

# **The State of New Jersey**

## **Fiscal Year 2004 Map Modernization Business Plan**

**April 30, 2004**



**FEMA**  
**REGION II**

## **EXECUTIVE SUMMARY**

### **Introduction**

Historically, the State of New Jersey has taken a strong role in the development of a rigorous floodplain management program at the State level while supporting those same efforts at the Federal level with the Department of Housing and Urban Development, and now, the Federal Emergency Management Agency (FEMA). In 1962, the State of New Jersey authorized its Department of Environmental Protection “to adopt land use regulations for the flood hazard area, to control stream encroachments, to coordinate effectively the development, dissemination, and use of information on floods and flood damages.” The state’s approach to effectively providing this information was to develop flood inundation maps. The New Jersey maps predated the Federal maps and presented the 1% annual chance event and the floodway that the Federal maps eventually showed but also reflected a special hazard area derived from a 1% annual chance plus 25% discharge. As these maps preceded similar efforts at the federal level, they help demonstrate the history and depth of the State of New Jersey’s commitment to floodplain management.

As FEMA embarks on its Multi-Hazard Flood Map Modernization Program effort, New Jersey seeks to leverage its own flood hazard mapping program, its deep institutional memory, and recent data acquisitions to work with FEMA to improve flood hazard mapping throughout the state. The state’s business plan set forth here describes the nature of the support New Jersey is seeking from FEMA and the ways in which the state can assist FEMA in providing state of the art hazard information to the citizens of New Jersey

### **Vision for Supporting Multi-Hazard Flood Map Modernization**

New Jersey’s current maps are in need of renewal. The bulk of the state’s effective maps are more than 16 years old and only a handful of New Jersey’s almost 550 National Flood Insurance Program (NFIP) communities are currently in the digital format. The manual cartographic methods used to develop most of the state’s maps limit the application of the data. New Jersey seeks to maintain and incrementally grow its role in project management and community outreach for Map Modernization. It will continue to work with established partners at the Federal level, like the US Army Corps of Engineers (USACE), United State Geological Survey (USGS), and Natural Resources Conservation Service (NRCS), while building partnerships at the municipal level for data development and program oversight.

The state envisions its NFIP coordinator, the New Jersey Department of Environmental Protection (NJDEP), as well as its Office of GIS (NJOGIS), working together with FEMA to develop the spatial data needed to support the development of updated, highly accurate flood hazard data. We are requesting FEMA’s support in developing a statewide elevation data that should reduce the cost of developing new hydraulic analyses. This data, when coupled with the statewide orthophotography produced by NJOGIS, will perform an excellent platform on which to build next generation hazard mapping.

New Jersey will continue to take the lead in prioritizing projects, coordinating available data sources and conducting the outreach-all essential components in the data production and map adoption components of the program. FEMA, in the state's plan, would retain responsibility for actually developing the new flood hazard data, producing the DFIRM and assisting in the post-preliminary process. NJDEP is requesting funding assistance in the form of 2 additional FTEs to implement a statewide outreach effort in anticipation of the increased production through MHFMMP.

Finally, New Jersey seeks to integrate its mapping program with the FEMA program. This integration hinges on creating FEMA FIRMs for New Jersey which present the New Jersey Special Flood Hazard Area (NJSFHA). The flood hazard area, computed by using a 1% annual chance discharge plus 25%, may be simply a digital layer, but this is the state's regulatory standard. Currently, because FEMA FIRMs do not have this data, the state is bound to maintain and update its own state maps each time FEMA updates its maps. This is an arduous process and necessitates some duplication of effort. By including the NJSFHA as an analyzed risk on the DFIRM, the state would be able to use the FEMA DFIRMs as the single source for both Federal and state floodplain management, freeing up staff resources and increasing efficiency.

### **Current Needs and Five-Year Implementation Strategy**

The State of New Jersey is requesting assistance from FEMA to accomplish three prime objectives.

1. Complete initial remapping of the state including :
  - ~100 miles of riverine restudy remaining to be tasked; and
  - Delaware Bay storm surge analysis;
2. Develop wall to wall elevation data for entire state; and
3. Digitally capture and georeference NJSFHA from state maps for use with unrevised streams on new maps

Accomplishing these objectives will ensure that the digital conversion of the flood maps for New Jersey will include the restudies and flood boundary refinements needed to keep the maps current with respect to flood hazard risk in the state. This will balance the need between producing the quantity of maps needed to meet FEMA's Government Performance and Results Act (GPRA) goals with the quality of the maps needed to support the National Flood Insurance Program.

Initial remapping involves incorporating the 175 miles of stream currently being restudied by FEMA with approximately 100 miles of stream restudy and a Delaware Bay storm surge analysis that is being requested by the state. The state's riverine restudy priority list has been generated primarily on the basis of streams whose long-term stream gage records demonstrate a need for new hydrologic/hydraulic analyses. The NJDEP has funded the USGS to update the state's regional peak flow equations that, when completed, will provide the basis for requesting new riverine restudies as the maintenance phase of the modernization program begins. In addition to the riverine updates, the state's request for an update to the Delaware Bay storm surge analysis accounts for the risk exposure that New Jersey communities in Cape May, Cumberland, Salem, Gloucester, and Camden Counties have from the effects of hurricanes and nor'easters in the Bay.

The second objective for the state is the development of a high-resolution digital elevation model using Light Detection and Ranging (LiDAR) technology. The state proposes that FEMA provide 35% of the total cost of developing this dataset, as that is the approximate portion of the state's land area that falls within the special flood hazard area. By developing a statewide elevation data set, FEMA will see cost and schedule advantages when contracting future restudies, which is essential given the scope of what is to be accomplished during Map Modernization.

Finally, the state is seeking funding from FEMA to digitally capture its existing flood inundation maps and task all its contractors to develop and map the NJSFHA for all current and future riverine restudies. This will lay the groundwork for efforts at the NJDEP to lobby the state legislature to integrate the state and Federal programs so that floodplain management in New Jersey has a unified foundation from which to progress.

These three elements are the essence of the state's needs. To achieve these objectives over the five-year implementation period will require funding for elevation data development and digital capture of the NJSFHA early in the Map Modernization effort timeline. This will allow the state to best assist FEMA in achieving its 4 objectives for Map Modernization while addressing the needs of the people of New Jersey.

## Performance Goals

With the full funding requested in this plan provided to the state's identified objectives, New Jersey is on course to exceed FEMA's 5-year GPRA goal 1 within the timeline goal. While the state may not be able to meet FEMA's goal in 2004, the entire population of New Jersey will have GIS flood hazard data online by 2009.

| Fiscal Year | FEMA GPRA Goal 1:<br>Population with Digital Map Online |           |
|-------------|---|-----------|
|             | NJ Projection   | FEMA Goal |
| 2004        | 18%   | 20%       |
| 2005        | 50%   | 50%       |
| 2006        | 65%   | 65%       |
| 2007        | 77%   | 75%       |
| 2008        | 93%   | 85%       |
| 2009        | 100%  | 100%      |

After 2005, New Jersey should be able to comfortably meet or exceed FEMA's GPRA 2. This will involve moving past the existing scattered individual community DFIRMs currently in existence to a countywide approach. Two recently issued (FY2004) countywide studies put New Jersey on pace to meet the goal; however, it will take full production according to the schedule presented in this plan to actually achieve and exceed those goals.

| Fiscal Year | FEMA GPRA Goal 2:<br>Population with Modernized Maps Adopted |           |
|-------------|--|-----------|
|             | NJ State Projection  | FEMA Goal |
| 2004        | 1%   | 10%       |
| 2005        | 18%  | 20%       |
| 2006        | 50%  | 35%       |
| 2007        | 64%  | 50%       |
| 2008        | 77%  | 70%       |
| 2009        | 93%  | 90%       |

Currently, the orthophotography developed by the state is New Jersey's most important contribution to the Map Modernization effort. Other sources of leveraged contributions to the production of GIS Flood Hazard Data include NJDEP funding of new regional peak flow equations, NJDEP funding of US Army Corps of Engineers riverine analyses, and potential State Bond Act monies which would provide NJDEP a funding source with which to match FEMA spending in the state. For the leverage calculations, we have made the assumption that FEMA is interested in cost-sharing with the state for development of statewide elevation, with a 35/65 split. 35% is the approximate coverage of flood hazards across the state as derived from Q3 data. The state is optimistic that it can find partners at the state and local level to provide this leverage. While the chart below contains both committed and proposed leverage sources, New Jersey will be able to assist FEMA in meeting GPRA Goal 3.

| Fiscal Year    | FEMA GPRA Goal 3:<br>Leveraged Effort Towards GIS Flood Hazard Data |                 |                    |                 |                     |            |
|----------------|---|-----------------|--------------------|-----------------|---------------------|------------|
|                | Leveraged Contribution  |                 |                    |                 | Total Project Cost  | % Leverage |
|                | Base Map Data   | Scoping         | Elevation Data     | H/H Data        |                     |            |
| 2005           | \$239,940   | \$25,000        |                    |                 | \$3,622,120         | 7%         |
| 2006           | \$135,880   | \$15,000        | \$2,275,000        | \$65,000        | \$6,291,080         | 39%        |
| 2007           | \$233,060   | \$15,000        |                    |                 | \$2,591,300         | 16%        |
| 2008           | \$211,130   | \$20,000        |                    |                 | \$2,568,880         | 15%        |
| 2009           | \$257,140   | \$20,000        |                    |                 | \$3,191,400         | 15%        |
| <b>Overall</b> | <b>\$1,599,070</b>  | <b>\$95,000</b> | <b>\$2,275,000</b> | <b>\$65,000</b> | <b>\$18,264,780</b> | <b>22%</b> |

New Jersey is interested in working with FEMA Region II to seek out and identify potential CTP partners through which the leverage figure can be increased. The intent here is to involve partners who have knowledge, data, and/or resources that would support FEMA's GPRA Goal 4.

## Program Funding

There are three elements that will require funding from FEMA over the 5-year period FY 2005-FY2009. These are:

- Initial Remapping of the State (including elevation data development and NJSFHA capture);
- Map Maintenance; and
- Administration and Program Management.

With the full support requested from FEMA in this plan provided, the project annual program costs, in current FY 2004 dollars, are summarized below.

| Program Element                           | FY05               | FY06               | FY07               | FY08               | FY09               | Total               |
|---|--------------------|--------------------|--------------------|--------------------|--------------------|---------------------|
| Initial Remapping                         | \$3,622,120        | \$1,791,080        | \$2,591,300        | \$2,568,880        | \$3,191,400        | \$13,764,780        |
| -Elevation Data                           |                    | \$3,500,000        |                    |                    |                    | \$3,500,000         |
| -NJSFHA Capture                           |                    | \$1,000,000        |                    |                    |                    | \$1,000,000         |
| Map Maintenance                           | \$0                | \$0                | \$394,250          | \$326,800          | \$365,850          | \$1,086,900         |
| Program Administration/<br>Management     | \$125,000          | \$125,000          | \$125,000          | \$125,000          | \$125,000          | \$625,000           |
| <b>Total Program Funding Requirements</b> | <b>\$3,747,120</b> | <b>\$6,416,080</b> | <b>\$3,110,550</b> | <b>\$3,020,680</b> | <b>\$3,682,250</b> | <b>\$19,976,680</b> |

With available data as well as current and potential leverage sources considered, details regarding funding being specifically requested from FEMA for FY 2005-2009 follow:

| Program Element                       |                        | FY05               | FY06               | FY07               | FY08             | FY09             | Total               |
|---------------------------------------|------------------------|--------------------|--------------------|--------------------|------------------|------------------|---------------------|
| Initial Remapping                     | Funding Requirement    | \$3,622,120        | \$1,791,080        | \$2,591,300        | \$2,568,880      | \$3,191,400      | \$13,764,780        |
|                                       | Requested FEMA Funding | \$3,357,180        | \$1,640,200        | \$2,440,420        | \$388,250        | \$468,500        | \$8,294,550         |
| Elevation Data Development            | Funding Requirement    | \$0                | \$3,500,000        | \$0                | \$0              | \$0              | \$3,500,000         |
|                                       | Requested FEMA Funding | \$0                | \$1,125,000        | \$0                | \$0              | \$0              | \$1,125,000         |
| NJSFHA Capture                        | Funding Requirement    | \$0                | \$1,000,000        | \$0                | \$0              | \$0              | \$1,000,000         |
|                                       | Requested FEMA Funding | \$0                | \$1,000,000        | \$0                | \$0              | \$0              | \$1,000,000         |
| Maintenance                           | Funding Requirement    | \$0                | \$0                | \$394,250          | \$326,800        | \$365,850        | \$1,086,900         |
|                                       | Requested FEMA Funding | \$0                | \$0                | \$333,500          | \$274,600        | \$308,700        | \$916,800           |
| Program Administration/<br>Management | Funding Requirement    | \$125,000          | \$125,000          | \$125,000          | \$125,000        | \$125,000        | \$625,000           |
|                                       | Requested FEMA Funding | \$125,000          | \$125,000          | \$125,000          | \$125,000        | \$125,000        | \$625,000           |
| <b>Total Requested FEMA Funding</b>   |                        | <b>\$3,482,180</b> | <b>\$3,890,200</b> | <b>\$2,898,920</b> | <b>\$787,850</b> | <b>\$902,200</b> | <b>\$11,961,350</b> |

This document does provide two alternative funding scenarios. Both alternative scenarios would prevent FEMA from reaching its GPRA goals in New Jersey with the kind of quality flood hazard information that is needed for sound floodplain management and that the people of New Jersey deserve.

## ACRONYMS AND ABBREVIATIONS

|        |   |
|--------|---|
| CTP    | Cooperating Technical Partner                       |
| DEM    | Digital Elevation Model                             |
| DFIRM  | Digital Flood Insurance Rate Map                    |
| DOQ    | Digital Orthophoto Quadrangle                       |
| FEMA   | Federal Emergency Management Agency                 |
| FGDC   | Federal Geographic Data Committee                   |
| FIS    | Flood Insurance Study                               |
| FTE    | Full-Time Employee                                  |
| GIS    | Geographic Information System                       |
| GPRA   | Government Performance and Accountability Act       |
| IDIQ   | Indefinite Delivery Indefinite Quantity             |
| LiDAR  | Light Detection and Ranging                         |
| MHFMMP | Multi-Hazard Flood Map Modernization Program        |
| NFIP   | National Flood Insurance Program                    |
| NJDEP  | New Jersey Department of Environmental Protection   |
| NJGIN  | New Jersey Geographic Information Network           |
| NJOGIS | New Jersey Office of Geographic Information Systems |
| NJSFHA | New Jersey Special Flood Hazard Area                |
| NRCS   | Natural Resources Conservation Service              |
| PFHV   | Post-Storm Flood Hazard Verification                |
| SFHA   | Special Flood Hazard Area                           |
| USGS   | United States Geological Survey                     |
| USACE  | United States Army Corps of Engineers               |

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## **I. Vision for Supporting Multi-Hazard Flood Map Modernization**

As a pioneer in the field of floodplain management and floodplain mapping, the State of New Jersey is acutely aware of the need to improve both the State's maps, through digital conversion, and FEMA's maps through updated analyses and mapping, for all communities in New Jersey. The State of New Jersey would like to achieve both goals through its support of each of FEMA's Multi-Hazard Flood Map Modernization Program (MHFMMP) objectives:

- Establish and maintain a premier data collection and delivery system;
- Achieve effective program management;
- Build and maintain mutually beneficial partnerships; and
- Expand and better inform the user community.

The business plan below discusses how the State of New Jersey will contribute to these goals.

### ***Current New Jersey Flood Mapping Program***



After Hurricane Floyd hit New Jersey in 1999, history recorded it as the single most costly disaster to affect the state. With more than one quarter of a billion dollars in damages and over one half of our population affected, Floyd's rainfall and subsequent flooding underscored the importance of accurate flood hazard data for proper risk assessment/insurance, emergency assistance and disaster mitigation efforts. Hurricane Floyd set more than 35 new peaks of record on streams throughout central and northern New Jersey. On the Raritan River, for example, peak stage was 15 feet over flood stage level and almost 5 feet over the previously recorded peak. The Town of Bound Brook, in Somerset County recorded flood depths of up to 10 feet, as it and other communities along the Raritan experienced severe property damage and flooding. A summary of claims, repetitive losses and other data for New Jersey counties is presented in Appendix A.

FEMA responded to New Jersey's needs through both its traditional disaster assistance role as well as by performing Post-Storm Flood Hazard Verification (PFHV) to identify effective flood risk data presented in the published Flood Insurance Study (FIS) and Flood Insurance Rate Map (FIRM) requiring updates. The results of this work so far has led to the completion of a restudy of 3 major rivers in the state and the current study of 4 more major rivers and tributaries. The completed new analyses have formed the foundation of 2 new countywide digital FIRMs (DFIRMs) that FEMA has produced thus far in New Jersey. These DFIRMs for Bergen County and Union County mark the beginning of the map modernization effort in New Jersey. However, much more remains to be done to provide the citizens of New Jersey with accurate, accessible, digital flood hazard data.

The bulk of the state's current, effective FIRMs are more than 16 years old. While some of the data presented on the maps reflects accurate assessment of flood hazards, there are many examples of maps that do not well serve the end-user. Communities throughout the state whose flood damage potential has increased due to develop are unmapped. The manual cartographic methods used to develop most of the state's maps limit the application of the data, given existing technology, e.g. GIS that is now available. Thus, use of FIRM data in many communities for

floodplain management and enforcement purposes is difficult at best. For a handful of New Jersey counties, simple conversion of the FIRM data to a digital format would provide an adequate flood hazard risk platform. In the majority of the state, however, map modernization should bring updated hydrologic/hydraulic analyses where requested coupled with flood hazard boundary redelineation for detailed hydraulic studies that are not in need of new analyses. These requests for new analyses for the initial remapping of the state have been provided to FEMA by the National Flood Insurance Program (NFIP) Coordinator for the state, the Flood Control Section in the New Jersey Department of Environmental Protection (NJDEP).

From its initial role developing new flood data through both in-house and contractor resources, NJDEP has transformed over time to a project oversight and management role. Currently, staff in the NJDEP Flood Control Section chiefly provide

- project prioritization;
- evaluate proposed and ongoing flood control and mitigation projects;
- review new hydrologic/hydraulic analyses submitted by FEMA's study contractors; and
- conduct community outreach.

While staff occasionally do still develop new flood data, the emphasis of our NJDEP flood control staff is to ensure the State's maps are up-to-date and consistent with the best available data. It is this data which NJDEP's Land Use Regulation Program uses to make determinations on stream encroachment permits and other land development requests. The state is interested in trying to eliminate redundancies and thereby free up staff resources by moving to unify floodplain mapping for New Jersey under the FEMA map. As an administrative state law issue, this will take some time to accomplish. Additionally, this will require assistance from FEMA to ensure that regulatory information presented on the state maps are transferred to the FEMA maps so that New Jersey state law can be followed. The end result should be more effective floodplain management at the state level.

With respect to current map projects, FEMA Region II IDIQ Contractors have been tasked to restudy over 175 miles of stream throughout the state. These restudied miles predominantly reflect streams for which Hurricane Floyd set a new maximum peak recorded discharge and were requested to be restudied by the state for this reason. Other restudied miles were requested so that better tools can be put in place to gage flood hazard risks in high-development pressure areas. As we have through the program's history in New Jersey, we will work with these IDIQ contractors to make sure that their completed analyses are accurate, cover the requested study limits, and reflect current conditions.

### ***New Jersey Flood Mapping Program Vision***

New Jersey will maintain and incrementally grow its role in project management and community outreach for Map Modernization. It will continue to work with established partners at the Federal level, like the US Army Corps of Engineers (USACE), United State Geological Survey (USGS), and Natural Resources Conservation Service (NRCS), while building partnerships at the municipal level for data development and program oversight. At present, New Jersey expects that the FEMA Regional office will manage all mapping activities based on input provided by NJDEP. NJDEP retains the right to make changes to this arrangement in future updates to this

business plan. As part of its vision, NJDEP seeks to partner with FEMA, other state agencies and local municipalities to develop new elevation data, statewide. The New Jersey Office of GIS (NJOGIS) would be the key partner in undertaking this effort.

The mission of NJOGIS is to promote the use of GIS technology among state agencies and to provide statewide leadership in the development of New Jersey's spatial data infrastructure. The OGIS has spearheaded a statewide implementation team who has prepared a strategic plan for developing and maintaining New Jersey's spatial data infrastructure. NJOGIS seeks to increase intragovernmental coordination so that limited financial resources can be used to develop geospatial framework data without duplicate efforts and spending. The NJOGIS has successfully led the effort to develop a statewide orthophotography layer and it is best-positioned to do the same for a statewide elevation data layer. The state is requesting support from FEMA to develop this data for approximately 35% of the land area of the state, which is the approximate portion of the state in the floodplain. The state is also contemplating using NJOGIS expertise for serving up flood hazard data through its existing geospatial data web portal: the New Jersey Geographic Information Network (NJGIN). This activity would build on its present capability to serve digital orthophotography coverage for the state and allow users to find additional valuable geospatial data in a "one-stop" environment.

Finally, New Jersey will work with FEMA over the next 5 years to integrate its own floodplain mapping with the new FEMA DFIRMs to streamline regulatory and planning efforts occurring at the state level. This business plan describes what role the State of New Jersey would like to participate in for the following activities:

- Project Management;
  - Project Prioritization;
  - Project Scoping;
- Data Sharing/Development; and
- Outreach.

### **Project Management**

This plan provides the blueprint for how New Jersey will support and implement FEMA's MHFMMP within the state. On an annual basis, the NJDEP will review the business plan and both assess our performance on the goals and objectives described here and provide updates on the restudy prioritization list, as needed. Mr. Clark Gilman, Chief of the Flood Control Section, NJDEP, is the NFIP coordinator for New Jersey and has managed and overseen the implementation of the program in New Jersey since its inception.

### **Project Prioritization**

As the NJDEP, under Mr. Gilman, has directly undertaken or overseen the floodplain analyses of over 2500 miles of streams in the state, there is an exceptional amount of institutional knowledge which is relied upon for project prioritization in the state. Additionally, the Flood Control Section has developed close links with groups around the state involved in floodplain management and water resources activities. Groups like the Millstone River Watershed Study Steering Committee exemplify the kind of network of local professionals through

which restudy needs are surfaced, evaluated and added to the state's priority list, as necessary. Based on continual needs assessment, New Jersey will continue to provide project prioritization to FEMA on an annual basis, through updated business plans.

### **Project Scoping**

At the initiation of each project in New Jersey, NJDEP will be involved in scoping each project. This includes discussing with FEMA and its contractor(s) the following:

- Upstream and downstream limits of restudy;
- Methodology of restudy;
- Available data to may be utilized; and
- Local concerns and any politically sensitive areas.

As part of its mission, the Flood Control Section, works with and provides funding to the USACE for flood control projects throughout the state. This work provides a direct channel through which new stream restudy candidates can emerge.

### **Data Sharing/Development**

At the current time, the most important dataset New Jersey has to contribute to the map modernization effort is the new high-resolution digital orthophotography it has developed. In late 2003, New Jersey completed its quality review and post-processing of a statewide layer of high-resolution orthoimagery. The orthoimagery has a 1.0 foot ground resolution and Federal Geographic Data Committee standards for positional accuracy. This imagery is far superior to the present statewide orthoimagery dataset available from the USGS. The data is all in the public domain, accessible through the NJGIN web site and is the requested basemap for all future DFIRMs.

In addition to orthoimagery data, New Jersey seeks to obtain FEMA assistance in producing high-resolution seamless elevation data. Our need for this data is described in Section III.

As part of future activities, NJDEP is committed to working with FEMA Region II to build partnerships at the municipal level. For example, Monmouth County has expressed interest in providing in-kind services through their GIS mapping group for a remapping of their community. We are working to determine what kind of data they can provide to this effort.

### **Outreach**

The Flood Control Section at NJDEP has worked successfully with communities throughout the state to conduct community assistance visits, instruct officials on floodplain management and work with communities to adopt new maps. This is a fundamental part of successful floodplain management and NJDEP would like to continually provide a suite of outreach efforts to successfully implement FEMA's MHFMMP with the local users. NJDEP would like to get funding assistance in the form

of 2 additional FTEs to implement a statewide outreach effort in coordination with MHFMMP.

In the state's plan, FEMA would retain responsibility for developing new flood hazard data, producing the DFIRM, and assisting us in the post-preliminary adoption process. The implementation of the fully funded scenario of the 5-year plan presented here will yield a full remapping of the state, provide high quality of multi-hazard flood data maps for the state's 21 counties and lay the groundwork for integration of the state and Federal mapping programs.

## **II. Current Needs and Five-Year Implementation Strategy**

### ***Current Needs***

The State of New Jersey is requesting assistance from FEMA to accomplish three objectives:

1. Complete initial remapping of the state including :
  - ~100 miles of riverine restudy to be tasked; and
  - Delaware Bay storm surge analysis;
2. Develop wall to wall elevation data for entire state (supports objective one); and
3. Capture and georeference New Jersey Special Flood Hazard Area from state maps for use with unrevised streams on new maps.

### ***Remapping***

As discussed previously, FEMA Region II has already tasked its IDIQ contractors to restudy over 175 miles of stream requested by the state. These streams have been identified for restudy primarily due to the effects of adding Hurricane Floyd to the gage record for USGS gages on these flooding sources. There is approximately 100 riverine miles remaining to be restudied on the state's request list. These streams reflect a split between requests generated post-Floyd and restudies necessitated due to the impacted community being previously unmapped. All 275 miles requested for restudy will be revised on the basis of new gage analyses and is provided, in order of priority, in Appendix B of this document. Concurrently, NJDEP has funded the New Jersey office of the USGS to update the state's regional peak flow equations by regression analyses. This work is scheduled to be completed in 2006. As the initial remapping of the state winds down and the maintenance phase of the program begins, other riverine flooding sources can be revised using this data. Until the update of the regional equations is complete, New Jersey is not comfortable revising these additional riverine streams.

In addition to the riverine requests, New Jersey is also asking for a new storm surge analysis for the Delaware Bay. The storm surge analysis is needed to account for the effects that hurricanes and nor'easters have on the New Jersey communities with risk exposure including Cape May, Cumberland, Salem, Gloucester and Camden Counties. With heavy rainfall runoff in the Bay basin, and a strong surge from the south retarding outflow from the river, large storm surges are possible. In fact, surges as high as 9 or more feet have been recorded in the bay. New Jersey suggests that FEMA Region II partner with Region III and other federal agencies to accomplish this large task. Development of a new storm surge can also form a platform with which to evaluate wind driven waves on the bay which can be higher than adjacent land due to the reduced surface friction and turbulence.

### ***Elevation Data Development***

The basis of accurate flood plain delineations is high accuracy elevation data. New Jersey has developed a spatial data infrastructure implementation plan titled, *New Jersey Spatial Data Infrastructure Implementation*, dated March 2002, which identifies development of a high-resolution seamless elevation dataset as a high priority for the state. The plan identifies 8 key geospatial framework data layers New Jersey is currently developing or plans to acquire. These layers include:

- Orthophotography
- Elevation
- Transportation
- Hydrography
- Critical Infrastructure
- Cadastral
- Land Use/Land Cover
- Geodetic Control

The state is forging partnerships between state agencies, Federal partners and local governments to fund and build these data layers. For production of DFIRMs and related Map Modernization objectives, development of these layers is extremely valuable. Statewide orthophotography will provide base mapping for all future DFIRMs. This layer was completed in fall 2003 and is scheduled for a 5-year update cycle. For use as a base map, the orthophoto data is made more valuable by completion of the transportation and hydrography layers, both scheduled to be delivered in April 2005. The transportation layer will provide up-to-date road names and structure locations, while the hydrography layer will deliver stream centerline and stream bank vector data which will meet DFIRM graphic specifications as well as assist in automated hydraulic modeling applications. The Land Use/Land Cover data, also scheduled for an April 2005 completion, will be helpful for use if the need for hydrologic models arises. All these layers were derived from the orthoimagery and will add to the value and accuracy of the base map and make base map preparation more efficient.

The state has identified FEMA as a key partner in the elevation data layer effort as DFIRM quality and accuracy will increase with use of high-resolution elevation data. The state would be the steward for this data in fulfilling a part of MHFMMP goal one: establishing and maintaining a premier data collection and delivery system.

The state proposes to produce a high-resolution Digital Elevation Model (DEM) using Light Detection and Ranging (LiDAR) technology. The State is requesting FEMA to provide 35% of the total cost of developing this dataset, as that is the approximate portion of the state's land area that falls within the special flood hazard area.

By developing a statewide elevation data set, FEMA will be able to take advantage of economies of scale when tasking its IDIQ contractors to complete the rest of the state's restudy request list. Currently, each study contractor, when tasked with a restudy, must hire a firm to develop elevation data for the floodplain. This piecemeal approach for developing elevation data in the stream corridor is expensive and inefficient, given the scope of what is to be accomplished during Map Modernization. If New Jersey can build the partnerships to leverage FEMA

contributions to elevation data development, a much more efficient solution to the issue can be reached and FEMA's IDIQ contractors can concentrate on developing new hydrologic and hydraulic analyses on an expedited timeline to meet FEMA's GPRRA objectives.

Another benefit of this effort would include the potential of quick and low-cost refinement of existing Zone A approximate area studies in the state. Zone A's are often the source of confusion and concern on the part of developers and homeowners whose structures are shown to be in the SFHA. While FEMA does develop approximate elevations for these homeowners when they apply for a Letter of Map Amendment, the process is often time-consuming. With state-wide elevation data developed, quick determinations can be made and advisory base flood elevations can be presented in the FIS or DFIRM for use by developers, floodplain administrators, or surveyors.

### ***Incorporate New Jersey Special Flood Hazard Area on DFIRM***

As the state with the highest population density in the U.S., New Jersey has adopted stringent floodplain management criteria to minimize the human and economic losses from flood disasters. Beyond setting the floodway encroachment surcharge limit at 0.2 foot, New Jersey has developed its own special flood hazard area (SFHA), which is presented on the state's floodplain delineation maps. The NJSFHA, which has been analyzed and mapped by the state for over 2,500 miles of stream, is developed by increasing the 1% annual chance (100-year) discharge by 25% and using this discharge in the corresponding hydraulic model. This is the regulatory standard which the state's Land Use Regulations enforce. Currently, because the FEMA FIRMs do not have this additional data, the state is bound to maintain and update its own state maps. This is an involved effort that needs to take place every time FEMA issues a LOMR or map update. Currently, in order to update the state maps, a Flood Control staff person must draft three documents to justify the need for change. After that correspondence has been approved at the State executive level, a public hearing is held. If no appeals or concerns are raised, the adoption process begins. This again involves securing multiple NJDEP section chief and department head approvals before obtaining Commissioner signoff and publishing in the state register. Clearly, the process, while admirable for its due process component, is arduous.

The state would like to be able to use DFIRMs as the single source for both Federal and state floodplain management. In order for this to happen, the state is requesting that all work to be contracted by FEMA to its contractors include mapping of the NJSFHA. Currently, though most contractors model the NJ design storm (1% annual chance + 25%), none submit mapping for it, as it is not a federal requirement. New Jersey believes that if FEMA were to provide this information, at least in a digital format, it would increase the possibility that the state can eventually adopt the FEMA maps as their regulatory standard and use the NJSFHA from this source. This would free a state employee to further focus on project oversight, QC of contractor submissions, partnership building, and project prioritization.

If the state is successful in obtaining assistance from FEMA and other partners to build a seamless elevation layer for the entire state, the NJSFHA can be redelineated from existing profiles for unrevised streams to be incorporated into the new countywide DFIRM products. If the state is unable to generate enough support to undertake the elevation data layer at this time,

we would ask that FEMA provide funding to digitize and georeference the NJSFHA boundary from the state's floodplain maps. These maps are only available in paper and mylar format and are an invaluable tool used by the state to regulate and manage floodplain development. Without digital conversion, these maps' existence is in jeopardy. This is a critical need for the department and an accomplishment that will improve FEMA's DFIRMs for the State of New Jersey in both direct and indirect ways.

### ***Five Year Implementation Strategy***

To implement the Map Modernization plan that we are outlining for New Jersey, we require funding for data development and personnel.

Currently, 2 Full Time Employees (FTEs) of the NJDEP Flood Control Section staff involved in implementing the NFIP in the state are funded by FEMA. In order to undertake the expanded responsibilities for community outreach, program support and due diligence review of the work of FEMA's contractors, we are requesting the need for one additional Staff Engineer and one Hazard Mitigation Specialist. These 2 new FTEs will also work to begin the process of trying to integrate the state and Federal mapping programs. The key factor in embarking on this effort will be FEMA's support in capturing the NJSFHA in all future DFIRM products. If this appeal for FEMA support and funding is answered then, at the state level, procedures will need to be developed to use the DFIRM for the stream encroachment permitting process. Again, the process to integrate the two mapping program may take some time, but the end result, if accomplished would be immensely valuable to FEMA and the state.

In implementing the plan outlined here, the State of New Jersey will help FEMA achieve its four objectives for Map Modernization.

#### **Establish and Maintain a Premier Data Collection and Delivery System**

New Jersey believes that by restudying its requested areas and partnering to develop statewide elevation data, FEMA and the state will have high quality data for use in assessing flood risks in the state. New Jersey is committed to the FEMA goal that 100% of developed data is accessible to the public. We will work with FEMA to ensure that all data is developed for use in a GIS environment. We are also investigating the possibility of housing or serving up flood hazard and framework data through the NJGIN web portal.

#### **Achieve Effective Program Management**

NJDEP has been and will continue to be a key player in the management of the NFIP in the state. Through prioritization and administrative support, we will help FEMA achieve each of its GPRA performance metrics. For example, New Jersey would like to assist FEMA in expediting the post-preliminary process timeline so that new maps can be adopted quicker. Also, New Jersey will be responsible for annual updates to this plan and continue to update the priority restudy list as events demand.

#### **Build and Maintain Mutually Beneficial Partnerships**

NJDEP has established solid working relationships with other Federal agencies including, USACE, USGS, and NRCS. NJDEP provides funding to these agencies to develop

projects and/or data important to the tasks of flood mitigation and/or floodplain management. The USACE, for example has been tasked by NJDEP to perform a number of flood control feasibility studies on streams throughout New Jersey including the Millstone River in Somerset County and Molly Anns Brook in Passaic County. These projects, when completed, should offer new existing conditions analyses for inclusion in the DFIRM. At the state level, NJDEP and NJOGIS are collaborating on development of the hydrography and land use/land cover geospatial framework data layers. Both agencies hope to collaborate with FEMA on elevation data development. Additionally, NJDEP is now joining with FEMA Region II and turning attention to potential partners at the county and municipality level for both prioritization and data development efforts.

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

NJDEP is very interested in providing more outreach to the end users of the DFIRM products.

- Continue to provide NJDEP staff to local communities as resources to facilitate better floodplain management and emergency response among local officials, engineers, and planners; and
- Working with communities to update and adopt a model local ordinance.

### ***Five Year Mapping Plan***

As stated above, New Jersey and FEMA Region II have made good progress in identifying and tasking riverine flood hazard data development that is needed. FEMA's IDIQ contractors are currently conducting new analyses for over 60% of the riverine miles identified for restudy by NJDEP. These riverine miles were primarily identified for one of two reasons. Either the flooding from Hurricane Floyd demonstrated that the current hydrologic analysis is inadequate without taking this event into account, or the affected communities have never been mapped/studied. All identified streams have USGS gage records for use in performing the hydrologic analysis. NJDEP would like to begin identifying other, non-gaged streams after USGS has completed their update to the state regression equations.

In addition to funding restudy of the remaining fluvial and coastal restudies, production of the DFIRMs must be completed for the initial remapping of the state. The order of priority for DFIRM production requested by the state is based on when FEMA contractors would be ready to submit the new hydrologic and hydraulic analyses and counties which have "emergency" restudy rated based on the PFHV work after Hurricane Floyd. This list is provided in the Appendix B. Some lower priority digital conversions were assumed to be accomplished earlier in the 5 year program cycle as part of the effort to meet GPRA goals and to address workflow considerations.

The state believes that if FEMA can provide funding for elevation data early in the five year Map Modernization effort, progress towards obtaining lower per stream mile costs for data development. Similarly, if funding for digital capture of the NJSFHA can come early in the five-year plan, the case for integration of the state and Federal mapping programs will be on much better footing as we work to convince state legislators of the need for their action.

### III. Performance Goals

To meet FEMA’s goals for MHFMMP of providing 100% of the state’s population with digital GIS flood data online by 2009 requires a well-managed program to undertake the necessary data development and map production efforts. A proposed project schedule, assuming full funding, to meet the GPRA goals is presented in Appendix C.

#### *FEMA GPRA Goal 1 – Population of New Jersey With GIS Flood Hazard Data Online*

New Jersey is on course to exceed FEMA’s 5-year GPRA Goal 1 within the timeline goal. While the state may not be able to meet FEMA’s goal in 2004, the entire population of New Jersey will have GIS flood hazard data online in 2009. This timeline accounts for the project timeframe for data that FEMA’s IDIQ contractors will be developing.

| Fiscal Year | FEMA GPRA Goal 1:<br>Population with Digital Map Online |           |
|-------------|---|-----------|
|             | NJ Projection   | FEMA Goal |
| 2004        | 18%   | 20%       |
| 2005        | 50%   | 50%       |
| 2006        | 65%   | 65%       |
| 2007        | 77%   | 75%       |
| 2008        | 93%   | 85%       |
| 2009        | 100%  | 100%      |

#### *FEMA GPRA Goal 2 – Population of New Jersey With Modernized GIS Maps Adopted*

After 2005, New Jersey should be able to comfortably meet or exceed FEMA’s GPRA Goal 2. At year one, the only modernized maps for the state are scattered individual community DFIRMs. In early fiscal year 2005, the countywide DFIRMs for Bergen (62 communities) and Union (22 communities) Counties will become effective. With these studies adopted and the course charted in this business plan followed, FEMA’s GPRA goal 2 will be easily met in New Jersey.

| Fiscal Year | FEMA GPRA Goal 2:<br>Population with Modernized Maps Adopted |           |
|-------------|--|-----------|
|             | NJ State Projection  | FEMA Goal |
| 2004        | 1%   | 10%       |
| 2005        | 18%  | 20%       |
| 2006        | 50%  | 35%       |
| 2007        | 64%  | 50%       |
| 2008        | 77%  | 70%       |
| 2009        | 93%  | 90%       |

A project schedule for meeting these goals is shown in Appendix C.

### ***FEMA GPRA Goal 3 – Percent Leverage Towards GIS Flood Hazard Data***

To date, the state of New Jersey has worked closely with FEMA and other Federal agencies to forge the partnerships necessary to increase the flood protection and flood hazard information available to our citizens. Examples of these partnerships include:

- USACE (New York District)-Green Brook Flood Protection Project (under construction)
- USACE (New York District)-Ramapo River/Borough of Oakland Flood Protection Project (under construction)
- USACE (New York District)-City of Elizabeth Flood Protection Project (complete)
- USACE (Philadelphia District)-Molly Ann's Brook Flood Protection Project
- USACE (New York District)-feasibility studies for Millstone, Peckman, Rahway, Shrewsbury, Passaic (upper), and Rockaway (upper) Rivers
- USGS-Development of new regression equations (\$300,000)

The orthophotography developed by the state can serve as a high quality base map for all DFIRMs to be developed for New Jersey. The leveraged cost of this base map data is approximately \$1.6 million. This is based on the FEMA Blue Book value for a base map of \$430/panel. We developed a state-wide paneling scheme, following the USGS DOQ paneling scheme and assuming that any Q3 flood hazard data falling on a USGS quarter quarter quad would be shown at the 1"=500' scale in the statewide paneling scheme. This countywide paneling estimation technique compared favorably to detailed panel counts performed for studies issued or in progress. By this estimate, there are more than 2,600 panels needed to cover the state.

For this leverage discussion, we make the assumption that FEMA is interested in cost-sharing with the state for development of statewide elevation data. The contribution split requested is 65/35, with 35% being the approximate coverage of flood hazard, as derived from Q3 data, over the state's land area. The state has received a price quotation of \$3.5 million for obtaining statewide digital elevation data from a leading LiDAR vendor. New Jersey is optimistic that it can find partners at the state and local level to provide this leverage. However, those partnerships are not in place currently, and the leverage information provided is based on the assumption that the state can find the required funding.

Other leverage opportunities include updated flood hazard data from the USACE which will be able to offset FEMA funding for updated riverine analyses. These opportunities develop on a yearly basis, as state funding becomes available. Future updates of the state's business plan will include these contributions as they come into focus. Further, the state is hopeful that a State Bond Act will provide a funding source to match FEMA spending in the state. This Bond act includes a provision for flood control planning and has passed both state legislative houses and awaits executive approval. This potential source of future leverage is not included in this discussion as it is yet to be realized, but we believe that future business plan updates will include more contributions from the state.

If our plan is successful, the State of New Jersey will be able to help FEMA meet its GPRA goal of increasing the leveraged effort towards GIS flood hazard data over the next 5 years. Granted the assumptions discussed above, the overall project leveraged cost should be approximately 22%.

| <b>FEMA GPRA Goal 3:<br/>Leveraged Effort Towards GIS Flood Hazard Data</b> |                               |                 |                       |                 |                           |                   |
|---|-------------------------------|-----------------|-----------------------|-----------------|---------------------------|-------------------|
| <b>Fiscal Year</b>  | <b>Leveraged Contribution</b> |                 |                       |                 | <b>Total Project Cost</b> | <b>% Leverage</b> |
|   | <b>Base Map Data</b>          | <b>Scoping</b>  | <b>Elevation Data</b> | <b>H/H Data</b> |                           |                   |
| 2005  | \$239,940                     | \$25,000        |                       |                 | \$3,622,120               | 7%                |
| 2006  | \$135,880                     | \$15,000        | \$2,275,000           | \$65,000        | \$6,291,080               | 39%               |
| 2007  | \$233,060                     | \$15,000        |                       |                 | \$2,591,300               | 16%               |
| 2008  | \$211,130                     | \$20,000        |                       |                 | \$2,568,880               | 15%               |
| 2009  | \$257,140                     | \$20,000        |                       |                 | \$3,191,400               | 15%               |
| <b>Overall</b>  | <b>\$1,599,070</b>            | <b>\$95,000</b> | <b>\$2,275,000</b>    | <b>\$65,000</b> | <b>\$18,264,780</b>       | <b>22%</b>        |

#### ***FEMA GPRA Goal 4 – Map Modernization Funding Put Through to CTPs***

As part of the Outreach effort, the state will work with FEMA Region II to seek out and identify potential CTP partners through which the state believes it can increase the leverage it is proposing. Through those efforts, New Jersey hopes to establish CTPs through which FEMA can meet its GPRA Goal 4.

#### **IV. New Jersey Map Modernization Funding and Alternative Funding Levels**

There are three elements that will require funding from FEMA over the 5-year period FY 2005-FY2009. These are:

- Initial Remapping of the State (including elevation data development and NJSFHA capture);
- Map Maintenance; and
- Administration and Program Management.

#### ***Full Funding***

Under the full funding scenario discussed, the projected annual costs are summarized below.

| <b>Program Element</b>                    | <b>FY05</b>        | <b>FY06</b>        | <b>FY07</b>        | <b>FY08</b>        | <b>FY09</b>        | <b>Total</b>        |
|---|--------------------|--------------------|--------------------|--------------------|--------------------|---------------------|
| Initial Remapping                         | \$3,622,120        | \$1,791,080        | \$2,591,300        | \$2,568,880        | \$3,191,400        | \$13,764,780        |
| -Elevation Data                           |                    | \$3,500,000        |                    |                    |                    | \$3,500,000         |
| -NJSFHA Capture                           |                    | \$1,000,000        |                    |                    |                    | \$1,000,000         |
| Map Maintenance                           | \$0                | \$0                | \$394,250          | \$326,800          | \$365,850          | \$1,086,900         |
| Program Administration/<br>Management     | \$125,000          | \$125,000          | \$125,000          | \$125,000          | \$125,000          | \$625,000           |
| <b>Total Program Funding Requirements</b> | <b>\$3,747,120</b> | <b>\$6,416,080</b> | <b>\$3,110,550</b> | <b>\$3,020,680</b> | <b>\$3,682,250</b> | <b>\$19,976,680</b> |

Details on funding specifically requested from FEMA for FY 2005-2009 are detailed in Appendix D and outline as follows:

| Program Element                     |                        | FY05               | FY06               | FY07               | FY08             | FY09             | Total               |
|-------------------------------------|------------------------|--------------------|--------------------|--------------------|------------------|------------------|---------------------|
| Initial Remapping                   | Funding Requirement    | \$3,622,120        | \$1,791,080        | \$2,591,300        | \$2,568,880      | \$3,191,400      | \$13,764,780        |
|                                     | Requested FEMA Funding | \$3,357,180        | \$1,640,200        | \$2,440,420        | \$388,250        | \$468,500        | \$8,294,550         |
| Elevation Data Development          | Funding Requirement    | \$0                | \$3,500,000        | \$0                | \$0              | \$0              | \$3,500,000         |
|                                     | Requested FEMA Funding | \$0                | \$1,125,000        | \$0                | \$0              | \$0              | \$1,125,000         |
| NJSFHA Capture                      | Funding Requirement    | \$0                | \$1,000,000        | \$0                | \$0              | \$0              | \$1,000,000         |
|                                     | Requested FEMA Funding | \$0                | \$1,000,000        | \$0                | \$0              | \$0              | \$1,000,000         |
| Maintenance                         | Funding Requirement    | \$0                | \$0                | \$394,250          | \$326,800        | \$365,850        | \$1,086,900         |
|                                     | Requested FEMA Funding | \$0                | \$0                | \$333,500          | \$274,600        | \$308,700        | \$916,800           |
| Program Administration/ Management  | Funding Requirement    | \$125,000          | \$125,000          | \$125,000          | \$125,000        | \$125,000        | \$625,000           |
|                                     | Requested FEMA Funding | \$125,000          | \$125,000          | \$125,000          | \$125,000        | \$125,000        | \$625,000           |
| <b>Total Requested FEMA Funding</b> |                        | <b>\$3,482,180</b> | <b>\$3,890,200</b> | <b>\$2,898,920</b> | <b>\$787,850</b> | <b>\$902,200</b> | <b>\$11,961,350</b> |

### Initial Remapping

The cost for the Initial Remapping task was based on both FEMA Blue Book and industry estimates for conducting new hydrologic and hydraulic analyses for our requested riverine and coastal requests. The costs for riverine and coastal restudies were estimated with the assumption that FEMA and the state could successfully partner to develop a high-resolution statewide elevation data layer. Estimated project unit costs are provided below.

| Task   | Unit  | Cost Per Unit |
|--|-------|---------------|
| Local Orthophoto Base Map  | Panel | \$430         |
| Detailed Riverine Restudy (Survey, Hydrology, Hydraulics, and Mapping) | Mile  | \$9,000       |
| DFIRM Production   | Panel | \$3,550       |

The cost for performing a new storm surge analysis in the Delaware was estimated at \$600,000, which was split between Cape May and Cumberland Counties. This cost was generated solely through a comparative analysis, given the Delaware Bay's 750+ square mile area. It is hoped that this cost can come down through research of possible existing analyses or cost sharing with other impacted communities such as those in Delaware and Pennsylvania (FEMA Region III).

As discussed before, there is a local orthophoto base map available for use in producing the DFIRM. The panel units were derived by using a state-wide paneling scheme, following the USGS DOQ paneling scheme and assuming that any Q3 flood hazard data falling on a USGS quarter quarter quad would be shown at the 1"=500' scale in the statewide paneling scheme. This countywide paneling estimation technique compared accurately to detailed panel counts performed for studies issued or in progress.

Included as part of the initial remapping category are the development of elevation data and the capture of the NJSFHA from the state's maps. The state is requesting FEMA assistance to develop a statewide elevation layer. The availability of this data lowers the cost of developing the new riverine and coastal analyses and, through redelineation, improves flood hazard information along flooding sources where the effective analyses has been judged sufficient. Development of this dataset will also have benefits for other water resource, land use, and multi-hazard applications. With a high-resolution elevation dataset developed for the entire state, delineation of the NJSFHA can also be accomplished. The state is asking for FEMA assistance to preserve the irreplaceable NJSFHA data presented on its state maps. This assistance would involve funding the digitization and georeferencing of the NJSFHA boundary from the state floodplain maps. This data can then be brought in as one of the digital layers of the new DFIRMs. This would open the possibility that NJ could adopt the FEMA DFIRMs as their regulatory standard, a move which will strengthen the value and efficacy of both programs.

### **Program Management and Administration**

As New Jersey seeks to maintain its longstanding role of support and implementation of the NFIP while the program is expanding its scope, so too must the NJDEP. In order to undertake these expanded responsibilities, we are requesting the need for one additional Staff Engineer and one Hazard Mitigation Specialist. These 2 new FTEs will join existing staff to undertake the following:

- Project planning (business plan updates, establishing priorities, etc.);
- Development of federal, state agency and local partnerships; and
- Community and public outreach.

These new FTEs will also work to begin the process of trying to integrate the state and Federal mapping programs. The key factor in embarking on this effort will be FEMA's support in capturing the NJSFHA in all future DFIRM products. If this appeal for FEMA support and funding is answered then, at the state level, procedures will need to be developed to use the DFIRM for the stream encroachment permitting process. Again, the process to integrate the two mapping program may take some time, but the end result, if accomplished would be immensely valuable to FEMA and the state.

### **Map Maintenance**

Currently all riverine flood hazard updates requested by the state are driven by the availability of long-term gage record for use in developing current flood discharge estimates. In 2007, when USGS will have new regression equations developed for New Jersey, the maintenance phase of the program can begin-updating flood hazards for streams with effective, countywide DFIRMs. For purposes of this estimate, it has been

assumed that 5% of the modernized DFIRM panels effective at the commencement of the maintenance phase will require updates to incorporate the revised engineering data and that 30 miles of stream will be updated with the new regression equations annually. We have assumed that the state's development of the regression equations and orthoimagery will contribute to the maintenance effort. We estimate that the availability of the new regression equations will contribute \$1,500/mile to the engineering restudy effort and the orthoimagery will provide a \$430/panel contribution to the production cost of the maintenance panels.

| <b>Fiscal Year</b>     | <b>Engineering Restudies<br/>(\$9,000/stream mile)</b> | <b>DFIRM Production<br/>(\$3,550/panel)</b> | <b>Total</b>       | <b>State<br/>Contribution</b> |
|------------------------|--|---|--------------------|-------------------------------|
| 2007                   | \$270,000  | \$124,250                                   | \$394,250          | \$60,750                      |
| 2008                   | \$270,000  | \$56,800                                    | \$326,800          | \$52,200                      |
| 2009                   | \$270,000  | \$95,850                                    | \$365,850          | \$57,150                      |
| 2010                   | \$270,000  | \$88,750                                    | \$358,750          | \$60,750                      |
| <b>Total 2007-2010</b> | <b>\$1,080,000</b>                                     | <b>\$365,650</b>                            | <b>\$1,445,650</b> | <b>\$230,850</b>              |

### ***Medium Funding Alternative***

Under the medium funding scenario (approximately 66%) of full funding, the program would not be able to acquire statewide elevation data, it would not be able to capture the NJSFHA from the state's existing maps, it would not be able to provide additional employees to assist in outreach and map adoption support, and maintenance activities could not begin as scheduled here. Without statewide elevation data, the cost for developing new hydraulic analyses would most likely increase. Also, without a method to capture the NJSFHA, the current two map system will continue, necessitating duplication of efforts and associated inefficiencies. More importantly, at the medium funding alternative, funding requested for initial remapping would need to be reduced by over \$400,000. This would most likely affect the storm surge modeling request. This is a critical area in need of hazard analysis and not conducting a restudy leaves a vulnerable part of the state in jeopardy. Other priorities could be adjusted, but the requests made in this plan under the full funding assumption are fundamentally the minimum that should be done to improve flood hazard mapping in New Jersey. Under any scenario other than full funding, New Jersey will not be able to meet FEMA's GPRA goals.

### ***Low Funding Alternative***

Under the low funding scenario (approximately 33%), significant parts of the state's basic restudy list would be untouched. This would result in underestimated flood hazards and a significant portion of the state's residents and officials inadequately informed and protected from flooding events. In fact, the state's priority list would be untouched after the first year. Of course, FEMA's GPRA goals would not be met and the majority of the state would be inadequately protected and informed.

**APPENDIX A**

**New Jersey Counties Summary Data**

| <b>FY STUDY GROUP</b>  | <b>Project / County Name</b> | <b>Square Miles</b> | <b>Current Population</b> | <b>Population Growth % (1990-2000)</b> | <b>No. of Flood Insurance Policies</b> | <b>No. of Claims (Since 1978)</b> | <b>No. of Repetitive Losses</b> | <b>Number of Panels</b> | <b>Square Miles</b> |
|------------------------|------------------------------|---------------------|---------------------------|--|--|-----------------------------------|---------------------------------|-------------------------|---------------------|
| <b>FY2005</b>          |                              |                     |                           |  |  |                                   |                                 |                         |                     |
|                        | SOMERSET                     | 305                 | 297,490                   | 23.8                                   | 2,661                                  | 2,059                             | 340                             | 145                     | 305                 |
|                        | ESSEX                        | 126                 | 793,633                   | 2                                      | 3,483                                  | 2,077                             | 128                             | 56                      | 126                 |
|                        | CAMDEN                       | 222                 | 508,932                   | 1.2                                    | 1,547                                  | 400                               | 27                              | 83                      | 222                 |
|                        | HUDSON                       | 47                  | 608,975                   | 10.1                                   | 6,304                                  | 772                               | 51                              | 34                      | 47                  |
|                        | OCEAN                        | 636                 | 510,916                   | 17.9                                   | 47,349                                 | 11,875                            | 517                             | 240                     | 636                 |
|                        | <b>SUBTOTAL</b>              | <b>1,336</b>        | <b>2,719,946</b>          |  | <b>61,344</b>                          | <b>17,183</b>                     | <b>1,063</b>                    | <b>558</b>              | <b>1,336</b>        |
| <b>FY2006</b>          |                              |                     |                           |  |  |                                   |                                 |                         |                     |
|                        | MERCER                       | 226                 | 350,761                   | 7.7                                    | 1,934                                  | 1,013                             | 77                              | 88                      | 226                 |
|                        | MIDDLESEX                    | 310                 | 750,162                   | 11.7                                   | 2,778                                  | 1,353                             | 158                             | 114                     | 310                 |
|                        | HUNTERDON                    | 430                 | 121,989                   | 13.1                                   | 860                                    | 296                               | 10                              | 114                     | 430                 |
|                        | <b>SUBTOTAL</b>              | <b>966</b>          | <b>1,222,912</b>          |  | <b>5,572</b>                           | <b>2,662</b>                      | <b>245</b>                      | <b>316</b>              | <b>966</b>          |
| <b>FY2007</b>          |                              |                     |                           |  |  |                                   |                                 |                         |                     |
|                        | MONMOUTH                     | 472                 | 615,301                   | 11.2                                   | 14,688                                 | 6,593                             | 603                             | 152                     | 472                 |
|                        | BURLINGTON                   | 805                 | 423,394                   | 7.2                                    | 2,938                                  | 563                               | 37                              | 259                     | 805                 |
|                        | SALEM                        | 338                 | 64,285                    | -1.5                                   | 1,925                                  | 366                               | 10                              | 131                     | 338                 |
|                        | <b>SUBTOTAL</b>              | <b>1,615</b>        | <b>1,102,980</b>          |  | <b>19,551</b>                          | <b>7,522</b>                      | <b>650</b>                      | <b>542</b>              | <b>1,615</b>        |
| <b>FY2008</b>          |                              |                     |                           |  |  |                                   |                                 |                         |                     |
|                        | GLOUCESTER                   | 325                 | 254,673                   | 10.7                                   | 1,271                                  | 221                               | 14                              | 115                     | 325                 |
|                        | SUSSEX                       | 521                 | 144,166                   | 10.1                                   | 265                                    | 86                                | 2                               | 147                     | 521                 |
|                        | PASSAIC                      | 185                 | 489,049                   | 3.9                                    | 3,916                                  | 5,384                             | 467                             | 84                      | 185                 |
|                        | MORRIS                       | 469                 | 470,212                   | 11.6                                   | 3,788                                  | 3,882                             | 358                             | 145                     | 469                 |
|                        | <b>SUBTOTAL</b>              | <b>1,500</b>        | <b>1,358,100</b>          |  | <b>9,240</b>                           | <b>9,573</b>                      | <b>841</b>                      | <b>491</b>              | <b>1,500</b>        |
| <b>FY2009</b>          |                              |                     |                           |  |  |                                   |                                 |                         |                     |
|                        | CAPE MAY                     | 255                 | 102,326                   | 7.6                                    | 45,363                                 | 15,497                            | 2,110                           | 104                     | 255                 |
|                        | CUMBERLAND                   | 489                 | 146,438                   | 6.1                                    | 734                                    | 604                               | 70                              | 170                     | 489                 |
|                        | WARREN                       | 358                 | 102,437                   | 11.7                                   | 601                                    | 286                               | 18                              | 121                     | 358                 |
|                        | ATLANTIC                     | 561                 | 252,552                   | 12.6                                   | 26,973                                 | 8,358                             | 866                             | 203                     | 561                 |
|                        | <b>SUBTOTAL</b>              | <b>1,663</b>        | <b>603,753</b>            |  | <b>73,671</b>                          | <b>24,745</b>                     | <b>3,064</b>                    | <b>598</b>              | <b>1,663</b>        |
| <b>PROJECT TOTALS:</b> |                              | <b>7,080</b>        | <b>7,007,691</b>          |  | <b>169,378</b>                         | <b>61,685</b>                     | <b>5,863</b>                    | <b>2,505</b>            | <b>7,080</b>        |

**APPENDIX B**  
**State Priority List**

| Priority              | Counties        | Stream   | Length (Miles) | Communities  |
|-----------------------|-----------------|--|----------------|--|
| 1                     | SOMERSET COUNTY | Corys Brook                                    | 4              | Bernards   |
|                       |                 | Dead River                                     | 4              | Bernards,Warren  |
|                       |                 | Harrison Brook                                 | 3              | Bernards   |
|                       |                 | Tributary 2 to Harrisons Brook                 | 2              | Bernards   |
|                       |                 | Raritan River                                  | 14             | Various  |
|                       |                 | South Branch Raritan                           | 10.2           | Branchburg, Hillsborough   |
|                       |                 | Peapack Brook                                  | 7.5            | Peapack, Bedminster  |
|                       |                 | North Branch Raritan                           | 17.5           | Various  |
|                       |                 | Holland Brook                                  | 4.9            | Branchburg   |
|                       |                 | Neshanic River                                 | 3.2            | Hillsborough   |
|                       |                 | Pike Run                                       | 2.6            | Hillsborough   |
|                       |                 | Royces Brook                                   | 6.7            | Hillsborough   |
|                       |                 | Lamington River                                | 15             | Bedminster,Branchburg  |
| 2                     | ESSEX COUNTY    | Millstone                                      | 13             | Various  |
|                       |                 | Bear Brook                                     | 1.6            | Livingston   |
|                       |                 | Canoe Brook                                    | 1.1            | Livingston   |
|                       |                 | Trib. To Canoe Brook                           | 0.6            | Livingston   |
|                       |                 | Slough Brook                                   | 2.7            | Livingston   |
|                       |                 | Peckman River                                  | 5.62           | Cedar Grove, Verona,W.Orange, W.Patterson                            |
|                       |                 | E. Branch Rahway River                         | 3.7            | W.Orange,Maplewood, S.Orange, Orange                                 |
|                       |                 | W. Branch Rahway River                         | 3.3            | W.Orange   |
| 3                     | CAMDEN COUNTY   | Crystal Lake Branch Trib to West Branch Rahway | 0.8            | W.Orange   |
|                       |                 | Cooper River                                   | 4.9            | Laurel Springs, Lindenwold, Somerdale, Lawnside, Gibbsboro, Voorhees |
|                       |                 | North Branch Big Timber Creek                  | 2.4            | Laurel Springs, Lindenwold, Clementon, Stratford                     |
|                       |                 | Mason Run                                      | 1.5            | Laurel Springs, Lindenwold   |
|                       |                 | Millard Creek                                  | 1              | Gibbsboro  |
|                       |                 | Nickelson Creek                                | 0.9            | Gibbsboro, Voorhees  |
|                       |                 | Newton Creek                                   | 3.6            | Collingswood, Oaklyn, Haddon, Gloucester                             |
|                       |                 | S. Branch Newton Creek                         | 0.8            | Haddon, Gloucester   |
|                       |                 | N.Branch Cooper                                | 8.7            | Cherry Hill, Voorhees  |
|                       |                 | Barton Run                                     | 2.1            | Voorhees   |
| Bottom Lake Tributary | 0.6             | Clementon                                      |                |  |

Blue=work completed  
Red=work in progress  
Black=unfunded requests

| Priority | Counties          | Stream                     | Length (Miles) | Communities          |
|----------|-------------------|----------------------------|----------------|----------------------|
| 4        | HUNTERDON COUNTY  | Lamington River            | 7              | Tewsbury             |
|          |                   | Holland Brook              | 4.92           | Readington           |
|          |                   | S. Branch Raritan River    | 3.3            | Various              |
|          |                   | Neshanic River             | 6.3            | Raritan, East Amwell |
|          |                   | First Neshanic River       | 1.5            | Raritan              |
|          |                   | Second Neshanic River      | 3              | Raritan              |
|          |                   | Third Neshanic River       | 3.2            | Raritan              |
|          |                   | Walnut Brook               | 1.8            | Raritan, Flemington  |
|          |                   | Back Brook                 | 5.8            | East Amwell          |
| 5        | MERCER COUNTY     | Miry Run                   | 4.2            | Hamilton             |
|          |                   | Shady Brook                | 1.3            | Hamilton             |
|          |                   | Pond Run                   | 4.5            | Hamilton             |
|          |                   | North Branch Pond Run      | 1.8            | Hamilton             |
|          |                   | Back Creek                 | 2.7            | Hamilton             |
|          |                   | Bedens Brook               | 3.1            | Hopewell (Twsp&Boro) |
| 6        | MIDDLESEX COUNTY  | Raritan River              | 2.5            | Highland Park        |
|          |                   | Mill Brook                 | 0.6            | Highland Park        |
|          |                   | W. Branch Mill Brook       | 0.2            | Highland Park        |
|          |                   | Boundary Branch Mill Brook | 1              | Highland Park        |
|          |                   | Coopermine Brook           | 0.6            | Edison               |
|          |                   | S.Branch Rahway            | 0.6            | Edison               |
| 7        | MONMOUTH COUNTY   | New Sharon Branch          | 0.8            | Upper Freehold       |
|          |                   | North Tributary            | 5.7            | Upper Freehold       |
|          |                   | Doctors Creek              | 1.1            | Upper Freehold       |
|          |                   | Shark River storm surge    |                | Neptune              |
|          |                   |                            | all            | Manalapan            |
|          |                   |                            | all            | Marlboro             |
| 8        | BURLINGTON COUNTY | Springer Brook             | 0.8            | Shamong              |
|          |                   | Muskingum Brook            | 2.5            | Shamong              |
|          |                   | Indian Mills Brook         | 2.5            | Shamong              |
|          |                   |                            |                |                      |
| 9        | SALEM COUNTY      | Salem Creek                | 0.6            | Woodstown            |
|          |                   | Chestnut Run               | 0.9            | Woodstown            |
|          |                   |                            |                |                      |
| 10       | GLOUCESTER COUNTY | Woodbury Creek             | 1.1            | W.Deptford           |
|          |                   | Woodbury Creek             |                | Woodbury             |
|          |                   | Mantua Creek               | 17.6           | Various              |
|          |                   | Little Ease Run            | 0.7            | Clayton              |
|          |                   | Scotland Run               | 0.9            | Clayton              |
|          |                   | Still Run                  | 1.9            | Clayton              |
|          |                   | Raccoon Creek              | 7.3            | Harrison             |
|          |                   | S. Branch Raccoon Creek    | 2.5            | Harrison             |

Blue=work completed  
Red=work in progress  
Black=unfunded requests

| Priority | Counties          | Stream                             | Length (Miles) | Communities                         |
|----------|-------------------|------------------------------------|----------------|-------------------------------------|
| 11       | SUSSEX COUNTY     | Dry Brook                          | 0.75           | Branchville                         |
|          |                   | Culvers Brook                      | 0.87           | Branchville                         |
|          |                   |                                    |                |                                     |
| 12       | PASSAIC COUNTY    | Molly Anns Brook                   | 1.9            | Haledon, Patterson                  |
|          |                   | Peckman River                      | 2.1            | Little Falls, W. Patterson          |
|          |                   |                                    |                |                                     |
| 13       | MORRIS COUNTY     | N. Branch Raritan                  | 3.2            | Mendham                             |
|          |                   | Burnett Brook                      | 1.4            | Mendham                             |
|          |                   | Indian Brook                       | 0.5            | Mendham                             |
|          |                   | Whippany River                     | 1.3            | Mendham                             |
|          |                   | Harmony Brook                      | 1.7            | Mendham                             |
|          |                   | Passaic River                      | 2.9            | Mendham                             |
|          |                   |                                    |                |                                     |
| 14       | CAPE MAY COUNTY   | Atlantic Ocean, Delaware Bay Surge |                | Middle Township, W.Wildwood, Dennis |
|          |                   |                                    |                |                                     |
| 15       | CUMBERLAND COUNTY | Delaware Bay Storm Surge           |                | Downe Township                      |
|          |                   |                                    |                |                                     |
| 16       | BERGEN COUNTY     | Saddle River                       | 18.2           | Various                             |
|          |                   | Hohokus Brook                      | 9.5            | Various                             |
|          |                   | Ramapo River                       | 1.3            | Oakland                             |
|          |                   | Ramsey Brook                       | 4              | Allendale, Ramsey, Mahwah           |
|          |                   |                                    |                |                                     |
| 17       | HUDSON COUNTY     | Digital Conversion                 |                |                                     |
| 18       | OCEAN COUNTY      | Digital Conversion                 |                |                                     |
| 19       | WARREN            | Digital Conversion                 |                |                                     |
| 20       | ATLANTIC          | Digital Conversion                 |                |                                     |

Blue=work completed

Red=work in progress

Black=unfunded requests

|   |     |
|---|-----|
| Total Miles Completed:                        | 30  |
| Total Miles In Progress:                      | 179 |
| Total Miles Requested (not incl. storm surge) | 100 |

**APPENDIX C**  
**Project Schedule**

| ID | Task Name               | 2003 |    | 2004 |    | 2005 |    | 2006 |    | 2007 |    | 2008 |    | 2009 |    | 2010 |    | 2011 |    |
|----|-------------------------|------|----|------|----|------|----|------|----|------|----|------|----|------|----|------|----|------|----|
|    |                         | Q3   | Q4 | Q1   | Q2 | Q3   | Q4 | Q1   | Q2 | Q3   | Q4 | Q1   | Q2 | Q3   | Q4 | Q1   | Q2 | Q3   | Q4 |
| 1  | <b>Studies Underway</b> |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 2  | <b>Bergen</b>           |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 3  | Preliminary DFIRM       |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 4  | Effective DFIRM         |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 5  | <b>Union</b>            |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 6  | Preliminary DFIRM       |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 7  | Effective DFIRM         |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 8  | <b>FY2005 Studies</b>   |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 9  | <b>Somerset</b>         |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 10 | Preliminary DFIRM       |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 11 | Effective DFIRM         |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 12 | <b>Essex</b>            |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 13 | Preliminary DFIRM       |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 14 | Effective DFIRM         |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 15 | <b>Camden</b>           |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 16 | Preliminary DFIRM       |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 17 | Effective DFIRM         |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 18 | <b>Hudson</b>           |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 19 | Preliminary DFIRM       |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 20 | Effective DFIRM         |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 21 | <b>Ocean</b>            |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 22 | Preliminary DFIRM       |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 23 | Effective DFIRM         |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 24 | <b>FY2006 Studies</b>   |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 25 | <b>Mercer</b>           |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 26 | Preliminary DFIRM       |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 27 | Effective DFIRM         |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 28 | <b>Middlesex</b>        |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 29 | Preliminary DFIRM       |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 30 | Effective DFIRM         |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 31 | <b>Hunterdon</b>        |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 32 | Preliminary DFIRM       |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 33 | Effective DFIRM         |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 34 | <b>FY2007 Studies</b>   |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 35 | <b>Monmouth</b>         |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 36 | Preliminary DFIRM       |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 37 | Effective DFIRM         |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 38 | <b>Burlington</b>       |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 39 | Preliminary DFIRM       |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 40 | Effective DFIRM         |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 41 | <b>Salem</b>            |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 42 | Preliminary DFIRM       |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 43 | Effective DFIRM         |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 44 | <b>FY2008 Studies</b>   |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 45 | <b>Gloucester</b>       |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 46 | Preliminary DFIRM       |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 47 | Effective DFIRM         |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 48 | <b>Sussex</b>           |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 49 | Preliminary DFIRM       |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 50 | Effective DFIRM         |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 51 | <b>Passaic</b>          |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 52 | Preliminary DFIRM       |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 53 | Effective DFIRM         |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 54 | <b>Morris</b>           |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 55 | Preliminary DFIRM       |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 56 | Effective DFIRM         |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 57 | <b>FY2009 Studies</b>   |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 58 | <b>Cape May</b>         |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 59 | Preliminary DFIRM       |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 60 | Effective DFIRM         |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 61 | <b>Cumberland</b>       |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 62 | Preliminary DFIRM       |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 63 | Effective DFIRM         |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 64 | <b>Warren</b>           |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 65 | Preliminary DFIRM       |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 66 | Effective DFIRM         |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 67 | <b>Atlantic</b>         |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 68 | Preliminary DFIRM       |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |
| 69 | Effective DFIRM         |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |    |

## **APPENDIX D**

### **Project Costs**

|                |                            | ESTIMATED COSTS                     |  |  |                                    |                              |                                   |   |  |   |  | CONTRIBUTION VALUES AND PERCENTAGES |                                      |                       |   |                       |
|----------------|----------------------------|-------------------------------------|--|--|------------------------------------|------------------------------|-----------------------------------|---|--|---|--|-------------------------------------|--------------------------------------|-----------------------|---|-----------------------|
| FY STUDY GROUP | Project / County Name      | Stream Miles Studied/ To Be Studied | Base Map Acquisition (State) (\$430/panel) | Community Scoping / Outreach (State) (\$5,000/co.) | Detail Modeling (FEMA) (\$9000/mi) | Modeling (FEMA) To Be Tasked | Modeling (FEMA) Tasked/ Completed | DFIRM / Database Production (FEMA) (\$2000/panel) | DFIRM Quality Control (FEMA) (\$700/panel) | Post-Preliminary Process (FEMA/MCC) (\$700/panel) | Printing and Shipping (FEMA/MSC) (\$150/panel) | Estimated Total Cost                | State Contribution - Estimated Value | Percent of Total Cost | Federal Emergency Management Agency- Estimated Cost | Percent of Total Cost |
| FY 2005        |                            |                                     |  |  |                                    |                              |                                   |   |  |   |  |                                     |                                      |                       |   |                       |
|                | SOMERSET                   | 108                                 | \$62,350                                   | \$5,000  | \$968,400                          | \$117,000                    | \$851,400                         | \$290,000   | \$101,500                                  | \$101,500   | \$21,750                                       | \$1,550,500                         | \$67,350                             | 4.3%                  | \$1,483,150   | 95.7%                 |
|                | ESSEX                      | 19                                  | \$24,080                                   | \$5,000  | \$174,780                          | \$0                          | \$174,780                         | \$112,000   | \$39,200                                   | \$39,200  | \$8,400  | \$402,660                           | \$29,080                             | 7.2%                  | \$373,580   | 92.8%                 |
|                | CAMDEN                     | 26                                  | \$35,690                                   | \$5,000  | \$233,100                          | \$5,400                      | \$227,700                         | \$166,000   | \$58,100                                   | \$58,100  | \$12,450                                       | \$568,440                           | \$40,690                             | 7.2%                  | \$527,750   | 92.8%                 |
|                | HUDSON                     | 0                                   | \$14,620                                   | \$5,000  | \$0                                | \$0                          | \$0                               | \$68,000  | \$23,800                                   | \$23,800  | \$5,100  | \$140,320                           | \$19,620                             | 14.0%                 | \$120,700   | 86.0%                 |
|                | OCEAN                      | 0                                   | \$103,200                                  | \$5,000  | \$0                                | \$0                          | \$0                               | \$480,000   | \$168,000                                  | \$168,000   | \$36,000                                       | \$960,200                           | \$108,200                            | 11.3%                 | \$852,000   | 88.7%                 |
|                | <b>SUBTOTAL</b>            | <b>153</b>                          | <b>\$239,940</b>                           | <b>\$25,000</b>                                    | <b>\$1,376,280</b>                 | <b>\$122,400</b>             | <b>\$1,253,880</b>                | <b>\$1,116,000</b>                                | <b>\$390,600</b>                           | <b>\$390,600</b>                                  | <b>\$83,700</b>                                | <b>\$3,622,120</b>                  | <b>\$264,940</b>                     | <b>7.3%</b>           | <b>\$3,357,180</b>                                  | <b>91.2%</b>          |
| FY2006         |                            |                                     |  |  |                                    |                              |                                   |   |  |   |  |                                     |                                      |                       |   |                       |
|                | MERCER                     | 18                                  | \$37,840                                   | \$5,000  | \$158,400                          | \$0                          | \$158,400                         | \$176,000   | \$61,600                                   | \$61,600  | \$13,200                                       | \$513,640                           | \$42,840                             | 8.3%                  | \$470,800   | 91.7%                 |
|                | MIDDLESEX                  | 3                                   | \$49,020                                   | \$5,000  | \$27,000                           | \$16,200                     | \$10,800                          | \$228,000   | \$79,800                                   | \$79,800  | \$17,100                                       | \$485,720                           | \$54,020                             | 11.1%                 | \$431,700   | 88.9%                 |
|                | HUNTERDON                  | 37                                  | \$49,020                                   | \$5,000  | \$333,000                          | \$225,000                    | \$108,000                         | \$228,000   | \$79,800                                   | \$79,800  | \$17,100                                       | \$791,720                           | \$54,020                             | 6.8%                  | \$737,700   | 93.2%                 |
|                | ELEVATION DATA DEVELOPMENT | --                                  | --   | --   | --                                 | --                           | --                                | --  | --   | --  | --   | \$3,500,000                         | \$2,275,000                          | 65.0%                 | \$1,225,000   | 35.0%                 |
|                | NJSFHA DIGITAL CAPTURE     | --                                  | --   | --   | --                                 | --                           | --                                | --  | --   | --  | --   | \$1,000,000                         | --                                   | --                    | \$1,000,000   | 100.0%                |
|                | <b>SUBTOTAL</b>            | <b>58</b>                           | <b>\$135,880</b>                           | <b>\$15,000</b>                                    | <b>\$518,400</b>                   | <b>\$295,380</b>             | <b>\$277,200</b>                  | <b>\$632,000</b>                                  | <b>\$221,200</b>                           | <b>\$221,200</b>                                  | <b>\$47,400</b>                                | <b>\$6,291,080</b>                  | <b>\$2,425,880</b>                   | <b>38.6%</b>          | <b>\$3,865,200</b>                                  | <b>61.4%</b>          |
| FY2007         |                            |                                     |  |  |                                    |                              |                                   |   |  |   |  |                                     |                                      |                       |   |                       |
|                | MONMOUTH                   | 20                                  | \$114,000                                  | \$5,000  | \$180,000                          | \$0                          | \$180,000                         | \$304,000   | \$106,400                                  | \$106,400   | \$22,800                                       | \$838,600                           | \$119,000                            | 14.2%                 | \$719,600   | 85.8%                 |
|                | BURLINGTON                 | 6                                   | \$194,250                                  | \$5,000  | \$52,200                           | \$52,200                     | \$0                               | \$518,000   | \$181,300                                  | \$181,300   | \$38,850                                       | \$1,170,900                         | \$199,250                            | 17.0%                 | \$971,650   | 83.0%                 |
|                | SALEM                      | 2                                   | \$98,250                                   | \$5,000  | \$13,500                           | \$13,500                     | \$0                               | \$262,000   | \$91,700                                   | \$91,700  | \$19,650                                       | \$581,800                           | \$103,250                            | 17.7%                 | \$478,550   | 82.3%                 |
|                | <b>SUBTOTAL</b>            | <b>27</b>                           | <b>\$406,500</b>                           | <b>\$15,000</b>                                    | <b>\$245,700</b>                   | <b>\$65,700</b>              | <b>\$180,000</b>                  | <b>\$1,084,000</b>                                | <b>\$379,400</b>                           | <b>\$379,400</b>                                  | <b>\$81,300</b>                                | <b>\$2,591,300</b>                  | <b>\$421,500</b>                     | <b>16.3%</b>          | <b>\$2,169,800</b>                                  | <b>83.7%</b>          |
| FY 2008        |                            |                                     |  |  |                                    |                              |                                   |   |  |   |  |                                     |                                      |                       |   |                       |
|                | GLOUCESTER                 | 32                                  | \$86,250                                   | \$5,000  | \$288,000                          | \$0                          | \$288,000                         | \$230,000   | \$80,500                                   | \$80,500  | \$17,250                                       | \$787,500                           | \$91,250                             | 11.6%                 | \$696,250   | 88.4%                 |
|                | SUSSEX                     | 2                                   | \$110,250                                  | \$5,000  | \$14,580                           | \$14,580                     | \$0                               | \$294,000   | \$102,900                                  | \$102,900   | \$22,050                                       | \$651,680                           | \$115,250                            | 17.7%                 | \$536,430   | 82.3%                 |
|                | PASSAIC                    | 4                                   | \$63,000                                   | \$5,000  | \$36,000                           | \$18,900                     | \$17,100                          | \$168,000   | \$58,800                                   | \$58,800  | \$12,600                                       | \$402,200                           | \$68,000                             | 16.9%                 | \$334,200   | 83.1%                 |
|                | MORRIS                     | 11                                  | \$108,750                                  | \$5,000  | \$99,000                           | \$99,000                     | \$0                               | \$290,000   | \$101,500                                  | \$101,500   | \$21,750                                       | \$727,500                           | \$113,750                            | 15.6%                 | \$613,750   | 84.4%                 |
|                | <b>SUBTOTAL</b>            | <b>49</b>                           | <b>\$368,250</b>                           | <b>\$20,000</b>                                    | <b>\$437,580</b>                   | <b>\$132,480</b>             | <b>\$305,100</b>                  | <b>\$982,000</b>                                  | <b>\$343,700</b>                           | <b>\$343,700</b>                                  | <b>\$73,650</b>                                | <b>\$2,568,880</b>                  | <b>\$388,250</b>                     | <b>15.1%</b>          | <b>\$2,180,630</b>                                  | <b>84.9%</b>          |
| FY 2009        |                            |                                     |  |  |                                    |                              |                                   |   |  |   |  |                                     |                                      |                       |   |                       |
|                | CAPE MAY                   | surge                               | \$78,000                                   | \$5,000  | \$300,000                          | \$300,000                    | \$0                               | \$208,000   | \$72,800                                   | \$72,800  | \$15,600                                       | \$752,200                           | \$83,000                             | 11.0%                 | \$669,200   | 89.0%                 |
|                | CUMBERLAND                 | surge                               | \$127,500                                  | \$5,000  | \$300,000                          | \$300,000                    | \$0                               | \$340,000   | \$119,000                                  | \$119,000   | \$25,500                                       | \$1,036,000                         | \$132,500                            | 12.8%                 | \$903,500   | 87.2%                 |
|                | WARREN                     | 0                                   | \$90,750                                   | \$5,000  | \$0                                | \$0                          | \$0                               | \$242,000   | \$84,700                                   | \$84,700  | \$18,150                                       | \$525,300                           | \$95,750                             | 18.2%                 | \$429,550   | 81.8%                 |
|                | ATLANTIC                   | 0                                   | \$152,250                                  | \$5,000  | \$0                                | \$0                          | \$0                               | \$406,000   | \$142,100                                  | \$142,100   | \$30,450                                       | \$877,900                           | \$157,250                            | 17.9%                 | \$720,650   | 82.1%                 |
|                | <b>SUBTOTAL</b>            | <b>0</b>                            | <b>\$448,500</b>                           | <b>\$20,000</b>                                    | <b>\$600,000</b>                   | <b>\$600,000</b>             | <b>\$0</b>                        | <b>\$1,196,000</b>                                | <b>\$418,600</b>                           | <b>\$418,600</b>                                  | <b>\$89,700</b>                                | <b>\$3,191,400</b>                  | <b>\$468,500</b>                     | <b>14.7%</b>          | <b>\$2,722,900</b>                                  | <b>85.3%</b>          |
|                | <b>PROJECT TOTALS:</b>     | <b>286</b>                          | <b>\$1,599,070</b>                         | <b>\$95,000.00</b>                                 | <b>\$3,177,960</b>                 | <b>\$1,215,960</b>           | <b>\$2,016,180</b>                | <b>\$5,010,000.00</b>                             | <b>\$1,753,500</b>                         | <b>\$1,753,500</b>                                | <b>\$375,750</b>                               | <b>\$18,264,780</b>                 | <b>\$3,969,070</b>                   | <b>21.7%</b>          | <b>\$14,295,710</b>                                 | <b>78.3%</b>          |

