocities. For example, from the table, if water depth is 3 feet and velocities are 1 foot per second, lands beyond that threshold are included in the County's floodway and are regulated as such; another threshold example shows lands that exceed 2 feet of depth and 2 feet per second velocity to be within the floodway. This is considered to be a very innovative approach based on life/safety issues. The County redraws floodway lines on the map based on the depth/velocity criteria, thereby expanding the areas subject to the more restrictive floodway requirements.

**Prohibition of Fill.** Fill for structural support of residential buildings is prohibited in Skagit County's flood chapter. King County in essence has the same standard by requiring that any residential construction that can occur in the floodplain be flow-through construction, i.e., be built using post and piling construction only.

**Prohibition of Residences in the Floodplain.** Thurston County has a requirement in their flood chapter that results in a prohibition of new residential structures anywhere in the County's floodplains. This exceeds the State requirement prohibiting new residences in the floodway.

**Zero-Rise Criteria in the Flood Fringe.** FEMA regulations specify that if a development is proposed in the floodway, it is subject to the zero-rise requirement, i.e., the development must be analyzed through a step-backwater analysis and conveyance compensation calculation and must meet the zero-rise standard (0.00 on a step-backwater run). King County, Pierce County and a few other jurisdictions apply this same criterion not only in the floodway, but also in the flood fringe (the standard is 0.01 on a step-backwater run in King County).

**Setbacks.** Setbacks have become the rule, not the exception, in Washington State. Setbacks provide an added margin of safety by keeping structures away from higher velocity flood waters, reduce losses due to erosion and bank failure, and provide a riparian buffer to protect fish and wildlife habitat. It is the latter reason, *viz.*, habitat protection that has spurred countless Washington communities to define buffers, usually through the Fish and Wildlife Habitat Conservation Areas section of local Critical Area Ordinances. These buffers often encompass areas larger than identified floodways; on smaller streams, they normally are wider than the floodway. This provision is perhaps the most effective floodplain management practice in the State at this time.

**Compensatory Storage.** FEMA and the State's minimum requirements allow filling in the flood fringe portions of the floodplain. This is based on the conveyance criterion which specifies that if the floodway is left open for conveyance, there will be no greater hydraulic rise than one foot anywhere in the floodplain due to encroachment. However, it does not address hydrological changes caused by fills that make it easier for floodwaters to concentrate faster in and near the channel, thereby often raising flood levels downstream. Many communities therefore have compensatory storage or "cut and fill" provisions in their ordinances that require developments to compensate for loss of flood storage caused by filling in the fringe, by removing an equal amount of material in the floodplain near the proposed development. Examples of communities that have this provision in Washington are too numerous to mention here.

**Higher Floodway Standard.** FEMA specifies a one-foot increase as the surcharge criterion used in defining the hydraulic floodway on their maps. However, some States specify a higher standard. Wisconsin, for example, requires a 0.1 foot, which means that for maps in Wisconsin, floodways must meet that standard; this results in a significantly wider floodway on the maps and a smaller developable area. One example of this requirement in Washington is on the upper Bear Creek in Redmond and King County. Is this not the same as **Zero-Rise Criteria in the Flood Fringe**.

**Septic System Prohibition.** Many cities in the State prohibit new septic systems in the floodplain (there is usually a sewer system to hook up to, however). Several other jurisdictions have limitations on septic systems; e.g., they are not generally allowed in the floodway in Thurston and Whatcom Counties, can only be built in the floodplain in King County if there is no practical alternative but cannot be placed within the severe CMZ, and there are other limitations that are practiced elsewhere in the State's communities.

**Enclosures Below BFE.** Structures built on foundation stem walls in the floodplain with the lowest habitable floor several feet or more above grade are usually built properly with adequate flood openings to allow water in to equalize pressures, and with areas below the BFE unfinished and used only for parking, building access, and limited storage. However, there is a tendency for some homeowners to convert this below-BFE space into habitable uses. To keep these violations from occurring, some communities require stem walls to be no more than 4 feet in height, and/or prohibit standard doorways or interior stairways to limit interior access options. Others require homeowners to pledge not to finish below-BFE areas either by signing non-conversion agreements or by deed restrictions (King County).

**Determining BFEs Where they do not Exist.** FEMA maps often display streams as “Unnumbered A Zones,” which means the estimated lateral extent of the floodplain is shown but elevations (BFEs) have not been determined. These are developed through a much lower level study than that which is derived through FEMA’s standard detailed study methods. Some communities in Washington compensate for this shortcoming by requiring that the proponent of a proposed development in the Unnumbered ‘A’ Zone perform a study to develop a BFE for the site. Pierce County has specific requirements for performing this kind of study; King County also requires such analyses along with a few other communities (mostly counties) in the State. I think this is actually a standard FEMA requirement.

**Subdivisions and Floodplains.** FEMA’s regulations do not prohibit new subdivisions in floodplains; rather, they prescribe minimum criteria related to drainage and safeguarding utilities and facilities in new subdivisions. Some Washington communities go beyond the FEMA minimum criteria by just not allowing subdivisions in floodplains. This is effectively controlled in King County, where new building lots have to contain at least 5,000 square feet of buildable land outside the floodplain. Similar measures exist in Clallam County, Jefferson County and Bellingham, among others.

**Hazardous Materials.** Petroleum products, chemicals and other toxic substances located in the floodplain can leak during a flood causing health and environmental problems; they should be stored outside the floodplain or, at a minimum, be elevated higher than the BFE and anchored. King County is an example of a community that regulates these materials by requiring removal of temporary structures or substances hazardous to public health, safety and welfare from the floodplain during the flood season from September 30 to May 1.

**Critical Facilities.** Critical facilities such as schools, fire/police stations, nursing homes, hospitals, chemical storage tanks, etc., if impacted by floodwaters, could have a significant negative impact on water quality, special populations and emergency response. Most Washington communities have retained a requirement from the 1987 State law and model ordinance that specifies that new critical facilities must be, to the extent possible, located outside of the 100-year floodplain, unless no feasible alternative site is available. If they are constructed in the floodplain, they must have their lowest floor elevated three feet above the BFE or to the 500-year flood level, with access to the facility protected. Communities with this provision receive special credit under the Community Rating System.

**Water Wells.** Washington State law, at WAC 173-160-171, requires that water wells must be located on high ground that is out of the floodway. This provision is found in local ordinances.

**Floodway Prohibition.** Construction of new residences and substantial improvement of existing residences within Washington's floodways, are prohibited. The exception is farmhouses that serve functioning farms; they can be replaced, repaired or improved (including substantial improvements) subject to certain conditions. This includes replacement or repair if the farmhouse suffers substantial damage from any peril (flood, earthquake, fire, wind, etc.). Non-farm residences, on the other hand, cannot be replaced or substantially improved in floodways. However, if non-farm residences are substantially damaged (more than 50 percent damage), under limited circumstances related to depth of flood water, velocity and erosion, they can be repaired. They can be repaired if the depth of flooding is less than 3 feet, the velocity is less than 3 feet per second and there is no evidence of flood-related erosion.

**FEMA Fish-Flood Ordinance.** Natural resource agencies at every level of government have consistently emphasized the contributions of floodplains to healthy fish habitat. With the recent listing of several salmonid species as threatened or endangered under the Endangered Species Act in large areas of the State of Washington, the need to protect and restore aquatic habitat has taken on a new urgency. FEMA Region X dealt with this by taking its basic model ordinance that enables communities to comply with NFIP and State floodplain management requirements, and added several sections that address aquatic habitat. This effort addressed CMZs, riparian buffer zones, several watercourse alteration requirements, fill prohibitions, vegetation and permeable surface requirements, and much more. The effort was assisted and strongly supported by the State.

## **B. State Organization**

### **1. Organizational Outline**

The State of Washington, Department of Ecology (DOE) is the State's NFIP coordinating agency. The Shorelands and Environmental Assistance Program (SEA) within the department of Ecology is the program responsible for the administration of floodplain management activities in the agency. The department of Ecology, SEA program, will assume a primary role as the lead entity in the Map Modernization Program.

#### **Management Support - DOE**

Gordon White, SEA Program Manager  
Neil Aaland, SEA Program Section Manager

#### **Flood Mapping Coordinator/Contract Officer - DOE**

Jerry Franklin- Information Technology Application Specialist

#### **Budget Officer - DOE**

Bev Huether – Environmental Planner

#### **State Regional Officers - DOE**

Dan Sokol – NFIP Coordinator, SW Regional Floodplain Management Specialist  
Ted Olson – NE Regional Floodplain Management Specialist, Engineer  
Chuck Steele – NW Regional Floodplain Management Specialist  
Cygna Rapp – Fluvial Hydrogeologist

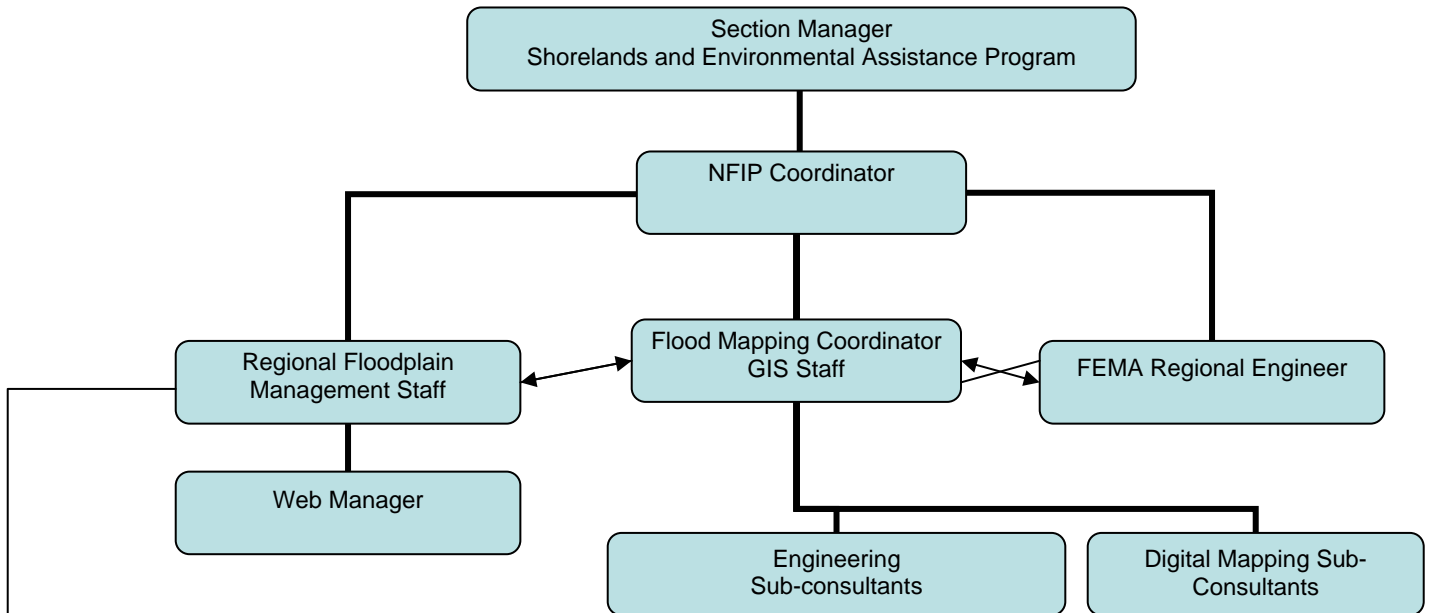
#### **Partnerships**

Floodplain Management Task Force Members  
WA Dept. of Ecology - Jerry Franklin, IT Applications Specialist  
WA Dept. of Transportation - Jim Park, Floodplain Management Specialist  
WA Dept. of Fish and Wildlife  
WA State Emergency Management Division  
US Army Corps of Engineers  
US Geological Survey  
FEMA

#### **Contractor/Consulting Team**

Tetra Tech/KCM, Inc.	Harper, Hauf, Righellis
Titan Systems Corp.	Moffatt Nichol
West Consultants	
AquaTerra	
David Smith & Assoc.	
Spencer B. Gross	
Ch2MHill	
Phillip Williams & Assoc.	
GeoEngineers	
Golder & Assoc.	

Map Modernization - Organizational Structure



**2. Ecology Regional Staff and FCAAP Grants Team**

**Superior Regional Staff**

The regional floodplain management staff for the WA Dept. of Ecology that work on the CAP/SSSE grant have extensive experience in the field or related fields. Our NW regional staff person has nearly 36 years of experience working in flood hazard management. He was a federal employee with HUD when the NFIP was first conceived and continued to work in the NFIP when FEMA was created in 1977. He was intimately involved in the development of policies and procedures for the NFIP, including flood hazard mapping. He worked in a variety of roles at the federal level, including 18 years as Mitigation Director for FEMA Region 10, before he joined Ecology 3 years ago. Our Eastern regional staff person has 37 years of experience working in the water resources and floodplain management field. He is a licensed professional engineer with experience in hydraulics and hydrology and is a licensed geologist. He has done extensive work delineating floodplains and conducting floodway assessments. Our SW regional staff person has 27 years experience as a planner working with local governments at the state level. He has also had experience in emergency preparedness and response and recovery. He has served in 7 federally-declared disasters, including earthquakes and hurricanes as well as floods. His experiences in the allocation of resources and budgeting also serves the program well.

**FCAAP Grants Team**

FCAAP staff share the commitment to providing technical assistance to recipients through a partnership approach. This concept applies to prospective applicants. By speaking with applicants directly on their individual projects, staff gains a better understanding of the intended project and can field questions during the evaluation process. **We strongly encourage applicants to contact our FCAAP staff whenever we can provide assistance on flood related issues** - from pre-application stage to project completion; from technical to grant administrative questions.

Contact	Technical Expertise	Phone	E-mail	Counties Served
Jerry Franklin	Mapping: FEMA / GIS	360-407-7470	<a href="mailto:jfra461@ecy.wa.gov">jfra461@ecy.wa.gov</a>	All
Bev Huether	Grant Administration	360-407-7254	<a href="mailto:bhue461@ecy.wa.gov">bhue461@ecy.wa.gov</a>	All
Ted Olson	FCAAP Plans, projects and NFIP	(509) -329-3413	<a href="mailto:tols461@ecy.wa.gov">tols461@ecy.wa.gov</a>	Adams, Asotin, Benton, Columbia, Douglas, Ferry, Franklin, Garfield, Grant, Lincoln, Pend-Oreille, Spokane, Stevens, Walla-Walla, Whitman
Doug Pineo	Biotechnical bank stabilization projects	509-456-2796	<a href="mailto:dpin461@ecy.wa.gov">dpin461@ecy.wa.gov</a>	All
Cygnia Rapp	Fluvial Geomorphologist	425-649-7129	<a href="mailto:cfre461@ecy.wa.gov">cfre461@ecy.wa.gov</a>	All
Dan Sokol	FCAAP Plans, projects and NFIP	360-407-7253	<a href="mailto:dsok461@ecy.wa.gov">dsok461@ecy.wa.gov</a>	Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Klickitat, Lewis, Mason, Pacific, Pierce, Wahkiakum, Skamania, Thurston
Chuck Steele	FCAAP Plans, projects and NFIP	425-649-7139	<a href="mailto:chst461@ecy.wa.gov">chst461@ecy.wa.gov</a>	Chelan, Island, King, Kitsap, Kittitas, Okanogan, San Juan, Skagit, Snohomish, Whatcom, Yakima
FEMA Region X	NFIP, Map Modernization	425-487-4703	<a href="mailto:David.Carlton@dhs.gov">David.Carlton@dhs.gov</a>	All
Jim Park	Transportation	360-705-7415	<a href="mailto:parkj@wsdot.wa.gov">parkj@wsdot.wa.gov</a>	All

Our FCAAP staff routinely consults with other Ecology staff, federal, and other state agencies on issues such as fisheries resources, wetlands acquisition, preservation/restoration, Shoreline Master Programs, water quality, etc. to provide local governments with comprehensive technical assistance.

## **C. State Disaster/Flood Related Losses**

### **1. Washington State Disaster History**

Washington is one of the most flood-prone States in the Country. In the 27 year period from 1970 through 1997, Washington had 25 Presidentially-declared flood disasters, ranking it only below the States of California, Texas, Oklahoma and Louisiana in that category during that time. In 1997, Washington had the highest number of Presidentially-declared disasters in the Country. Washington also ranks high in terms of policies, claims and number of participating communities. In addition, in Region X, Washington State has 45 percent of the Regional policies, 62 percent of the claims and 39 percent of the participating communities.

There are three tables in the appendix that detail the State's disasters and losses:

- Federal Disaster Declarations for Washington State 1956 – 2003, Appendix M.
- Washington State's Policies and Claims, Appendix N.
- Total Repetitive Loss Properties; January 2002, Appendix O.

## **D. Floodplain Mapping Support**

### **1. Federal**

#### **a) USACE**

#### **Seattle, Portland, and Walla Walla Districts - Flood Plain Management Services**

##### **Authority and Scope**

Section 206 of the Flood Control Act of 1960 (PL 86-645) as amended, provides authority for the Corps of Engineers to use its technical expertise in floodplain management matters to help both public and private interests.

##### **Objective**

The objective of the Flood Plain Management Services (FPMS) Program is to foster public understanding for dealing with flood hazards and to promote prudent use and management of the nation's floodplains. People who live and work in the floodplains need to know about the flood hazards and the actions they can take to reduce property damage and to prevent the loss of life caused by flooding. Land use adjustments based on proper planning and the employment of techniques for controlling and reducing flood damages provide a rational way to balance the advantages and disadvantages of human settlement on floodplains. These adjustments are the key to sound floodplain management.

##### **Types of Assistance**

The FPMS Program provides a full range of technical services and planning guidance on floods and floodplain issues within the broad umbrella of floodplain management. Involvement by project sponsors, who may furnish field survey data, maps, and historical flood/information is encouraged.

### **Technical Service**

The program develops or interprets site-specific data on obstructions to flood flows, flood formation and timing; flood depths or stages; flood-waste velocities; and the extent, duration, and frequency of flooding. It also provides information on natural and cultural floodplain resources of note, and flood loss potential before and after the use of floodplain management measures.

### **Planning Assistance**

On a larger scale, the program provides assistance and guidance in the form of "Special Studies" on all aspects of floodplain management planning including the possible impacts of off-flood plain land use changes on the physical, socioeconomic, and environmental conditions of the floodplain. This can range from helping a community identify present or future flood plain areas and related problems, to a broad assessment of which of the various remedial measures may be effectively used. The program also provides guidance and assistance for meeting standards of the National Flood Insurance Program and for conducting workshops and seminars on non-structural flood plain management measures, such as flood proofing. Guides, Pamphlets, and Supporting Studies are conducted under the program to improve the methods and procedures for mitigating flood damages. Guides and pamphlets are also prepared on flood proofing techniques, floodplain regulations, floodplain occupancy, natural floodplain resources, and other related aspects of floodplain management.

### **b) USGS**

#### **Water Resources of Washington State**

Flooding is the natural hazard of most concern in Washington and it affects lives in the State every winter and spring. Flood monitoring, forecasting, and warning methods allow for planning of responses to potential floods, but flood-inundation maps needed by local planning agencies to assess flooding and floodplain issues are seriously outdated. Flood frequency and magnitude are the basis for many planning decisions, but limited databases and changing conditions make determination of 100-year floods and other frequency discharges an uncertain science. The effects of land alterations on the frequency and magnitude of floods is unclear. Urbanization creates large and small stream flow and ground-water flooding issues that seldom occurred in pre-development times, such as snow- and ice-clogged storm drains or flooding in low-lying areas because of rising ground-water levels. Effects of forest practices on runoff and flooding are contradictory and unclear. Dams alter the hydrology of a watershed, reduce channel capacities through sediment aggradations, and present unknown flood-related issues if removed. Increased technical information is needed on these flood-related issues.

- Flood monitoring, forecasting, and warning methods
- Accurate estimates of flood frequency and magnitude
- Better understanding of the effects of urbanization, forestry, and other land-use practices on flooding

### **Understanding of the effects of dams on flooding and channel geomorphology**

USGS gages on streams in Washington have provided information on flood monitoring since about 1900, and the present network of stations, computer links, and real-time data operated by the USGS remains one of the foremost networks in the country. The network provides real-time stream-flow data from 160 gauging stations via radio, satellite, computer, and dedicated phone lines to local public utilities districts and power companies. Availability of real-time stream-flow data on the Web now allows not only public agencies but the public themselves to make use of the information at critical times.

As part of the USGS Natural Hazards Project in the Seattle area, the Water Science Center developed a method for using real-time stream-flow data, Geographic Information System mapping capabilities, and a computer delivery system to provide real-time maps of projected flood inundation and depth during storms. This Project also produced regional flood-frequency analyses, estimates of hazards caused by channel migration, and maps of areas prone to ground-water flooding. The USGS also conducts numerous flood-frequency and flood-simulation studies and updates flood-frequency analyses for the State. USGS scientists developed a flood-simulation model and a flood forecast system for the Puyallup River Basin and assessed flooding potential in the South Prairie Creek Basin. Some USGS projects include studies of key processes in major floods, such as rain on snow. Discharge measurements at more than 200 gauging stations throughout the State provide information on channel changes over the years.

## 2. State of Washington

### a)) Washington's Statewide Floodplain Management Supporting Programs

While Ecology has a very important role in floodplain management activities in the State with its leadership in implementing the State Floodplain Management Law at Chapter 86.16 RCW and the Flood Control Assistance Account Program, the agency is but a part of the State's overall floodplain management program. There are at least 10 other agencies involved in floodplain management on a statewide basis, five of which are major players. This is especially noteworthy in view of the evolving nature of floodplain management in the Northwest, in response to mandates of the Endangered Species Act and similar efforts. No longer can floodplain management be viewed only in the somewhat narrow context of flood loss reduction, hydraulic engineering approaches and flood insurance. More than ever, there needs to be a more holistic approach to floodplain management, emphasizing the biological and geomorphologic aspects of stream and estuarine systems. This increasingly necessitates the expertise of other resource agencies of the State, especially the Departments of Fish and Wildlife and Natural Resources.

**Division of Emergency Management.** DEM is a most important agency, in that this is the agency that coordinates State disaster mitigation, preparedness, and response and recovery activities. DEM's Mitigation function is especially important, in that it offers technical assistance and funding in the post-disaster setting and, increasingly, for pre-disaster mitigation activities. The Agency administers the Hazard Mitigation Grant Program, the Pre-Disaster Mitigation program and the Flood Mitigation Assistance Program. Many of the eligible activities in these programs are the same that can be funded through FCAAP. With greater funding available through the DEM programs, FCAAP has been able to be used to match the DEM programs. Especially important is the role DEM plays in funding communities to undertake all-hazards planning. In the past, this planning has been coordinated between the two agencies to achieve the same goals. There are many local planning efforts that utilize both DEM and Ecology planning funds because of the similarity in planning criteria.

**Department of Fish and Wildlife.** WDFW administers the Hydraulic Project Approval (HPA) process, which requires permits for work in streams or work that can affect flows in the State's streams. Of great importance is the expertise the agency offers in terms of providing advice on the impact of development proposals on fish habitat. There are close to 300 communities in the State that have adopted the standard flood loss reduction ordinance prepared by FEMA and Ecology, but that ordinance does not address environmental protection in the State's floodplains; environmental protection of floodplains is generally regulated under the protective measures for wetland and riparian areas, and expertise in the riparian element is commonly sought from resources within the WDFW. Ecology does not approve any of its FCAAP projects, whether they be planning or flood damage reduction projects, without coordination and approval of WDFW.

**Community, Trade and Economic Development, Local Government Division.** This Division administers the Growth Management Act at the State level, which includes administration of activities that are related to local Critical Areas Ordinances. With increasing emphasis on environmental protection of floodplains engendered by the Endangered Species Act, other elements of CAOs become very important for floodplain managers, especially the Fish and Wildlife Habitat Conservation Areas element of CAOs. It is estimated that in many communities, this element trumps the Frequently Flooded Areas element in terms of primacy in the regulation of development, especially on smaller streams. Observations reveal that on these streams there is marked reduction of development due to implementation of stream buffers and other preservation measures necessitated by the Fish and Wildlife Habitat Conservation Areas element, which has materially helped to, in turn, reduce flood losses in the State. The Local Government Division also has grant programs that can assist communities to locate development out of floodplains, and has the Washington State Building Code Council, which complements code mitigation activities undertaken by Ecology.

**Washington State Department of Transportation.** While WSDOT involvement is limited mainly to highway right-of-way areas, the agency has extensive resources and expertise that can and often does contribute to floodplain management elements of projects throughout the State. The Agency is experienced at flood-flow modeling, both using conventional methods and expanding on these methods to include some of the more contemporary models. The Agency has much expertise in channel migration zone (CMZ) delineation and application, in view of the influence of CMZs on many of their projects. They have been able to contribute to some floodplain mapping efforts in the State, and their expertise is often sought on specific projects.

**Department of Natural Resources.** DNR administers the Forest Practices Act, which includes issuance of permits that involve practices relevant to floodplain management. They encounter many problems on lands they regulate that are often discovered on private lands, and their research capabilities and applications often serve as models for floodplain management practices elsewhere. This is particularly true with respect to fish habitat protection and enhancement, which is why much can be learned by other State agencies and communities from practices that might occur first on DNR lands.

**DEM/Ecology Memorandum of Agreement.** This MOA is dated August 3, 1995 and was signed by the Directors of CTED and Ecology (DEM used to be in CTED; it is now in the Military Department). The Agreement addresses the need to coordinate development of local flood hazard mitigation plans and Comprehensive Flood Hazard Management Plans, to assure that both accomplish the same objectives and will be accepted by all parties. The purpose of the Agreement is to ensure that a single local plan, when approved by DEM and Ecology, will meet State and Federal requirements for a variety of project funds. The Agreement established a single planning requirement for local flood hazard management plans, a common review process, integration of both planning processes with growth management planning, and similar integration between the FCAAP application and the Robert T. Stafford Act Section 404 application. Although this Agreement is now in need of updating in view of FEMA's all-hazards planning requirements brought on by the Disaster Mitigation Act of 2000 it, nevertheless, has elements that are still operative and serves as a model for coordination among State agencies.

**SHB 3110 Committee.** After the devastating floods of 1995, 1996 and 1997, the Legislature enacted Substitute House Bill 3110 to address problems brought out by these disasters. SHB 3110 resulted in convening an interagency and intergovernmental technical committee chaired by WSDOT in cooperation with Ecology. One of the purposes of this committee was to identify opportunities for coordination on flood related issues. The Committee prepared a report entitled: *Floodplain Management: Flood Hazard Reduction Projects and Agency Coordination*” dated February 1999, which presented recommendations developed by the Committee. One recommendation was to establish an ongoing floodplain management task force, with Ecology as the lead agency. Other recommendations involved improved access to information and funding, establishment of environmental mitigation standards, increased technical assistance, a review of various flood models, and expansion and updating of flood maps. This Committee has been convened periodically since issuance of the report, and is currently being used in the FEMA/State Map Modernization efforts. Members of the Committee are from the State’s DOT, CTED, EMD, DNR, WDFW and Ecology; other members are from local and tribal government, Federal agencies and private consultants (see appendix P. Partnership Plan).

### **3. Local**

#### **a) Washington State Examples of Remapping Efforts**

In the state of Washington, several local communities and local government agencies are in the process of updating flood hazard maps. These jurisdictions are taking several different approaches to revising their flood hazard maps. Descriptions of these different methods, as well as descriptions of methods taken by local and state governments in Oregon and North Carolina, are briefly described below.

##### **King County, Washington**

Extensive flooding that occurred in King County in 1990 revealed numerous inaccuracies with the flood insurance rate maps being used by the county. In general, the maps were underestimating the flood levels with flood damage occurring to property and public facilities located outside the 100-year flood boundary. In 1993, King County implemented a program to update flood hazard maps. The county prioritized river basins needing map revisions based on whether the floodplains were unstudied, contained no 100-year flood elevations, or contained substantial zone A areas. Currently, King County has revised floodplain maps for over 60 miles of the Tolt River, the Raging River, three forks of the Snoqualmie River, the middle Green River, and the south fork of the Skykomish River. The county attempts to revise floodplain maps using full river coverage within the county and hence does not stop mapping at city boundaries (Stypula 2001 personal communication).

King County updates its flood hazard maps by performing detailed hydrologic and hydraulic studies to prepare revised floodplain and floodway maps. Accurate base maps are developed using digital elevation data at the 2-foot contour interval, and show all roads, buildings, structures, houses, and vegetation data. The county is currently using the interferometric synthetic aperture radar (IFSAR) technology to obtain terrain and elevation data (Stypula 2001 personal communication). Updated hydrologic information is obtained from King County and USGS gauging stations, and flood frequency analyses are performed using historical flow data. River cross-sections are resurveyed using narrower linear spacing than required by FEMA, to produce more accurate data for use in the hydraulic model. Hydraulic modeling is then performed using the latest version of the HEC-RAS model. The resulting product is the accurate delineation of the floodplain and floodway produced on a detailed digital base map that contains accurate elevation and planimetric data. Using GIS technologies, these detailed maps can be used by other county departments and communities for a variety of purposes such as identifying critical riparian habitat zones, showing areas in need of instream and floodplain habitat improvement, and identifying aquatic species migration barriers (Stypula 2001 personal communication).

### **Pierce County, Washington**

On September 22, 1999, Pierce County entered into a cooperating technical partner's agreement with FEMA to redelineate flood hazard maps along approximately 13 miles of the Puyallup River and 30 associated tributaries using updated topographic data. The county received a \$40,000 grant from FEMA to perform the remapping. The total cost of the project is unknown, but was greater than the \$40,000 provided by FEMA (Brake 2001 personal communication).

Pierce County determined that flood insurance rate maps for the Puyallup River and tributaries were inaccurate after the February 1996 flood that caused extensive damage to private property and public facilities located outside the 100-year floodplain boundary. The county speculated that river channel reconfigurations and watershed land-use changes were likely responsible for the inaccuracy of the maps. The county determined that it would update its flood insurance rate maps using a stepped approach. The first step was to rapidly redelineate floodplain boundaries and update the maps using the method of Jones et al. (1998). Briefly, this method involves no new hydrologic and hydraulic analysis; instead, updated high-accuracy digital elevation data and detailed digital base maps are combined with existing flood insurance elevation data to redelineate the floodplain boundary and determine new base flood elevations. The second step is to perform detailed hydrologic and hydraulic analysis at a later date when funding is available.

Use of the Jones et al. (1998) method appears to be one way to rapidly update flood insurance rate maps without the cost of performing a detailed hydraulic study. The benefits of this method are 1) it is relatively inexpensive (estimated cost is approximately 10 to 20 percent of the cost of performing new hydrologic and hydraulic analysis [Jones et al. 1998]), 2) it provides digital maps that can be combined with other digital data such as roads, buildings, vegetative cover, land-use using GIS technologies, and 3) it provides digital maps that are more accurate than existing flood insurance rate maps. This technique would be useful for situations where the existing flood insurance engineering analysis is adequate but the base maps and elevation data used to delineate the floodplain boundaries are not sufficiently detailed nor up-to-date, or for situations where the existing maps are very inaccurate and an agency needs to rapidly redelineate floodplain boundaries for floodplain management and growth management decisions. Although the method appears to be sound, Pierce County noted that it worked better on low-gradient river areas than on high-gradient river areas (Brake 2001 personal communication).

### **City of Issaquah, Washington**

On March 15, 2000, the City of Issaquah entered into a cooperating technical partners agreement with FEMA to update flood hazard maps on Issaquah Creek and Tibbetts Creek using updated topographic data, updated flood probability data, and new hydraulic modeling results (Ritland 2001 personal communication). The agreement states that the City of Issaquah would perform flood hazard map updating under the guidance and oversight of FEMA. The estimated total cost of the project is \$180,000 dollars, with all funding from the city.

The City of Issaquah determined that the original 1979 FEMA flood hazard study and flood insurance rate maps for Issaquah Creek and Tibbetts Creek were inaccurate after flood levels occurring in 1986, 1990, and 1996 exceeded the predicted 100-year flood level in certain areas of the city. During these flood events, properties, businesses, and public facilities located outside of the mapped 100-year floodplain were damaged and building foundations undermined. The city determined that the original 1979 FEMA study used outdated and inaccurate base mapping data as well as inaccurate modeling methods to produce the flood insurance rate maps (Ritland 2001

personal communication). In 1998, Issaquah initiated a remapping program to provide accurate base map and elevation data from which future floodplain delineations could occur.

The City of Issaquah hired a consultant to update its FEMA flood hazard maps using detailed study methods. The methods used consisted of 1) collecting highly accurate digital elevation data, 2) developing new base maps that show all planimetric data including roads, buildings, houses and vegetation, 3) using updated high-flow data collected by the U.S. Geological Survey (USGS) and King County, 4) collecting extensive high water elevations during flooding events, 5) using an updated flood frequency analysis performed by the USGS, and 6) performing new hydraulic analyses using Boss RMS for AutoCAD version 4.0 with HEC-RAS as the analysis engine. This information is being used to produce detailed digital flood insurance rate maps to allow the City of Issaquah to make sound floodplain management and growth management decisions. In addition, the new digital maps will be available for use by other communities and agencies to perform other studies such as critical floodplain habitat mapping and stream survey mapping.

### **City of North Bend, Washington**

The City of North Bend is situated within the floodplain of the middle fork and south fork of the Snoqualmie River. In the 1960s, King County constructed levees at various locations along the south fork to protect the city from flooding, resulting in North Bend being included in the King County flood hazard protection program. In the early 1980s, the City of North Bend entered into the National Flood Insurance Program, and FEMA conducted a flood insurance engineering analysis and produced flood insurance rate maps. However, in 1997, the U.S. Army Corps of Engineers decertified the levees, which resulted in FEMA requesting the Corps to update the flood hazard study and flood insurance rate maps for North Bend (Heiden 2001 personal communication).

The Corps of Engineers produced preliminary updated flood insurance rate maps in August 2000. However, the city and King County appealed the validity of these maps, stating that several inaccuracies existed with the delineation of the 100-year flood boundary. Because the City of North Bend does not have the technical capability to perform flood mapping studies, the city requested that King County evaluate the updated maps and complete the floodplain mapping update if necessary. To meet this request, King County entered into a cooperating technical partners agreement with FEMA to take the lead in completing the City of North Bend floodplain mapping study initiated by FEMA and conducted by the Corps of Engineers. The agreement provides King County with grant funding to support the technical reevaluation of the FEMA study and update the City of North Bend flood insurance rate maps (King County 2000).

### **Yakima County, Washington**

Yakima County does not have a program to update flood hazard maps and relies on FEMA to update these maps within the county. Flooding occurs beyond the 100-year floodplain limits depicted on the existing flood insurance rate maps for the lower Naches River and Yakima River. Many of the existing maps in Yakima County are inaccurate because of 1) land-use changes in the watersheds, and 2) use of inaccurate elevation data and poor vertical resolution in creating the maps (Knutson 2001 personal communication). The county has several programs to improve its existing maps without performing new engineering studies. For example, on the lower Naches River, the county is using GIS technologies to digitize existing flood insurance rate maps and to overlay them onto WSDOT 1996 flood flyover aerial photos. The county will note differences in the mapped floodplain boundary and the actual 1996 floodplain boundary, and will revise flood hazard maps using the most restrictive boundaries (Knutson 2001 personal communication). The county may extend this map overlay program to include the Yakima River valley. Yakima County is also considering updating flood insurance rate maps using the method of Jones et al. (1998), as described above for Pierce County (Knutson 2001 personal communication). Currently, Yakima County has access to accurate airborne light detection and ranging (LIDAR) elevation data and digital orthophoto quadrangle base maps for the Yakima and Naches river valleys. Because the county has GIS capabilities, using the method of Jones et al. (1998) is feasible. (Yakima County is currently a CTP and is updating their maps with DHI)

### **Walla Walla County, Washington**

Walla Walla County does not have a program to update floodplain maps, and relies on FEMA to revise flood insurance rate maps within the county. FEMA funds all map updates that occur in the county, and the Corps of Engineers has performed all remapping studies. Because many of the existing maps appear inaccurate, and FEMA has been slow to update these maps, the county is considering updating these maps using existing information with no new analysis or floodplain mapping. This method consists of digitizing existing flood insurance rate maps and fitting them to updated digital orthophoto quadrangle base maps (Krueger 2001 personal communication). Once the map is digitized, county floodplain managers can redelineate the floodplain boundary as needed based on high water mark levels recorded during recent flooding events. Although this method does not truly update the floodplain boundary, it allows for improved floodplain management decisions, because the existing floodplain is then more accurately represented on a high-quality base map.

**b) Local Agency Concerns and Needs**

Local jurisdictions where floodplain maps need revision must be partners in the process, regardless of whether they are contributing funds to a modeling and mapping effort. In order for local agencies to abide by the results of new floodplain maps in their ongoing floodplain management work, they will need to understand how the maps were created, what data were used, and specifically where the accuracy of the maps is approximate. Local agencies should be engaged in the process from the beginning stages of data gathering through review of updated mapping documentation, prior to FEMA initiating its review (i.e., at a point where their comments can make a difference). Local agencies will likely be attuned to information sources that may not be evident to others involved in modeling work. These agencies can also play an important role in communicating the intent, progress, and results of remapping efforts to their constituents.

An important consideration in the involvement of local agencies is availability of computer resources. To take full advantage of new floodplain maps, and to efficiently participate in their development, local agencies must have sufficient computer capabilities and resources to efficiently work with data files, display and plot maps, and communicate with those preparing and maintaining the maps. Local agency staff or their consultants must be trained in the use of DFIRM's and supporting technologies.

## **E. State Funding Programs**

### **1. Flood Control Assistance Account Program (FCAAP)**

Washington has had a Legislatively-established flood control maintenance program for over 50 years. The original program was passed in 1951, and was called the Flood Control Maintenance Program (FCMP). While it was a funded program, funding was sporadic, and mainly occurred in response to flood events.

In 1984, the Legislature enacted Chapter 86.26 RCW, State Participation in Flood Control Maintenance and established the Flood Control Assistance Account Program to assist local jurisdictions in comprehensive planning and flood control maintenance efforts. Ecology administers the program and distributes matching grants out of the FCAAP account to cities, counties and other special districts that are responsible for flood control. The rules under which Ecology operates the FCAAP are found at Chapter 173-145 WAC. This is one of very few State programs in the Country that provides grant funding to local governments for floodplain management planning and implementation actions. The program has been funded for \$4 million per Biennium since its establishment, with additional amounts provided after severe flooding events. Funding was reduced to \$2 million in 2003-2005, due to severe budget constraints.

In order to be eligible for FCAAP assistance, the flood hazard management activities of a local jurisdiction must be approved by Ecology in consultation with the Department of Fish and Wildlife. Also, a Comprehensive Flood Hazard Management Plan (CFHMP) must have been completed and adopted by the appropriate local authority or be in the process of being prepared in order to receive FCAAP Flood Damage Reduction project funds for a particular planning area. This policy evolved through years of the FCMP and early years of FCAAP in response to the observation that poor management in one part of a watershed may cause flooding problems in another part. Only through a comprehensive basin, watershed or stream planning process can this be avoided.

Local jurisdictions must participate in the NFIP and be a member in good standing in order to qualify for an FCAAP grant. Planning grants up to 75% of total project cost are available for comprehensive flood hazard management planning. Flood Damage Reduction projects can receive grants up to 50% of total project cost, and must be consistent with the CFHMP. Emergency grants are available to respond to unusual flood conditions. FCAAP can also be used for the purchase of flood prone properties, for limited flood mapping and for flood warning systems. In general, funding currently is running about 60% for planning and 40% for projects.

In the last full Biennium, 2001-2003, there were 37 projects throughout the State that were funded through FCAAP. There were 33 projects as shown in the following categories, with four additional projects that were special studies:

- 12 were for CFHMPs or updates to these plans. For example, complete CFHMPs were prepared for Clear Creek in Kitsap County, for Winthrop and for Pullman, while the second phase of these reports or plan updates were prepared for the Dungeness River in Clallam County, Grays Harbor County, Salmon Creek Basin in Thurston County, and the Naches River in Yakima County.

## Map Modernization

- 7 were Flood Damage Reduction Projects, ranging from biotechnical stabilization and habitat restoration work on the Naches River in Yakima County and the Green River in King County, to culvert work in Ferry County.
- 5 were acquisition projects of flood-prone structures, on the Quilcene River in Jefferson County, the Cedar River in King County, the Methow River in Winthrop, Clear Creek in Pierce County and the Similkameen River in Okanogan County.
- 4 were Channel Migration Zone studies, which included work in King, Lewis, and Pierce Counties.
- 2 were Corps of Engineers/County Feasibility Studies for flood control projects, in Lincoln and Skagit Counties.
- 2 were grants to establish flood warning systems, in Kittitas and Pierce Counties.
- 1 project resulted in a flood emergency response plan, in LaConner.

As seen in this summary, there was a wide variety of FCAAP projects during the last Biennium. Significantly, there has been a similar array of planning and flood damage reduction projects in recent Biennia, as there is in the current round. There are currently 13 projects in this truncated round, most of which are for planning (7), two of which are for acquisition, two of which are for channel migration zone studies, and two of which are special studies.

### **2. Washington State's Coastal Zone Management (CZM) Grant Program**

Local jurisdictions within Washington's 15 coastal counties use CZM grants to improve local shoreline master programs, enhance public access to shorelines, provide environmental education, and conduct other shoreline related projects. The grant program was established by federal law in 1972 and is administered by the National Oceanic and Atmospheric Administration (NOAA). Approximately \$400,000 are passed through from NOAA to local governments every year. Grants are administered at the state level by the Washington State Department of Ecology's Shorelands and Environmental Assistance Program.

The focus for the 2003-2004 grant cycle is shoreline planning. Projects that lead to an updated Shoreline Master Program (e.g. inventory and analysis, environment designation mapping, policy development, etc.) will receive the highest priority. Other types of projects will be considered if funding allows. Due to the Endangered Species Act (ESA) listings of salmonids in Washington's waters, CZM grant applicants must determine whether or not their proposed projects will affect salmon. Planning projects need to address this issue as part of the planning process. Applications for 306A small construction projects need to include the "ESA Listed Salmonids Checklist / Mitigation Strategy Form" to identify impacts and document how these impacts will be mitigated. We expect that CZM 306A construction projects will receive the most federal scrutiny in this regard. However, all projects should be assessed by the applicant for potential impacts.

### III. Statutory Management

#### A. Federal Floodplain Laws and Regulations - Federal Policy

**National Flood Insurance Act of 1968** — In 1968 Congress realized that virtually no insurance was available in the private sector to protect against the peril of flooding. In recognition of this and the fact that 70-80 percent of all disasters in the United States are flood events, the National Flood Insurance Act of 1968 was enacted to create institutions designed to help property owners protect themselves from losses due to flooding. The Act requires the identification of all floodplain areas within the U. S. and the establishment of flood-risk zones within those areas, and directed the FIA to conduct these studies. As a result of these ongoing studies Flood Insurance Rate Maps (FIRMs), which delineate areas of flood hazard, were created for many U.S. communities. These maps show the location of areas of special flood hazard and applicable risk premium zones. Flood Hazard Boundary Maps (FHBMs) were also created to identify areas of flood hazard based on approximate methods.

A Flood Insurance Study (FIS) includes much more data than FIRMs and FHBMs. Data within the FIS can help communities make sound development decisions. Information provided by the FIS, such as flood profiles, velocities, and cross-sectional data can enable communities to adopt or amend floodplain management measures. An FIS also provides the information necessary to establish and maintain flood insurance premiums.

The Act also created the National Flood Insurance Program (NFIP), which is administered by the FIA. The National Flood Insurance Act of 1968 is included in Title XIII of the Housing and Urban Development Act of 1968, as amended.

**National Flood Insurance Program**—The NFIP, Title 24 Code of Federal Regulations (CFR) Part 1909, was created to help prevent losses to property owners due to floods. NFIP makes Federal flood insurance available to property owners who live in communities that comply with local ordinances designed to mitigate flooding losses. Insurance rates are based upon the flood probabilities determined by FIRMs. The eligibility for purchase of flood insurance is dependent on community agreement to adopt ordinances to mitigate the impact of future flooding. As a result, the Federal government was able to make flood insurance available, while avoiding the possible incentives the program could provide for unwise floodplain development if floodplain ordinances were not required. Ordinances may include elevation of the lowest floor of structures above the 100-year base flood level for a given community. To find out if a community is participating in the NFIP, contact the local building officials, insurance agents, or the NFIP customer line at (800) 638-6620. In addition, each participating community has a designated Floodplain Administrator.

**National Flood Insurance Reform Act of 1994**— The National Flood Insurance Reform Act, a 1994 amendment to the National Flood Insurance Act, created an interagency task force known as the Flood Insurance Task Force (Task Force). The Task Force, made up of designees from ten Federal agencies and organizations, makes recommendations concerning the establishment and adoption of standardized enforcement procedures under the NFIP. The Task Force is also directed to conduct studies of (1) the fees charged under the Flood Disaster Protection Act, (2) the extent to which Federal agencies and the secondary mortgage market can provide assistance

in NFIP compliance, and (3) the extent to which existing NFIP programs of Federal agencies and corporations can serve as a model for other Federal agencies. Lastly, the Task Force is directed to develop recommendations concerning enforcement and compliance procedures based on these studies.

**Flood Disaster Protection Act of 1973**—Before the adoption of the Flood Disaster Protection Act, the purchase of flood insurance was voluntary. Major flooding disasters in 1972 caused extensive losses to federally funded structures that did not voluntarily purchase flood insurance under the NFIP. Because of this, the Flood Disaster Protection Act requires the purchase of flood insurance for buildings acquired or constructed in special flood hazard areas with grants or other Federal assistance such as FHA mortgages. Special flood hazard areas are those areas within the 100-year base floodplains.

**Executive Order (EO) 11988, "Floodplain Management," May 24, 1977**—EO 11988 seeks to avoid the long and short-term adverse impacts associated with the occupancy and modification of floodplains, and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative. EO 11988 applies to federally funded projects and directs agencies to consider alternatives to sitting in a floodplain. EO 11988 applies to development in the 100-year floodplain as well as critical actions in the 500-year floodplain.

A critical action is defined by the Water Resources Council Floodplain Management Guidelines as any activity for which even a slight chance of flooding is too great. For example, if an action would create an added dimension to the flood, as would be the case for facilities producing or storing volatile or toxic materials, or if the occupants of a building located in the floodplain (hospitals, schools) were not sufficiently mobile to evacuate the area in the event of a flood, the action would be a critical one. The loss of irreplaceable records, emergency services or a time-sensitive judiciary action would also be considered critical actions.

Critical actions reflect the concern that the impacts of floods on human safety, health, and welfare for many activities sometimes cannot be minimized unless a higher degree of protection than the 100-year floodplain is provided. Activities determined to be critical actions, such as the function of the U.S. Courts, are subject to a higher standard—the 500-year flood.

Practicable alternatives to sitting in a floodplain can include carrying out the proposed action outside of the floodplain, accomplishing the same objective using other means, or taking no action at all. Alternative sites within the floodplain need to be evaluated if there are no practicable sites outside the floodplain. Finally, the floodplain location itself must be shown to be practicable before the action can be taken, and the need to select a floodplain location must be clearly demonstrated. If it is determined there is no practicable alternative to sitting in a floodplain, accepted flood proofing and other flood protection measures shall be applied to new construction or rehabilitation. To achieve flood protection, agencies shall, among other methods, elevate structures above the base flood level rather than filling in land. According to ADM 1095.2, elevation shall be "accomplished by the use of open work, for example, columns, walls, piles, or piers."

Guidelines for determining no practicable alternative and critical actions are included in the FEMA publication, "Further Advise on Executive Order 11988 Floodplain Management." This publication is available from NEPA Call-In or by contacting the FEMA publications center (800) 480-2520.

**GSA ADM 1095.2, "Consideration of Floodplains and Wetlands in Decision making," October 31, 1983**—ADM 1095.2 contains GSA policy for the implementation of EO 11988. The intent of this guidance document is to (1) minimize the impact of floods on human safety, health and welfare, (2) minimize the destruction, loss, or degradation of wetlands, (3) preserve and restore the nature and beneficial values of floodplains and wetlands, (4) reduce the risk of flood loss, (5) develop procedures to involve the public in the floodplain management and wetland protection decision-making process, and (6) incorporate the Unified National Program for Floodplain Management into agency programs. GSA ADM 1095.2 outlines the GSA decision-making process, which must be followed when floodplains or wetlands are involved.

**Executive Order 13006, "Locating Federal Facilities on Historic Properties in Our Nation's Central Cities," May 21, 1996**—EO 13006 directs Federal agencies to give first consideration to historic properties in historic districts when locating Federal facilities. If no such property is suitable, the agencies are directed to consider other developed or undeveloped sites within historic districts. EO 13006 is subject to the requirements of EO 12072, "Federal Space Management," which requires first consideration to centralized community business areas when meeting Federal space needs except where it is otherwise prohibited. EO 13006 also directs Federal agencies responsible for Federal facilities to take steps to reform, streamline, and minimize regulations, policies, and procedures that impede the Federal Government's ability to establish or maintain a presence in historic districts or to acquire historic properties to satisfy Federal space needs.

EO 13006 is not intended to conflict with EO 11988; rather, the intent of EO 13006 is to first consider historic central city areas for property actions. If this area is in a flood hazard area, then guidance in EO 11988 must be followed. If the floodplain location is determined to be the only practicable alternative, then the action will proceed in the historic central city area.

The above policies and guidance are designed to minimize the threat to human health, losses due to flooding, and adverse impacts on the floodplain and environment. This is accomplished through mitigation of the flooding impact by means of flood proofing new and existing structures in accordance with the NFIP. Several documents are available from FEMA and U. S. Army Corps of Engineers, which provide information on flood proofing and floodplain management to meet regulatory compliance. These documents are available by contacting NEPA Call-In, FEMA, or the local U.S. Army Corps of Engineers (USACE) office.

## **B. State Legislation –Evolution of the State Floodplain Management Law**

Washington's floodplain management law is found at Chapter 86.16 RCW. This law states that prevention of flood damage is a matter of statewide public concern and places regulatory control within the Department of Ecology. In addition to State laws in the Revised Code of Washington (RCW), which are established through the legislative process, administrative rules are adopted to implement the laws and have the force and effect of State law. The Washington Administrative Codes (WAC) which implements Chapter 86.16 RCW are found at Chapter 173-158. Chapter 86.16 RCW is cited in floodplain management literature, including FEMA's National Assessment, as one of the first and strongest in the Nation. A major challenge to the law in 1978, *Maple Leaf Investors v. Ecology*, is cited in legal references to floodplain management issues. The Court upheld the law, declaring that denial of a permit to build residential structures in the floodway was a valid exercise of police power and did not constitute a taking.

In addition to Chapter 86.16 RCW, there are two other statutes that, along with their administrative rules (WACs) also address floodplain management activities in the State. Chapter 86.12 RCW, Flood Control by Counties, authorizes County governments the power to levy taxes, condemn properties and to undertake flood control activities directed toward a public purpose. Chapter 86.26 RCW, State Participation in Flood Control Maintenance, establishes the Flood Control Assistance Account Program (FCAAP) which provides funding for local flood hazard management efforts and sets criteria for the use of FCAAP funds. Portions of these three statutes were amended in 1991 by Engrossed Substitute Senate Bill 5411 to strengthen and coordinate flood hazard management activities Statewide.

The most important change to the State's basic 1935 floodplain management law at Chapter 86.16 RCW, other than adoption of the residential floodway prohibition in 1969, occurred in the late-1980s. Prior to 1987, two separate floodplain management programs existed in Washington State. The State Flood Control Zone (FCZ) Permit Program was administered by Ecology Regional Offices and applied to 16 rivers in Western Washington and two rivers in Eastern Washington; thus, there were 18 FCZs. Over one-third of the floodprone communities in the State (92 of 250) were located in a FCZ.

The National Flood Insurance Program (NFIP) was established in 1968. However, it did not have a serious impact on Washington communities until two things changed. First, the original program was voluntary and there were not many communities that participated until passage of the Flood Disaster Protection Act of 1973. This Act made flood insurance mandatory as a condition of receiving any Federal or Federally-related assistance; while community participation was still voluntary, the effect of the mandatory insurance requirement made it difficult for a community to not participate, since insurance would not be available in a non-participating community which, in turn, severely affected lending in such communities. The upshot of this was that by 1975, community participation had soared from a handful of communities to over 200 counties, cities and towns. All of these communities had to adopt a local floodplain management ordinance that met requirements of the NFIP, which meant that there were two floodplain management programs in many of these communities, local and State.

The second change involved an extensive mapping effort by FEMA. Detailed Flood Insurance Studies were required for all of the participating communities and the National Flood Insurance

Act of 1968 placed that responsibility on HUD, later to become a FEMA responsibility after FEMA's creation in 1978. Most of these mapping efforts started in the late-1970s and were not completed until the early to mid 1980s. The State permit system and floodway prohibition were only functional if maps were available; when these maps started becoming available, the problem of two separate programs, a State permit system and a local floodplain ordinance, became obvious in terms of duplication and confusion between the two.

Thus, during the 1987 Legislative Session, the Legislature amended the 1935 State law by eliminating the State flood control zones and the duplicate permit process, specifying that an applicant would no longer have to get a permit from the State. The law directed communities to prohibit new residential development in designated floodways throughout the State, not just in the former FCZs. This was a major change, in that FEMA was providing maps throughout the State, not just in the FCZs. The law authorized Ecology to establish minimum State requirements (rules) which equal or exceed Federal requirements for floodplain management, and to disapprove local ordinances not meeting State and federal requirements. Ecology proceeded to adopt rules to implement the new law, which included a prohibition on most new development in all coastal high hazard areas (V Zones) and a flood protection elevation standard to elevate buildings one foot above mapped flood elevation levels, both of which exceeded Federal standards and both of which stirred much controversy.

In the 1989 Legislative Session, the Legislature again amended Washington's floodplain management law. These changes eliminated Ecology's authority to establish, by rule, statewide requirements which exceed the minimum requirements of the NFIP, thereby eliminating the more restrictive standards in Coastal V Zones and the one-foot flood protection elevation standard. The 1989 Law, which adopted NFIP requirements as State requirements, affirmed that local governments could adopt floodplain management regulations that exceed NFIP requirements, and retained the requirement that local governments were responsible for enforcing the State residential floodway prohibition. This provision prohibits the construction of new residential buildings in mapped floodways anywhere in the State, and prohibits the substantial improvement of residences in the floodway. The latter requirement includes prohibition of the reconstruction of a substantially damaged residence (damaged over 50 percent of the structure's market value).

The last significant change to the State's Floodplain Management Law occurred in the 1999 Legislative Session, when the Legislature enacted an exception to the residential floodway prohibition that stated that the prohibition does not apply to existing farmhouses in designated floodways that meet certain provisions. The resultant WAC 173-158-075 dealing with existing farmhouses allows repairs, reconstruction, replacement, or improvements to existing farmhouse structures located in floodways and on lands designated as agricultural lands of long-term commercial significance under RCW 36.70A.170. This includes provisions to either substantially improve such farmhouses, or repair them if they are substantially damaged.

The 1999 Legislation also allowed for reconstruction or replacement of substantially damaged residences other than farmhouses under certain circumstances. The resultant rule, WAC 173-158-076, authorizes Ecology to assess the risk for substantially damaged residential structures other than farmhouses that are located in floodways. Ecology will only act at the request of a local government; absent such a request, no repair or replacement is allowed. Such requests can only be for substantially damaged residential structures, not for substantial improvements of an

existing residence that has not been damaged (here the basic law applies, i.e., there can be no substantial improvements of non-farm residences in the floodway).

The Ecology assessment must be based on a scientific analysis of specific conditions of the floodway, based on depths, velocities and erosion. The rule specifically states that flood depths cannot exceed more than three feet, flood velocities cannot exceed more than three feet per second, and there can be no evidence of flood-related erosion. These criteria were developed to reflect the fact that FEMA has mapped floodways throughout the State and this mapping has, in some instances, included floodway areas of shallow flooding and low velocities since the FEMA criteria is hydraulic conveyance, and these instances did not present a relative threat regarding life-safety issues.

### **C. RCW 86.16.010**

#### **Statement of policy -- State control assumed.**

The legislature finds that the alleviation of recurring flood damages to public and private property and to the public health and safety is a matter of public concern. As an aid in effecting such alleviation the state of Washington, in the exercise of its sovereign and police powers, hereby assumes full regulatory control over the navigable and nonnavigable waters flowing or lying within the borders of the state subject always to the federal control of navigation, to the extent necessary to accomplish the objects of this chapter. In addition, in an effort to alleviate flood damage and expenditures of government funds, the federal government adopted the national flood insurance act of 1968 and subsequently the flood disaster protection act of 1973. The department of ecology is the state agency in Washington responsible for coordinating the flood plain management regulation elements aspects of the national flood insurance program.

Duties of the department of Ecology.

The department of ecology shall:

- (1) Review and approve county, city, or town flood plain management ordinances pursuant to RCW [86.16.041](#);
- (2) When requested, provide guidance and assistance to local governments in development and amendment of their flood plain management ordinances;
- (3) Provide technical assistance to local governments in the administration of their flood plain management ordinances;
- (4) Provide local governments and the general public with information related to the national flood insurance program;
- (5) When requested, provide assistance to local governments in enforcement actions against any individual or individuals performing activities within the flood plain that are not in compliance with local, state, or federal flood plain management requirements;
- (6) Establish minimum state requirements that equal minimum federal requirements for the national flood insurance program;

(7) Assist counties, cities, and towns in identifying the location of the one hundred year flood plain, and petitioning the federal government to alter its designations of where the one hundred year flood plain is located if the federally recognized location of the one hundred year flood plain is found to be inaccurate; and

(8) Establish minimum state requirements for specific flood plains that exceed the minimum federal requirements for the national flood insurance program, but only if: (a) The location of the one hundred year flood plain has been reexamined and is certified by the department as being accurate; (b) negotiations have been held with the affected county, city, or town over these regulations; (c) public input from the affected community has been obtained; and (d) the department makes a finding that these increased requirements are necessary due to local circumstances and general public safety.

#### **D. State Legislation and Guidance – Planning**

##### **RCW 86.12.200 Comprehensive flood control management plan -- Elements.**

The county legislative authority of any county may adopt a comprehensive flood control management plan for any drainage basin that is located wholly or partially within the county.

A comprehensive flood control management plan shall include the following elements:

(1) Designation of areas that are susceptible to periodic flooding, from inundation by bodies of water or surface water runoff, or both, including the river's meander belt or floodway;

(2) Establishment of a comprehensive scheme of flood control protection and improvements for the areas that are subject to such periodic flooding, that includes: (a) Determining the need for, and desirable location of, flood control improvements to protect or preclude flood damage to structures, works, and improvements, based upon a cost/benefit ratio between the expense of providing and maintaining these improvements and the benefits arising from these improvements; (b) establishing the level of flood protection that each portion of the system of flood control improvements will be permitted; (c) identifying alternatives to in-stream flood control work; (d) identifying areas where flood waters could be directed during a flood to avoid damage to buildings and other structures; and (e) identifying sources of revenue that will be sufficient to finance the comprehensive scheme of flood control protection and improvements;

(3) Establishing land use regulations that preclude the location of structures, works, or improvements in critical portions of such areas subject to periodic flooding, including a river's meander belt or floodway, and permitting only flood-compatible land uses in such areas;

(4) Establishing restrictions on construction activities in areas subject to periodic floods that require the flood proofing of those structures that are permitted to be constructed or remodeled;

(5) Establishing restrictions on land clearing activities and development practices that exacerbate flood problems by increasing the flow or accumulation of flood waters, or the intensity of drainage, on low-lying areas. Land clearing activities do not include forest practices as defined in chapter [76.09](#) RCW.

A comprehensive flood control management plan shall be subject to the minimum requirements for participation in the national flood insurance program, requirements exceeding

the minimum national flood insurance program that have been adopted by the department of ecology for a specific flood plain pursuant to RCW [86.16.031](#), and rules adopted by the department of ecology pursuant to RCW [86.26.050](#) relating to flood plain management activities. When a county plans under chapter [36.70A](#) RCW, it may incorporate the portion of its comprehensive flood control management plan relating to land use restrictions in its comprehensive plan and development regulations adopted pursuant to chapter [36.70A](#) RCW.

**NOTES:**

**Findings -- Intent -- 1991 c 322:** "(1) The legislature finds that:

(a) Floods pose threats to public health and safety including loss or endangerment to human life; damage to homes; damage to public roads, highways, bridges, and utilities; interruption of travel, communication, and commerce; damage to private and public property; degradation of water quality; damage to fisheries, fish hatcheries, and fish habitat; harm to livestock; destruction or degradation of environmentally sensitive areas; erosion of soil, stream banks, and beds; and harmful accumulation of soil and debris in the beds of streams or other bodies of water and on public and private lands;

(b) Alleviation of flood damage to property and to public health and safety is a matter of public concern;

(c) Many land uses alter the pattern of runoff by decreasing the ability of upstream lands to store waters, thus increasing the rate of runoff and attendant downstream impacts; and

(d) Prevention of flood damage requires a comprehensive approach, incorporating storm water management and basin-wide flood damage protection planning.

(2) County legislative authorities are encouraged to use and coordinate all the regulatory, planning, and financing mechanisms available to those jurisdictions to address the problems of flooding in an equitable and comprehensive manner.

(3) It is the intent of the legislature to develop a coordinated and comprehensive state policy to address the problems of flooding and the minimization of flood damage." [1991 c 322 § 1.]

**RCW 86.26.007**

**Flood control assistance account -- Use.**

The flood control assistance account is hereby established in the state treasury. At the beginning of the 1997-99 fiscal biennium and each biennium thereafter the state treasurer shall transfer four million dollars from the general fund to the flood control assistance account. Moneys in the flood control assistance account may be spent only after appropriation for purposes specified under this chapter. During the 2003-2005 fiscal biennium, the legislature may transfer from the flood control assistance account to the state general fund such amounts as reflect the excess fund balance of the account.

RCW 86.26.050 provides that counties and other municipal corporations responsible for flood control maintenance may apply to the department of ecology for financial assistance for the preparation of comprehensive flood control management plans and for flood control maintenance projects. The purpose of those plans is described in RCW 86.26.105. The department shall determine priorities and allocate available funds from the flood control assistance account program (FCAAP) among those counties applying for assistance, and shall adopt rules establishing the criteria by which those allocations must be made. The criteria must be based upon proposals that are likely to bring about public benefits commensurate with the amount of state funds allocated thereto. This chapter describes the manner in which ecology will implement the provisions of the act.

## **IV. Map Modernization Program**

### **A. DOE's vision for supporting Flood Map Modernization**

The Washington State Department of Ecology (DOE) (Ecology) (the State) is the designated agency with floodplain management authority, and is the NFIP State Coordinator. Ecology will be responsible for implementing the FEMA Map Modernization initiative, including the writing and execution of the State Mapping Plan. DOE's vision for supporting Map Modernization has various elements that are currently in-place or will depend on funding levels and is discussed here. However, at the core of DOE's philosophy are fundamental key objectives that are common to both FEMA and the State. DOE's ability to collaborate and achieve FEMA goals will be primarily driven by budget constraints, FEMA headquarters, and regional priorities.

#### **1. Current Efforts, Capacities, and Resources**

**These activities may include, but are not limited to, the "Fundable Mapping Support Activities"**

Washington State is currently performing the following activities:

- Project planning and Scoping – The State has dedicated its full resources to the planning phases of Map Modernization and given adequate funding will continue to dedicate staff towards individual project scoping meeting.
- Contract Management – The State has secured a team of consultants to perform mapping and study related activities and has capacity to manage the consultant in terms of budgets, workloads, and deliverables.
- Digital Data Sharing – The State's current GIS framework has compiled the vast majority of base map components required under the current DFIRM guidelines and specifications and has mechanisms in-place for distribution to the public.
- Assessment of Community Mapping Needs - The State is performing detailed community assessments of both flood hazard data and mapping needs and has populated MNUSS with results. The State is staffed and ready to move onto a refinement and completeness phase of the assessment.
- Outreach – the State has capacity and is performing several outreach strategies including scoping workshops, web-based guidance materials, in-house technical and policy expertise, and extensive knowledge of the issues and concerns of Washington's flood prone communities. In addition, the state has integrated CAP/SSSE activities into Map Modernization outreach components such as: Community Assistance Visits (CAVs), the State's Flood Control Assistance Account Program (FCAAP), and attendance at public and final meetings.

## Map Modernization

Washington State can also provide the following services to advance the Map Modernization Objectives if funding levels are adequate and interest is high.

- Services to communities focused on improving CRS rankings and credits.
- Workshops and training sessions on items such as: Map Modernization, DFIRM preparation and maintenance, and LIDAR topography applications. Utilization of DFIRMs, map reading, coordination of DFIRMs with local GIS platforms, explanation of additional benefits of Map Modernization for all hazard identification, hazard mitigation planning and response and recovery. Coordinate the collection of historic data, particularly for calibration or mapping of unmapped areas.
- Provide new and highly accurate spatial coordinate information of areas such as: repetitive loss properties, high water marks, flood scars, erosion areas, groundwater flooding, and other floodplain structures for use in multi-hazard mapping using Global Positioning System technology.
- Multi-agency coordination both for mapping agencies and user agencies that will foster mutually beneficial outcomes and enhance the delivery of risk management applications and operations.
- Providing direct GIS/mapping expertise to communities focused on building capacity and map ownership at the local level.

### **2. Flood Hazard Data**

The State's current efforts in flood hazard data are in developing and maintaining a statewide digital flood hazard database with staff and capacity in-place to distribute data, integrate updated data, manage and analyze data, and provide guidance towards all phases of the Map Modernization effort. Ecology's vision is to start housing and managing flood hazard data during and after the Map Modernization Program.

### **3. Flood Hazard Mapping**

Current flood hazard mapping efforts are aimed at providing digital base map layers, technical mapping assistance, and complimentary mapping components to local governments that lead to local ownership and improved decision-making. In addition, technical assistance towards the development of plans, projects, flood hazard mapping tools, digital environments, and data sharing. Further, coordination with a multi-agency Floodplain Management Task Force dedicated to mutually beneficial partnerships that achieve shared outcomes through the identification and communication of flood hazard information and spatial data collection. The State's vision is to broaden flood hazard mapping to incorporate all floodplain management interests such as: Salmon recovery, transportation planning, and multi-hazard mapping.

#### 4. NFIP Activities

The State currently performs several NFIP activities that meet or exceed the NFIP criteria.

The floodplain management assistance activities are outlined in FEMA's Community Assistance Program, State Support Services Element (CAP-SSSE), and includes the following major categories:

- Community Assistance Visits (CAVs)
- Community Assistance Contacts (CACs)
- Floodplain Ordinance Assistance
- Regional-State Program Coordination Meetings
- Local Officials Workshops
- Newsletters
- General Technical Assistance

#### 5. The State would like to achieve the following:

- a) Institute a primary role in the collection, integration, and distribution of multi-hazard geo-spatial information that supports risk management applications and operations.
- b) Provide effective planning and program management through the input and integration of more than 100 years of combined staff experience in Washington State floodplain management, NFIP operations, and FEMA protocols. The State can offer enhanced program management through multi-agency partnerships that provide motivation and incentives towards improved flood hazard information and multi-hazard mapping. Further effective program management will be provided through the State's consulting team, which is a leader in Washington State floodplain management and has extensive experience with FEMA's flood hazard mapping programs.
- c) The State hopes to foster guidance and outreach programs that better inform the public of where to obtain the best available information and how to effectively use the information to make sound decisions that reduce the vulnerability to hazards. Primary outreach activities would focus on workshops and guidance documents in areas such as: planning, ordinances, digital data, DFIRM mapping, community rating system, technical advisory committees, and web-based materials. All Map Modernization activities will have a focus on providing better information in the shape of better tools that will lead to better decision making in flood hazard reduction and landuse planning.

## **6. Intended Roles**

The State is preparing for three discrete levels of funding that will drive the State's intended roles (see I.D. Staff and Budget Overview).

### **Option A**

#### **Maximum Level of Participation**

fulltime and administrative support, the State intends to be a fully managing state, similar to the Cooperating Technical State approach being utilized by North Carolina, Michigan, and California. As such, we can perform needs assessments, digital data sharing, determine the mapping needs of the State, prioritize mapping work, perform coordination with other federal, state, local, and private sector partners, issue Mapping Activity Statements to our consultant to perform the work, provide DFIRM maintenance, and perform due process and outreach activities. The State will also be the repository for the completed DFIRMs, including certain raw data, base maps, and final products.

### **Option B**

#### **Moderate Level of Participation**

Given dedicated funding for a fulltime Flood Mapping Coordinator, funding Ecology is prepared to participate at a moderate level. As such, the State will determine the mapping needs, prioritize mapping work, manage the mapping dollars, issue Mapping Activity Statements to our consultant to perform the work, and house the resulting data and products into our data collection and delivery system. At this moderate level of participation, the State will NOT have capacity to perform all due process activities.

### **Option C**

#### **Minimum Level of Participation**

Without funding for a Flood Mapping Coordinator, and without adequate mapping dollars available to the State, DOE will be a limited partner and will have capacity to perform only a few of the Map Modernization activities. As such, we will determine the mapping needs of the State, prioritize mapping work, and house the data and products into our data collection and delivery system.

## **B. Needs and Plan/Strategy**

### **1. Project Description**

Department of Ecology (DOE) (Ecology) currently has staff and capacity to perform high-level activities in the Map Modernization effort. Given funding for a flood mapping coordinator and administrative assistance, the State's overall plan is that of a Full-Mapping State and will dedicate its resources towards prioritizing mapping needs, providing outreach to local communities, developing a data collection and delivery system, and managing our contract for performing restudies and digital conversions. Without funding for a flood mapping coordinator, the State will reduce its role to planning and archival capacities and will NOT have capacity to manage a consultant to perform restudies and digital conversions.

### **2. DOE's Primary Resources**

- Experienced staff in areas of GIS, information technology systems, digital topography, partnership coordination, engineering, planning, NFIP, floodplain ordinances, outreach, and community assistance.
- State supported funding mechanism for flood hazard mitigation (FCAAP) can be used as a cost share for both management and mapping activities beginning in July of 2005.
- A team of consultants that can provide management/support for all mapping activities within the State. This consultant can perform all of the eligible activities under the Map Modernization Program.
- Mutually beneficial partnerships developed to cooperate with both State and Federal agencies that maximizes on inter-disciplinary data collection, integration, and management.

### **3. Justification**

The Department of Ecology will help compliment FEMA's Map Modernization efforts and achieve the goals listed in the Multi-Hazard Flood Map Modernization Objectives by:

- Enhancing our current data collection and delivery system to maximize on the goals and objectives of Map Modernization. DOE currently has a state-of-the-art GIS platform, experienced technical staff, and over 100 years of combined experience in Washington's flood hazards and flood-prone communities.
- Effective program management dedicated to identifying goals and objectives, reducing redundancy, assuring data standards and consistency, and monitor Map Modernization progress. DOE staff and consultant team is intimately experienced with FEMA protocols, operations, and objectives. The State intends to maximize on effective program management through the dedicated efforts of our staff and consultant team.
- Continue formal development of multi-agency partnerships that ensure proper data collection, compatibility, and dissemination to primary users. DOE is enhancing its partnership with several state and federal agencies to coordinate on data collection and project involvement (see appendix P. Partnership Plan).

## Map Modernization

- Improve our technical guidance and outreach to local communities and the public that support Map Modernization products and services and implement innovative solutions for the presentation of multi-hazard data. DOE can achieve these via workshops, web-based guidance materials, community assistance visits, project scoping meetings, flood map adoption guidance, and multi-agency coordination.
- Integrating FCAAP into Map Modernization goals and objectives.

### **4. DOE's Identified Shortfalls:**

The Department of Ecology's primary shortfall is funding for a Flood Mapping Coordinator. This position is critical to performing most of the Map Modernization activities described in this plan. The State will pay staff time and overhead for the Flood Mapping Coordinator for the year 2004 as a match. A secondary shortfall is DOE's inability to provide direct cash match until July 2005. The agency does however intend to utilize its FCAAP grants program to focus on Map Modernization priorities.

### **DOE's Proposal**

DOE is proposing that FEMA provide funding for FTE's to perform mapping coordination and administrative activities for years 2005 - 2009.

## **5. Project Plan**

### **Project Timeline**

Project timeline began in 2003 with FEMA funding to develop the plan (Phase I) and will extend through the year 2009 when all of Washington State's counties will have completed or preliminary DFIRM's with priority restudies incorporated. This plan details the timeline into three budget scenarios and a year-by-year account for each county and a strategy to complete the Map Modernization program in Washington State by 2009 (see appendix A. County Conversion Schedule and Appendix L. Mapping Needs Spreadsheets). DOE will ensure effective program management in all phases and activities by working closely with Region X staff to develop aggressive yet achievable timelines for each phase of the Map Modernization effort; including fast-track opportunities, quarterly reporting, and a long-term completeness plan. The State will ensure a good start to the program by providing up-front details of State's priority flood hazard areas and flood hazard reduction goals.

### **Resources**

DOE will rely on a funding for a flood mapping coordinator and will utilize its regional floodplain management staff and GIS expertise to manage the effort. DOE will provide program management, training and various outreach activities to promote map modernization within the state. Elevating the State's capacity as a "Full Mapping State" will be a team of consultants contracted specifically to help manage the program, perform studies, and modernize the maps into FEMA approved DFIRM's. Complimenting the program will be a suite of State and Federal agencies with an established partnership aimed at broader floodplain management, multi-hazard mapping, and enhanced program.

### **Deliverables**

DOE has established a direct conduit between FEMA, the consultant, and Ecology for enhanced product delivery of assessments, technical information, data, and products. CTP agreements with

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## Map Modernization

FEMA and Mapping Activity Statements for each mapping project will include a list of deliverables and a schedule for delivery by DOE and/or the consultant. Deliverables will/may include MNUSS updates, training in GIS, regulations, flood plain management, and higher regulatory standards. All deliverables will meet FEMA's guidelines and specifications for flood hazard mapping and constant coordination with FEMA Region X will ensure adequate and timely delivery of all of the required elements of the Map Modernization Program.

### **Reporting**

DOE will utilize our in-house staff and mapping consultant, in alignment with FEMA Region X, to establish and maintain reporting records. DOE will use a scheduling tool that has been developed by the Region to track and report on mapping activities and progress (see appendix Q. Tracking Tools).

### **Quality Assurance**

DOE will rely on our consultant, FEMA's regional IDIQ's, and the NSP for quality assurance of all products, engineering plans, and data development deliverables. DOE will manage the data collection and delivery system and provide periodic Q/A coordination with FEMA and the consultant for management oversight to ensure adequate delivery to FEMA and the repository.

#### **IV.C. Performance Goals**

DOE's in-house staff has over 100 combined years of experience and service to floodplain management in Washington State. This knowledge base will provide continuous improvement strategies and innovative technical and business practices. Performance goals will be directed and measured through a series of project management tools designed specifically for the Map Modernization Program. First and foremost will be directives that are aligned with FEMA's goals and objectives:

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

##### **1. Program Management Goals**

DOE intends to achieve effective program management by complimenting our Map Modernization efforts with our current CAP/SSSE activities and grants programs. The State's Flood Mapping Coordinator, regional staff, and our consultant will combine existing program elements such as Community Assistance Visits, Comprehensive Flood Hazard Management Planning, technical advisory committees, and flood hazard identification efforts into an integrated Program Management structure. This team will prioritize and align Map Modernization needs with existing NFIP activities and maximize on the potential for each to contribute to one program. For example, at the beginning of each biennium DOE's FCAAP grants program (see II.E.1. FCAAP) will use Map Modernization goals to help award grants to communities with mapping needs and leverage those funds towards overall program objectives.

##### **2. Partnership Goals**

DOE is establishing a partnership with several state and federal agencies to coordinate on Flood Hazard data collection, project activities, and engineering applications that will ensure data reliability, compatibility, and dissemination. A sub-component of the State Business Plan will be integrated multi-agency responsibilities that will promote the expansion of partners, data ownership, and are driven by the individual goals and objectives of each agency. The partnership will identify commonalities, opportunities, and areas for future growth of Washington's 'Floodplain Management Task Force' (See II.D. Floodplain Mapping Support and Appendix L. Partnership Plan). For example, a plan is being formulated to integrate into the program multi-hazard data as well as newly highlighted activities such as Department of Homeland Security's (DHS) interest in Dam Failure Mapping.

DOE will aggressively pursue monitoring and performance goals and that will reduce redundancy and maximize on partner contributions through this multi-agency cooperative agreement as well as through its core group of regional specialists. These groups meet frequently to assess progress and predict where future activities will require effort and propose action.

##### **3. Data Collection and Delivery**

DOE's Flood Mapping Coordinator and our consultant have extensive experience and training with FEMA data standards and product specifications. DOE's geo-spatial data collection and

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delivery system uses state-of-the-art GIS technology complimented by the latest in web-based delivery systems. The State currently maintains digital flood hazard data (Q3) for the entire State and distributes the data via internet viewing tools and downloadable GIS data and intends to archive past data and ensure that the most current and best available information is easily accessible from our web-site. The system contains the most reliable information available and is capable of maintaining new flood hazard data that meets or exceeds FEMA standards. The State of Washington's future GIS and internet applications are secured through agency commitment and State policy. Thus, the incorporation of Map Modernization activities should not require significant FEMA funding to support these activities.

### **Flexible Solutions**

The State will ensure flexible solutions that adapt to various mapping opportunities while maintaining continuity of Map Modernization objectives. DOE will ensure effective program management by offering FEMA the most experienced and knowledgeable floodplain specialists in the state towards the Map Modernization Program. The State's regional specialists have extensive NFIP experience and an intimate knowledge of the State's NFIP communities and historical trends. Additionally, long-term continuity of flood hazard mapping services will be assured by clearly defined responsibilities that provide matrix management opportunities and progressive delivery solutions.

### **4. Flood Hazard Data**

Currently, the State provides flood hazard data freely to the public and local governments in quick-access internet viewers in context with other hazards, environmental data, and planning tools. As well, DOE distributes flood hazard data in GIS based formats for detailed and extensive planning applications resulting in reduced vulnerability to natural, accidental or man-made hazards. DOE's data viewing and distribution systems are easy to use, flexible, and adaptable. This system allows for future technological advances and is formatted for public use. The State will exploit its existing digital mapping technologies to provide FEMA with a premier data collection and delivery system for use in FEMA's Map Modernization Program and Multi-hazard Mapping Initiative.

### **5. Applications**

DOE's current floodplain management activities routinely create innovative approaches and applications that ensure effective administration of the NFIP at all levels. Map Modernization goals and objectives will increase that level of administration.

DOE utilizes a multi-agency cooperative framework comprised of natural resource, ecological, community development, and transportation entities that allows multiple participants to use and contribute data. This multi-agency task force maximizes on individual data components that support flood hazard mapping and seeks opportunities to apply such information throughout the interests of all parties and presents the material to broader audiences for future application development.

## **6. Security**

The State's security policy is strictly monitored and enforced in broad-ranging disciplines. DOE will ensure the security and standardization of all information related to the Map Modernization effort by constant input and feedback from Region X staff, FEMA guidance materials, training, and workgroups.

## **7. Multi-Hazard**

DOE currently distributes flood hazard data through web-based viewers and allows for a multi-hazard context environment. DOE's cooperative involvement with the USGS and 'The National Map' will ensure that future flood hazard information activities will facilitate access and distribution across various platforms and applications. DOE has a well-established Flood Hazard and Floodplain Management Web Site with links to FEMA's Multi-Hazard Mapping Initiative, and periodically reviews its web site for expandability to progressive applications and innovative concepts. Plans are in-place to coordinate with FEMA's HAZUS Flood Analysis Module including training and data integration.

## **8. Expand and Better Inform the User Community**

DOE's Map Modernization Plan will improve our technical guidance and outreach to local communities and the public that support proper floodplain management products and services. It will seek out and implement solutions for the presentation of multi-hazard data. DOE will achieve these goals through dedicated in-house staff, the consultant, local workshops, web-based guidance materials, community assistance visits, and multi-agency coordination. DOE staff are experienced and trained in effective outreach strategies, educational workshops, program presentation, and open communication techniques. One of the State's primary goals in Map Modernization is to expand Flood Hazard Mapping to broader levels where local ownership of a reliable tool leads to a better-informed community and ultimately reduces their vulnerability to natural and man-made disasters.

## **9. Dam Failure/Inundation Mapping**

In Addition, this plan proposes to integrate the Department of Homeland Security's interest in modernizing Dam Inundation Mapping. At this time, dam failure/inundation mapping proposals are underway and integration into this plan will be attached as an appendix when prepared.

#### IV. D. Tracking Tools

DOE will monitor and track mapping progress using several tracking tools to evaluate program performance (see section appendix for Tracking and Reporting Tools). The State will deliver necessary reports that evaluate program performance through planned periodic reviews structured towards pre-identified goals as well as ensuring integration into FEMA’s web-based system for tracking and reporting cost, schedule, and performance.

##### 1. Success Measures

Success measures will incorporate FEMA guidelines on a year-by-year basis and will address FEMA goals as indicated in the following table.

Map Mod Year	2004	2005	2006	2007	2008	2009
% pop with GIS Data	20%	50%	65%	75%	85%	100%
% pop adopted GIS	10%	20%	35%	50%	70%	90%
% effort leveraged	20%	20%	20%	20%	20%	20%
% funds to CTPs	20%	25%	35%	45%	50%	60%

A completeness plan is being developed using two tracking tools. The first tool is a spreadsheet that will track the individual mapping needs, by county. The second tool is a county-wide conversion schedule that incorporates mapping work necessary prior to county conversion. Below are examples of these tools with full spreadsheets and tables attached as appendices (see Appendix A. County Conversion Schedule, Appendix H. Mapping Needs Spreadsheets, Appendix M. Tracking Tools, and Appendix M. Community Populations Spreadsheets).

##### 2. Mapping Needs by Panel

Example table – full tables are found in the appendix for each year for three budget scenarios

County	Streams	Panels	Panels Remain	Panels Complete	Date	Detail study	Completed
					Funded	approx. miles	or contracted
CHELAN		29	29				
KING							
	Mill Creek					1	
	Cedar River					21	21
	Lower Snoqualmie R. r					34	34
	Springbrook Creek					7	7
	Rolling Hill Creek					1.2	1.2

**3. Budget Scenarios**

Target Year	detail study approx. miles	Completed or contracted	Remaining	Panels	Panels Remaining	Panels Completed
<b>HIGH BUDGET</b>						
2003	178.1	178.1		41	0	41
2004	210.61	78.31		163	163	0
2005	374.07	38		565	328	312
2006	33.95	0		510	435	75
2007	43.32	0		588	513	75
2008	0	0		513	423	90
2009	0	0		246	246	0
Total	840.05	294.41	545.64	2626	2108	593
<b>MEDIUM BUDGET</b>						
2003	178.1	178.1				
2004	197.61	77.31				
2005	257.75	38				
2006	5.7	0				
2007	2	0				
2008	0	0				
2009	0	0				
Total	641.16	293.41	347.75			
<b>LOW BUDGET</b>						
2003	178.1	178.1				
2004	108.9	72				
2005	129.02	38				
2006	0	0				
2007	0	0				
2008	0	0				
2009	0	0				
Total	416.02	288.1	127.92			
					Panels	2108
					Cost	\$3,000
					Total	\$6,324,000

#### 4. County Conversion Schedule

Example – Full tables in Appendix A.

County Name	Decile Rank	County-wide Conversion	Target Dates	Panels	People/Panel	Conversion Cost
Adams	9	Ready For Conversion	2007	35	470	\$105,000
Columbia	8	Ready For Conversion	2007	15	274	\$45,000
Ferry	9	Ready For Conversion	2007	27	269	\$81,000
Garfield	9	Ready For Conversion	2007	18	129	\$54,000
Grays Harbor	2	Incorp. Restudies	2007	94	728	\$282,000
Island	3	Ready For Conversion (DONE)	2007	41	1830	\$123,000
Lincoln	8	Ready For Conversion	2007	41	246	\$123,000
Pacific	4	Ready For Conversion	2007	25	831	\$75,000
Pend Oreille	7	Ready For Conversion	2007	45	267	\$135,000
total						<b>\$1,023,000</b>
Asotin	7	Ready For Conversion	2006	9	2273	\$27,000
Benton	2	Ready For Conversion (lower Yakima)	2006	96	1566	\$288,000
Clallam	3	Incorp. Restudies	2006	80	829	\$240,000
Franklin	6	Ready For Conversion	2006	92	573	\$276,000
Okanogan	5	Ready For Conversion	2006	47	834	\$141,000
San Juan	7	Minimal work needed	2006	12	1214	\$36,000
Stevens	5	Ready For Conversion	2006	62	654	\$186,000
Wahkiakum	5	Ready For Conversion	2006	20	190	\$60,000
Walla Walla	5	Ready For Conversion	2006	53	1059	\$159,000
Whitman	5	Ready For Conversion	2006	115	353	\$345,000
total						<b>\$1,731,000</b>

**5. Community Populations Spreadsheet**

<b>Community</b>	<b>Population</b>	<b>Dollars Sent to CTP(2003)</b>	<b>Dollars Sent to CTP(2004)</b>	<b>Contribution</b>	<b>DFIRM Date</b>	<b>Population(2004)</b>
<b>Adams County</b>	16,434					0
.Hatton town	97					0
.Lind town	573					0
.Othello city	5,897					0
.Ritzville city	1,713					0
.Washtucna town	258					0
.Balance of Adams County	7,896					0
<b>Asotin County</b>	20,453					0
.Asotin city	1,096					0
.Clarkston city	7,192					0
.Balance of Asotin County	12,165					0
<b>Benton County</b>	150,366					0
.Benton City city	2,767					0
.Kennewick city	57,949					0
.Prosser city	5,015					0
.Richland city	41,496					0
.West Richland city	9,071					0
.Balance of Benton County	34,068					0

Example Table – Full tables in Appendix M

## **E. Project Management Tools**

Integrated into the tracking and scheduling components of the plan are several project management tools. This section of the plan details both internal activities, consultant activities, and FEMA directed activities into one State Plan to ensure adequacy and completeness of the plan.

### **1. State and Consultant Activities**

The State will delegate most of the map production, engineering, and digital conversions to their consultant per a defined contract. The State will manage the contract, perform administrative activities (CAP MAP), and, given adequate funding will coordinate and perform due process activities, training, needs assessment, scoping and outreach.

Flood Studies will be directed by DOE or FEMA. DOE's consultant has been evaluated through a Request for Proposals (RFP), a contracting step used by Washington State to determine if companies have the necessary expertise and experience to meet the standards required by FEMA. An emphasis on having successfully performed Flood Study and DFIRM creation in the past was part of the RFP. The USGS and a quasi-governmental group known as the Puget Sound LIDAR Consortium will also be consulted regarding the collection of spatial and topographic data with the intention of application to the Map Modernization Program.

### **2. Proposed Approach to Map Production**

The flood studies, mapping, and digital conversions will be performed by DOE's consultant, FEMA, a consultant selected by a local CTP and/or one of DOE's partners such as the U.S. Army Corps of Engineers (Corps). The Corps is currently performing studies on several major western Washington river systems, and is expected to continue these studies during the mapping period covered by this plan (2003-2009). DOE's consultant will be contracted directly by Ecology and the consultant has all the necessary expertise and experience to perform flood studies, digital conversions, and project management. The consultant and the local community will collect the necessary data and submit them to FEMA for approval. In addition to the work being contracted by Ecology, it is anticipated that FEMA Region X will continue to direct the work being performed on the western Washington Rivers mentioned above, using their IDIQ, NSP, or coordination with the Corps.

### **3. Specific Resources and/or Capabilities of the Agency.**

DOE's primary role is as the NFIP State Coordinator, and as the Mapping Plan author. Ecology is the co-chair of the Floodplain Management Task Force, the coordinating body in Washington State for floodplain management issues. At present Ecology has four staff providing direct NFIP support to communities, and one additional staff providing State Mapping Plan and Floodplain Management Task Force leadership (see II. B. 2. Regional Staff).

Ecology has excellent Geographic Information System (GIS) capabilities and these capabilities will be used to provide technical assistance to local communities regarding data collection, management, and storage for digital information. DOE will be the FIRM and DFIRM repository for the state. The DFIRMs will be stored in Ecology's GIS database and integrated into distribution applications.

Ecology also administers the Flood Control Assistance Account Program (FCAAP), a grant program to local government for flood projects, including mapping activities, writing flood hazard management plans, and structural and non-structural flood control projects. This account provides about \$3 million dollars per biennium to local governments for this work (see II. E.1. FCAAP).

Ecology has secured a leading team of consultants to provide mapping and project management support to Ecology for the Map Modernization Program. The consultant can perform all of the eligible activities of the mapping program and will effectively compliment the State's in-house capabilities.

### **4. Previous or On-going Flood Study or Data Collection Activities**

On-going flood studies by the Corps and FEMA include Clark County, Island County, Pierce County, Whatcom County, Spokane County, Skagit County, and Chelan County, as well as several cities and small streams. In addition, Ecology has paid for flood study data collection in Yakima County (Naches River), Kitsap County (Clear Creek), Whatcom County (Lower Nooksack), and the City of Sultan (Snohomish County) through the FCAAP process. This data will be used to support either flood studies or map upgrades as needed.

#### **Base Map Components**

The FEMA-approved base maps, Digital Ortho-Quarter Quadrants (DOQQ's), have already been acquired statewide by Ecology and are stored on our agency GIS database for use in Map Modernization projects. These can be used by any local community to create their base map. In addition, DOE has and maintains statewide data that meet or exceed FEMA's base map specifications. These data layers are tiled by county and free to local communities for their base mapping. Among these data sets are several of the base map features required by FEMA for the Map Modernization Program. DOE will determine the best available information for base maps and topography and work with communities to obtain or develop better information where necessary.

### **5. Amount of Work that DOE is Capable of Managing.**

Ecology is anticipating handling approximately half of the available mapping funding for Washington State, with the balance being administered by FEMA Region X. At present, we are anticipating a funding level of approximately 2 million dollars for each Federal Fiscal Year (FFY) that will be managed by Ecology, or a total of about 10 million dollars over the course of the project. The majority of DOE's management capabilities rely on funding for a Flood Mapping Coordinator and administrative assistance.

### **6. How the State will Fulfill the Cost-share Requirements.**

Ecology intends to use the FCAAP account to provide the 20% funding match desired by FEMA. However, these matching dollars will NOT be available until July 2005. For year 2004, the State will pay staffing costs for a Flood Mapping Coordinator as match for year '04. Our current planning calls for at least 1 million dollars to be dedicated to the mapping program every two years, or a total of 2 million dollars for the five-year project. There is also data and studies currently being performed under FCAAP grants to local governments which will support some of the mapping projects identified in this plan. The value of these contributions has not yet been estimated. Any future FCAAP grants to local governments for mapping work will be considered direct state-funded support to the mapping project and any data collected in the past with FCAAP funding will be considered a contribution valued in accordance with FEMA's guidance on partner contributions (Blue Book). DOE is also aggressively leveraging in-kind data and services towards the program and will itemize these contributions on a project by project basis. Can you count any of the activities you guys do that are not funded by CAP-SSSE? I would think so.

### **7. State and Consultant Capacity**

State Capacity – current capacity is one and one half FTE's (Full-Time Employees)

- Management and database skills for annual prioritization of counties
- Communicating with appropriate officials and conducting meetings for scoping
- Management of budgets
- GIS guidance and technical assistance
- Gathering of, refinement of, and implementation of base mapping, topographic information and GIS for developing DFIRMS
- Development of contracts with specific scopes of work

Consultant Capacity

- Cartographic, GIS, and engineering
- Development of contracts with specific scopes of work
- Gathering of, refinement of, and implementation of base mapping, topographic information and GIS for developing DFIRMS
- Hydrology and hydraulic analysis and delineation of floodplain boundaries
- Management of engineering and GIS resources
- QA/QC review of draft information (*technical, database, and graphical review*)
- Completion of maps and reports to meet appropriate specifications
- Management of budgets

## 8. Map Modernization Activities

### CAP-MAP vs. CTP funding scenarios

The following tables reflect activities in which the State will perform as Administrative activities (or CAP-MAP oversight) and those activities that will be performed as CTP activities. As shown below, some activities may require both funding mechanisms.

The first table reflects activities that can be performed given **full funding for a Flood Mapping Coordinator and administrative assistance**. The second table reflects activities that can be performed without funding for a Flood Mapping Coordinator. However, in some cases, FEMA funding may be required to ensure adequate completeness of those activities.

Table 1 - Comprehensive List of Flood Map Modernization Activities that assumes **full funding for a Flood Mapping Coordinator** (See section I.D. Staff and Budget Overview).

Activities	CAP-MAP (Oversight)	CTP (Projects)
Activity 1A – Scoping	X	X
Activity 1B – Outreach	X	
Activity 1D – Needs Assessment	X	
Activity 2a – Topographic Data Inventory	X	X
Activity 2b – Topographic Data Procurement	X	X
Activity 10a – Digital Base Map Inventory	X	X
Activity 10b – Digital Base Map Sharing	X	X
Activity 11b – DFIRM Maintenance	X	
Activity 15 – Project Selection	X	
Activity 16 – Contract Negotiation/Management	X	X
Activity 18 – Technical Standards Agreement	X	X
Activity 19 – Due Process Activities – Conduct Time & Cost Meeting and Final Meeting, process appeals	X	X
Activity 21 – Information Technology Systems	X	X
Activity 23 – Report to Oversight Authorities	X	X
Activity 1C – Field Surveys and Reconnaissance		X
Activity 3 – Independent QA/QC of Topographic Data		X
Activity 4 – Hydrologic Analyses		X
Activity 4A – Coastal Hazard Analysis		X
Activity 5 – Independent QA/QC of Hydrologic Analyses		X
Activity 5A – Independent QA/QC of Coastal Hazard Analysis		X
Activity 6 – Hydraulic Analyses		X
Activity 7 – Independent QA/QC of Hydraulic Analyses		X
Activity 8 – Floodplain Mapping		X
Activity 8a – Floodplain Mapping (Approximate)		X
Activity 9 – Independent QA/QC of Floodplain Mapping		X
Activity 10 – Base Map Acquisition and Preparation		X
Activity 11 – DFIRM Production (Non-Revised Areas)		X
Activity 11A – Independent QA/QC of DFIRM Production (Non-Revised Areas)		X
Activity 12 – Merging of Revised and Non-Revised Information		X
Activity 12A – Application of DFIRM Graphic Specifications		X
Activity 12B – Independent QA/QC of DFIRM Graphics		X
Activity 13 – Preparation and Issuance of Preliminary FIS and FIRM		X
Activity 14 – Post-Preliminary Processing		X

Table 2 - Comprehensive List of Flood Map Modernization Activities that assumes **NO funding for a Flood Mapping Coordinator or adequate funding to the State for mapping projects.**

Activities	CAP-MAP (Oversight)	CTP (Projects)
Activity 1D – Needs Assessment	X	
Activity 10b – Digital Base Map Sharing	X	
Activity 11b – DFIRM Maintenance	X	
Activity 15 – Project Selection	X	

### 9. Summary of Resource Needs - Annually

The following table reflects the resources needed to complete the tasks annually. For example, 10% of a full-time employee (FTE) is required to adequately address the task of “Statewide Prioritization of Mapping Projects”. The “Estimate of Resources Needed” is how much of an employees time is necessary to address and complete the task. “Available State Resources” refers to the State’s commitment of an employee.. “Outsourced Resources Needed to Complete the Work” refers to those tasks that the State has no resources and will have to contract for those services.

Task Category	Estimate of Resources Needed	Available State Resources	Available non-State Resources	Outsourced Resources Needed to Complete Work
Statewide prioritization of projects	20% FTE	10% FTE	0	10% FTE (match)
Scoping for individual projects	60% FTE	30% FTE	0	30% FTE (match)
Preparation of MAS	10% FTE's	10% FTE	0	5% FTE (match)
Gathering and refining base mapping, topographic, and GIS	2 FTE's	0	0	2 FTE's
Development of hydrologic and hydraulic analyses	2 FTE's	0	0	2 FTE's
Panel layout and preparation of graphical information	1 FTE	0	0	1 FTE
Database completion	1 FTE's	0	0	1 FTE's
Mgt. of engineering and GIS resource	1 FTE	0	0	1 FTE
Management of budget	10% FTE	10% FTE	0	
Engineering QA/QC	1 FTE	0	0	1 FTE
Graphical and database QA/QC	1 FTE	0	0	1 FTE
Completion of preliminary maps, report, database and submittal	2 FTE's	0	0	2 FTE's
Annual update of Business Plan	10% FTE	10% FTE	0	0
Programmatic Activities	80% FTE	80% FTE	0	0

## **10. Outreach Plan**

### **Map Modernization Outreach Activities**

The Department of Ecology (DOE) has capacity to perform several outreach strategies including scoping workshops, interim and final meetings, web-based guidance materials, in-house technical and policy expertise, and extensive knowledge of the issues and concerns of the State's flood prone communities. DOE will also provide outreach activities through public and organizational workshops such as: Northwest Floodplain Managers Association (NORFMA), the Association of State Floodplain Managers (ASFPM), professional organizations, and inter-agency coordinated efforts.

### **Countywide formats**

A primary focus of the DOE's outreach activities will be to spearhead the countywide conversion process and minimize any issues that may arise, such as: community provided GIS data, political boundary questions, and local concerns. DOE will do this by preparing letters to all NFIP communities informing them of Map Modernization goals and objectives. One of the goals highlighted will be the countywide digital format objective and how the jurisdictions can work together with DOE to ensure a smooth transition to countywide formats. DOE will follow-up this outreach strategy with direct communication with the communities regarding project scoping, data availability assistance, base map preparation, refining community needs assessment, contact information within each jurisdiction, and location and contact of County GIS staff.

### **Workshops**

Workshops and training sessions can be provided to communities on items such as: Map Modernization, mapping priorities, CTP requirements, DFIRM preparation and maintenance, and digital topography. DOE plans to commit 50% of an FTE to performing outreach activities including two such workshops per year. An important outreach activity will be to familiarize the communities with the new DFIRM tools and promote local ownership of the products. This is ideal for workshop environments where the DOE's expertise can provide hands-on training of new digital data and tools such as GIS viewers, understanding digital topography, and custom products. Further outreach activities can also be provided by DOE in workshop environments such as: CRS, elevation certificates, model ordinances, Comprehensive Flood Hazard Management Planning (CFHMP), and preparation for Community Assistance Visits.

### **Website**

Web-based outreach activities will be provided by DOE as supplementary and complimentary components of the Outreach Plan. DOE's current Floodplain Management website contains excellent information on various facets including: Links to FEMA's Map Modernization Site, FEMA's map service center, emergency information, floodplain ordinances and insurance rates, flood fact sheets, links to a multitude of flood-related sites and partners, links to available data, and community specific contact information. DOE will further enhance this web site to include FAQ sections, items of interest, Map Modernization specific materials, and outreach documents.

**11. CTP Agreements and Mapping Activity Statements (MAS)**

DOE will use the following table to help manage local CTP agreements and incorporate the prescribed data and products into the business plan and archive (see appendix E. and F. FEMA/DOE CTP agreements).

Name of Partner	Effective Date	Agreement Received by MCC	Mapping Activity	MAS Effective Date	MAS No.	MAS Received by MCC
WA State Dept. of Ecology	03/01/01	Yes	Assessment of Community Mapping Needs	03/01/01	1	Yes
			Digital Base Map Sharing	03/01/01	2	Yes
Clark County, WA	05/23/02	Yes	Hydrologic & Hydraulic Analyses & Floodplain Mapping		1	No
			Hydrologic & Hydraulic Analyses & Floodplain Mapping		2	No
			Hydrologic & Hydraulic Analyses & Floodplain Mapping		3	No
			Hydrologic & Hydraulic Analyses & Floodplain Mapping		4	No
Grays Harbor County		No				
City of Issaquah	03/15/00	Yes	Hydrologic & Hydraulic Analyses & Floodplain Mapping	08/30/01	1	Yes
King County	09/26/00	Yes	Hydrologic & Hydraulic Analyses & Floodplain Mapping	09/26/00	1	Yes
			Hydrologic & Hydraulic Analyses & Floodplain Mapping		2	No
Lewis County		No				
Pierce County	09/22/99	Yes	Redelineation of Floodplain Boundaries Using Updated Topographic Data	09/22/99	1	Yes
			Hydrologic & Hydraulic Analyses & Floodplain Mapping		2	No
City of Puyallup		No				
City of Renton		No	Hydrologic & Hydraulic Analyses & Floodplain Mapping		1	No
Skagit County		No				
Snohomish County		No	Hydrologic & Hydraulic Analyses & Floodplain Mapping		1	No
City of Tacoma		No				
Thurston County		No				
Whatcom County	08/31/00	Yes	Coastal Flood Hazard Analyses & Floodplain Mapping	07/30/01	1	Yes
Yakima Co.		No				

## **F. Mapping Metrics**

Spreadsheets are located in the appendix detailing the States mapping activities under three budget scenarios for every year of the plan. (see Appendix L. Mapping Needs Spreadsheets).

### **1. FEMA - FY 2003 Budget Decisions Overview**

The following paragraphs are included into this plan as a means of incorporating FEMA directives, guidelines, and commitments. This includes a 2003 Budget Decisions Overview, First and Second Decile Communities, and HQ-Identified Projects.

#### **a) Background**

To prepare for making decisions regarding the distribution of funding under Map Modernization in FY 2003, the Hazard Mapping Division in the Federal Insurance and Mitigation Administration (FIMA) collected and compiled a significant amount of data from various sources into one comprehensive database. Sources of data included:

Status of studies and mapping projects currently in progress. These data were provided by the Mapping Coordination Contractors (MCCs), and included proposed delivery dates, study format, communities involved, and more.

Data collected by the Census for every county in the United States including the District of Columbia, Puerto Rico, and the Virgin Islands (total of 3,146 counties in 53 “states”). Data included 2000 population, number of housing units, non-negative population growth, land area and more.

Insurance data at the county level was also compiled from various sources within FIMA. Data included number of flood policies, number of claims, number of repetitive flood loss properties and claims, number of flood disaster declarations, number of mapped flood panels, and more.

Flood map plans developed by FEMA’s Regional offices in coordination with the states (the “State Plans”). These state plans were developed in September 2002 to meet specific objectives at the time they were developed. The data included recommendations for funding specific studies at the county level, the potential cost of such studies, and the proposed delivery date of final map products.

Information on Early Implementation projects. This information was developed by FEMA’s Regional offices and highlighted projects that could be delivered in a short timeframe. This information was compiled in March 2003.

Information collected during a meeting in Atlanta in February 2003 that outlined what factors FEMA should consider when targeting areas for updated flood maps.

These criteria included:

- High population density
- High growth areas
- High risk areas: history of repetitive loss/claims/disasters
- NFIP policy base
- Leverage existing data
- Accuracy and adequacy of products
- Comprehensive watershed approach

### **Ranking**

Hazard Mapping Division ranked each county in the nation from 1-3,146. The ranking was accomplished by focusing on quantifiable numbers that reflected the criteria developed in Atlanta. Primarily, the data used came from Census, the flood insurance program, and disaster response data (specific data elements were: population, growth, housing units, policies, claims, repetitive loss properties and claims, and flood disasters). The percentage each county contributes to the national total was calculated for each data element and added across the elements. Those values were then totaled for the nation and ranked from highest to lowest.

For example: Miami-Dade County, FL makes up 0.79% of the nation's population, 1.05% of the population moving into areas chosen to move there, they make up 0.73% of all housing units nationwide. Miami-Dade County makes up 7.86% of the flood policy base, is responsible for 3.51% of the claims filed, has 2.53% of the repetitive loss properties and 1.94% of the repetitive loss claims. They also make up roughly 0.08% of the declared flood disasters nationwide. Adding these percentages totals 18.49%. Those same computations were done for all 3,146 counties nationwide. They were then sorted from highest to lowest and assigned ranks from 1 to 3,146.

The county rankings were then aggregated into "deciles." Each county was assigned a number from 1 to 10 (314 counties per decile). For purposes of FY 2003 funding, specific emphasis was placed on counties in the top decile.

### **Study Categories**

Several study categories were identified. "DFIRM Upgrades" is a category of studies recently or soon to be completed that can be delivered in the new DFIRM specification with a view tool for use at the community level. FEMA has developed this product as the foundation for the future of flood hazard identification. "Pipeline Studies" are in-house studies actively being worked on. Many are fully funded, however, many are in need of additional resources to bring them to completion. It was determined that these studies should continue if they were in top decile counties because they already have had a significant amount of FEMA resources dedicated to them. Further, many of them can be delivered much more quickly than newly initiated studies. "Other Federal Agency" work was determined to also be an area of focus. As a result, several ongoing studies involving other federal agencies were funded. "Other Compelling" projects was a category created to capture earmarks and other high profile projects. "Early Implementation" projects are proposed new study starts that were determined to have quick turn around.

### **DFIRM Upgrades**

A number of recently- or nearly-completed studies were found to be in a format readily convertible to the February 2002 DFIRM specification such that they could be delivered to local governments using a recently developed "beta" version of a flood map view tool. A field of 385 potential counties where DFIRM 2002 products could be delivered was identified. The criteria used to narrow the field included: must be a county within the top 5 deciles (ranked within the top 50% of all counties nationwide), must be a "full" community product, and the product must be deliverable in preliminary or effective format by the end of FY 2003. This narrowed the field from 385 candidates to 132. The total estimated cost to complete the work is approximately \$6 million.

### **Pipeline Studies**

In-house work or “pipeline studies” were defined as those where the MCC had either been funded to initiate processing, or had already received a completed study contractor or CTP mapping package. A significant amount of work was determined to fall within this category (398 counties). Over half of this work (277 counties) was insufficiently funded and could not be completed without additional resources. The top decile was consequently fully funded (71 counties). The total estimated cost to deliver this work is approximately \$10 million.

### **Other Federal Agency Work**

Recognizing the importance of work being performed by Other Federal Agencies, it was decided to continue several projects with the Army Corps of Engineers and the U.S. Geological Survey that had been initiated in FY 2002. Five studies in the top decile counties were funded at a total estimated cost of \$425k.

### **Other Compelling Reasons**

Earmarks and high profile studies that had compelling reasons to fund were given consideration under this category. Studies needing funding in this category include New York State (earmark), North Carolina (strong CTP), West Virginia (earmark), Wisconsin (CTP), Louisiana (earmark), and Colorado (CTP). The total cost for these efforts is estimated at approximately \$15 million.

### **Early Implementation Projects**

After funding had been allocated for the above categories, there was approximately \$45 million remaining. Of that total, \$15 million was designated for the Early Implementation Projects with the most potential for providing quick benefits. The remaining \$30 million was distributed to the Regions using the “Atlanta” factors noted above to determine the percentage to each Region. Guidance for selecting projects was provided to the Regions in a memo from Anthony Lowe dated May 14, 2003.

### **Conclusion**

Studies specifically selected to receive funding in 2003 are generally highly ranked with regard to the Atlanta factors, can be quickly turned around and delivered to state and local governments, and/or have other fairly compelling reasons to move forward. The total value of projects specifically identified is approximately \$46 million. This funding will result in mapping products being delivered to roughly half the nation’s population and roughly half the flood policies in force. The Regional offices have been asked to verify that the projects specifically identified are still valid. An additional \$30 million is being distributed to the Regional offices and will be targeted at the nation’s highest ranking counties (top 20%) based on the criteria developed in Atlanta.

**b) FY03 Atlanta Ranking for Washington State - First and Second Decile Communities**

Clark (1)	Benton (2)
King (1)	Cowlitz (2)
Lewis (1)	Grays Harbor (2)
Pierce (1)	Kitsap (2)
Skagit (1)	Thurston (2)
Snohomish (1)	Whatcom (2)
Spokane (1)	Yakima (2)

\* Decile means ten-percent incremental ranking nationwide by county, 1 as highest, 10 as lowest, according to the Atlanta Map Modernization ranking criteria. (1) herein designates counties in the first “Decile”, and (2) designates counties in the second “decile”.

\* Criteria include high growth, most policies, most repetitive losses, high risk, and high density.

**c) Draft Fiscal Year 2003 Spending Plan - HQ-Identified Projects**

County	State	Scope	Contractor/Partner
Whatcom	WA	DFIRM	MCC
Island	WA	DFIRM	MCC
Skagit	WA	Pipeline	MCC
Snohomish	WA	Pipeline	MCC
King	WA	Snoqualmie R CTP	

\* Pipeline mean Studies currently at the MCC, either unfunded or partially funded, that the Federal Insurance & Mitigation Administration views as early success with additional funds.

**d) Fiscal Year 2004 HQ Proposed Projects**

County	Stream(s)	SC-Cost	NSP- Cost	Total Cost
Yakima	Naches	\$90,000	\$180,000	\$270,000
Spokane	Chester Ck	\$13,500	\$10,000	\$23,500
Clark	All	\$524,000	\$430,000	\$954,000
Pierce	All	\$650,000	\$200,000	\$850,000
King	Snoqualmie	\$100,000	\$100,000	
	Cedar	\$150,000	\$150,000	
	Springbrook	\$25,000	\$50,000	\$75,000
Skagit	Skagit(COE)	\$85,000	\$50,000	\$135,000
Spokane	County-wide	\$400,000	\$408,000	\$808,000
Region Corps Update				\$12,200OFA
Totals		\$1,787,500	\$1,578,000	\$3,377,700

## **F. Mapping Metrics cont.**

### **2. Washington State**

This section outlines the State's mapping activities including: Mapping Needs Assessment and Priority Setting Approach, Five Year Funding Plan, Budget Scenarios, and Criteria for Ranking Map Updates.

#### **a) Mapping Needs Assessment and Priority Setting Approach**

The Department of Ecology performed a mapping needs assessment of local governments beginning in May 2000, and continued this work through July 2001. Initiated by a Cooperating Technical Partner agreement with FEMA in June, 2001, the Department of Ecology entered the data collected into the MNUSS database. This brought the total percentage of communities having MNUSS data entered in the database to approximately 72%. We understand that some of that data was not transferred over into a new version of the database, but that it was recovered and is managed in a DOE database. We are continuing to do outreach activities to our communities, during which we seek to update and complete our mapping needs assessment work. This mapping needs assessment included the following tasks:

- Reviewing and updating the information in the FEMA Mapping Needs Update Support System (MNUSS);
- Soliciting mapping needs information from counties and communities;
- Reviewing available community-specific data;
- Assigning map upgrade methods and priorities to each county; and
- Assessing whether the proposed map update options would achieve the GPRA performance measures and revise the map update methods accordingly.

This mapping needs assessment collected the following data on a county-by-county basis:

- Age of the existing maps;
- Known mapping needs as recorded in the FEMA Mapping Needs Update Support System
- Status of existing maps (digital, manual, none);
- Existing or potential local mapping partners;
- Number of unmapped, floodprone communities;
- Number of communities;
- Availability of existing base map, topographic data, and/or flood hazard data
- Number of Letters of Map Change processed during the last 10 years;
- Population and population growth (U.S. Census and/or State-developed figures);
- Flood insurance claims and/or repetitive losses;
- Availability of State and/or local funding;
- Format of existing maps (countywide or community-based format); and
- Ongoing map updates, including updates being undertaken by regional agencies or communities under the Cooperating Technical Partners (CTP) Program.

## Map Modernization

Upon completion of the mapping needs assessment, the Department of Ecology ranked each county to determine the order in which the counties' mapping needs should be addressed. The regional floodplain specialists, based on their personal knowledge and discussions with local communities, provided a listing of priority areas for the three regions of Washington State, and these listings formed the basis for the priorities presented in the state mapping plan.

Some of the communities with the oldest FIRMs are not high priority areas for the State. For example, the oldest maps in the state are in Garfield and Douglas Counties, two areas with low population densities and infrequent flooding. These areas will be upgraded to DFIRMs in order to meet Map Modernization goals. There are also a number of ongoing re-studies being performed by the Corps and FEMA which will continue into the mapping period (2003-2005). These activities are included in the plan, and generally occur in areas of high priority for the State.

### **b) Five Year Funding Plan - Budget Scenarios**

**“Option A” Maximum Level** - Planning will assume full funding to accomplish all identified priorities and activities with the State as defined in WA State Criteria for Ranking Map Updates, see below.

**“Option B” Moderate Level** - Planning will assume two-thirds funding to accomplish HIGH and MEDIUM priorities and activities.

**“Option C” Minimum Level** - Planning will assume one-third funding to accomplish only HIGH priority activities.

Maximum funding levels will address HIGH, MEDIUM, and LOW ranking flooding sources as well as DFIRM conversion. Moderate funding levels will address HIGH ranked flooding sources, some MEDIUM flooding sources, and DFIRM conversions. Minimum funding levels will address only HIGH-ranking flooding sources and DFIRM conversions.

### **c) WA State Criteria for Ranking Map Updates**

1. HIGH RANK
  - a. Decile 1 or 2 community and Populations
  - b. Known problems that need to be addressed before DFIRM conversion
  - c. Pipeline Projects
  - d. Ready for DFIRM conversion
2. MEDIUM RANK
  - a. Decile 3 – 5 community and Populations
  - b. No major immediate flood risk
  - c. Need for partnerships (WSDOT, WDFW)
3. LOW RANK
  - a. Decile 6-10 community and Populations
  - b. Very little immediate flood risk
  - c. Little GIS capacity

**d) Criteria for DFIRM Conversions**

- High Population per panel
- Few restudies needed before conversion
- Available data and ready for conversion
- In-kind contributions
- Quality of local GIS system

## V. Cost Indices

### A. Estimated Costs to Complete Proposed Mapping Activities

The Map Modernization activities to be performed in the State are estimated to cost approximately \$20 million. Approximately \$10 million of this amount should be provided by FEMA to the State/CTP's, and the State will provide a match of about \$2 million, through both in-kind and cash contributions.

Two categories of costs will be considered by DOE in Floodplain Map Modernization:

- Program administration costs (CAP MAP), and
- Project (mapping) costs. (CTP)

This Business Plan will identify current program management capabilities and estimations for project mapping. Project mapping will be itemized into restudy costs and DFIRM conversion costs. One of the advantages of DOE's plan will be a significant savings to DFIRM conversion costs per panel due to advanced software developed by our consultant specifically for converting FIRM's to DFIRM's. This savings will allow the State to dedicate more funding towards project mapping activities.

Although there is no official method for estimating costs, the State will address two methods for estimating costs.

#### Simple Cost Estimation Methods vs. Units Cost Method

In accordance with Region X preferences on cost estimation, DOE will use the Units Cost approach to estimating project mapping costs and will adhere to FEMA's *Guidelines and Specifications for Flood Hazard Mapping Partners*, dated April 2003. Any Mapping Activity Statements and subcontractor agreements will incorporate these Guidelines by reference.

#### Project Scope and Leveraging Contributions

The first step in calculating mapping costs will be to identify the scope of the project. FEMA's fundamental building block for mapping projects typically is the countywide map. Further, leveraging federal dollars with state and local contributions will be pursued aggressively.

In 2002 FEMA published Estimating the Value of Partner Contributions to Flood Mapping Projects: A "Blue Book" with prices for typical pay items. The purpose of the "Blue Book" was not to set prices, but to estimate the value of partner contributions. The unit prices were considered to be typical costs that FEMA would incur by contracting for mapping and publication from a Mapping Coordination Contractor (MCC) or regional (indefinite delivery/indefinite quantity, or IDIQ) contractor.

The State of Washington will propose 'detailed level' studies for all restudies. Detailed study costs vary greatly depending on the size of the stream and complexity of bridges and other obstructions. As a starting point, DOE's plan will begin by estimating detailed studies at \$21k per river mile. This estimation is most likely to be on the high-end of the estimation scale and due to the extensive amount of in-kind data, services, and state grants program contributions, per unit costs should be significantly less expensive.

### Simple Cost Estimation Methods

Some FEMA regional offices use all-purpose cost calculations. For example, one FEMA Region assigns a dollar value to studies for each county, based on population:

County Size	Study Cost	Preliminary Processing	Effective Map Processing
Large Population County	\$270,000	\$160,000	\$130,000
Medium Population County	\$135,000	\$80,000	\$65,000
Low Population County	\$50,000	\$30,000	\$30,000

### Unit Costs

A more exact method of cost estimation will be to calculate study and publication costs based on unit prices. The quantities required for this estimation are simple:

Unit Description	Unit	Comments
Stream Reach Length	Miles	Generally, all streams draining one square mile or more. Typically divided into study types: detailed, approximate, conversion of existing detailed, etc.
Shoreline Length	Miles	For coastal areas (on oceans or large Lakes).
Alluvial Fan Area	Square Miles	Refers to active deposition/erosion areas.
Panels	Total	Rural panels will match USGS 7.5-minute quadrangle maps (scale 1" = 2,000'). Urban maps may be divided into quarter quadrangles (scale 1" = 1,000'), or quarter quarter quadrangles (scale 1" = 500').



**B. Cost of Converting FIRMs and creating DFIRMs to FEMA specifications**

Department of Ecology acquired information on the cost of creating DFIRMs, per FEMA specifications, to assist the State in compiling the Washington Map Modernization Business Plan. The following assumptions are draft estimates from our consultant and will be further developed as needed.

The basis for the following estimate is current DFIRM work, but must not be construed as a bid and/or binding.

The assumptions behind the cost information are as follows:

- The project encompasses an entire county
- Average number of panels per county is 70 to 120
- Vertical datum adjustments are not necessary
- A pilot project is not required
- Source materials are hard copy FIRM panels
- Countywide GIS base map layers are available

Conversion of FIRM panels to a digital format, edgematching and producing data layers and layer attributes to meet FEMA DFIRM specifications will be in the range of \$2800 - \$3200 per panel.

The above estimate reflects significant savings due to developing the DFIRM on a countywide basis. The cost of creating DFIRMS on a panel-by-panel basis vs. on a countywide basis could be significantly more. The difference is due to processing base map data for one panel vs. compiling the base map for 70 to 120 panels. Having countywide GIS base map layers also results in significant saving. The cost of creating the base map layers/attributes from digital orthophotos could average \$1000 more per panel.

## **VI. Appendices**

Appendix A. County Conversion Schedule

Appendix B. Community Needs Assessment New Letter

Appendix C. Washington State SIP August 2002

Appendix D. Washington EMD State Hazard Mitigation Plan - Flood Hazards

Appendix E. FEMA/DOE CTP Agreement – Community Needs Assessment

Appendix F. FEMA/DOE CTP Agreement – Digital Data Sharing

Appendix G. Washington State Floodplain Mapping White Paper

Appendix H. Mapping Needs Spreadsheets; 2004 – 2009, Three Budget Scenarios

Appendix I. Disaster Declarations

Appendix J. Washington State Policies and Claims

Appendix K. Washington State Repetitive Loss Properties

Appendix L. Partnership Plan

Appendix M. Community Populations Spreadsheets

Appendix N. Cost Estimators