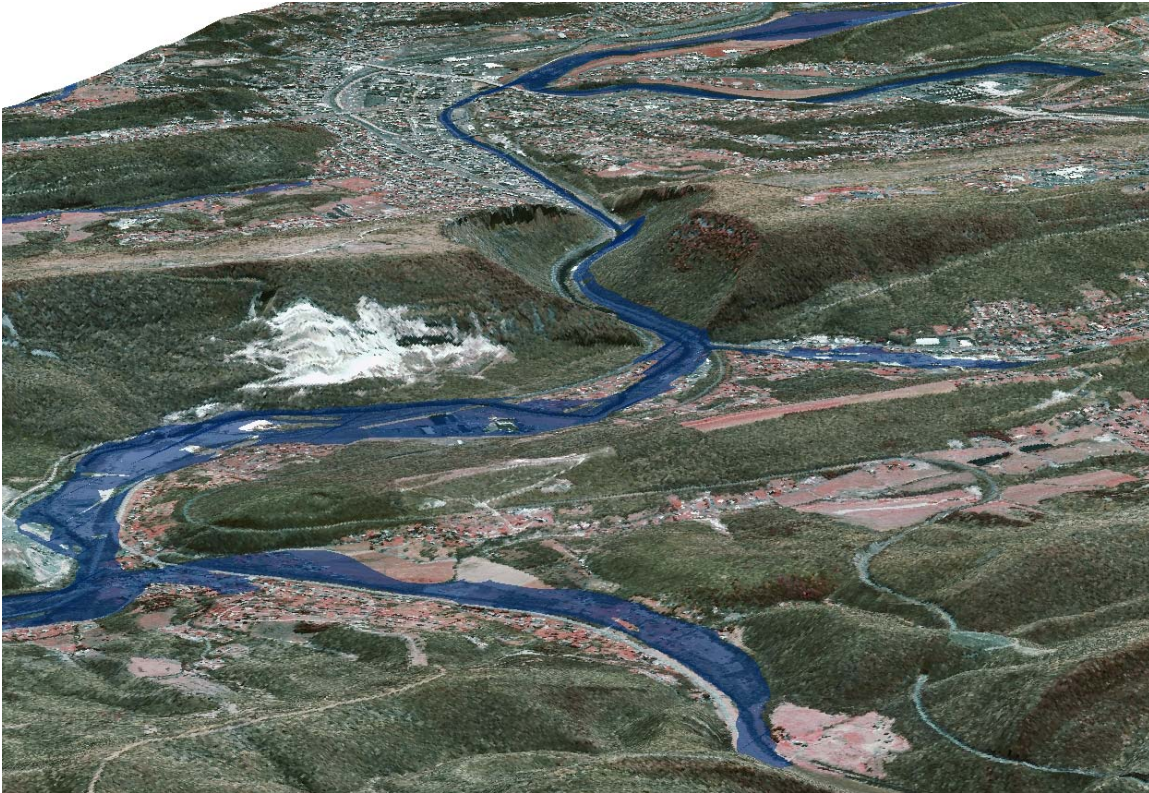


State of Maryland

Cooperating Technical Partner

Floodplain Mapping Business Plan

2004 - 2009



Prepared for

Federal Emergency Management Agency

Region III

Submitted by
Wetlands and Waterways Program
Water Management Administration

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Cover : Image depicts a Maryland Digital Ortho Quarter Quad draped over a USGS 10-meter Digital Elevation Model (DEM). The area shown is Wills Creek in Alleghany County with FEMA's Q3 flood layer also draped over the three dimensional image.

MAP MODERNIZATION IN MARYLAND - BUSINESS PLAN

Overview:

The Federal Emergency Management Agency (FEMA) has Map Modernization funds available for states that are interested in playing an active role in floodplain mapping. In order to assess each partner's interest, FEMA has requested a 5-year business plan from states depicting the details of a map modernization effort. The State of Maryland is pleased to submit this Plan in response to FEMA's request.

Outlined in the plan are the roles that Maryland can perform in updating the maps by coordinating new studies, maintaining these maps, storing the data, and disseminating this information to all users in a web based format. State agency partners will be identified which will assist in maintaining and disseminating the new flood study data.

The end product must be digital data and it must be obtained on a limited budget. However, to be useful to our State floodplain permitting function in the Wetlands and Waterways Program, the new studies must be based on the best available technology. This includes generating very accurate topography through the use of Light Detection and Ranging (LiDAR) to develop terrain models, using the most current watershed model to calculate hydrology, and utilizing hydraulic models to determine water surface elevations to delineate floodplains. To minimize cost, the State is seeking to use automated technology, which will reduce the number of field run cross sections.

If new studies can be done with FEMA funding and without the costs associated with traditional detailed studies, MDE can develop a new set of "live" studies, which are modified as watershed conditions change. The Wetlands and Waterways Program, which now reviews proposed changes to the floodplain submitted by outside engineers to issue Waterway Construction Permits, will be able to model any proposed changes and keep the maps current as permits are issued. Letters of Map Change (LOMCs) can become part of the review process.

If the State's flood studies can be analyzed at reasonable cost in the manner described above, and FEMA will bear the bulk of the cost associated with generating the new studies, MDE believes that it is in the State's best interest to play a major role in the map modernization effort and take over the function of maintaining the D-FIRM floodplain model. An information technology (IT) solution to house the requisite data, update it as needed, and disseminate the data to different users will be necessary. One of the major savings to the National Flood Insurance Program (NFIP) under MDE's plan is that the study data is kept current, reducing the cost of future revisions.

History of Flood Hazard Mitigation in Maryland

The State realized that it had a legitimate interest in assuring that floodplains are not unduly restricted, and that it had a right and responsibility to regulate encroachment. A program was initiated in 1933 by the enactment of the Waterway Construction Law requiring that a person must obtain a permit if they propose any change to the course, current, or cross section of any nontidal stream or body of water in the State. Originally, the requirement applied to the 50-year floodplain, but the 100-year floodplain standard was adopted in 1976 to be consistent with the federal requirements. The primary objective of the permit program is to assure the public safety and avoid damage when projects are proposed in the floodplain. In addition to permitting, the law established a program to control the waters of the State and cooperate with federal agencies in matters pertaining to flood control. Included was providing assistance to local governments in drafting land use regulations pertaining to areas subject to flooding and conducting floodplain

studies to support this effort. The permit program was administered by the Water Resources Administration in the Department of Natural Resources (DNR) for many years. In 1992, the floodplain permit review was combined with the Nontidal Wetlands permit review in the Nontidal Wetlands and Waterways Division. In 1995, these functions were transferred to the Maryland Department of the Environment.

Maryland passed the Flood Control and Watershed Management Act of 1976 to provide the foundation for watershed planning for flood management. Five goals were established: (1) reduction of existing flood hazards; (2) prevention of future flood hazards; (3) adequate emergency preparedness; (4) preservation of the environmental quality of watersheds; and (5) reduction of economic and social losses. The Act also stated the need for better coordination among agencies having flood hazard mitigation responsibilities. It mandated the development of a list of priority watersheds to be studied for the 100-year flood and the preparation of local flood management plans. The Act created a comprehensive flood management grant program (CFMGP) to fund watershed studies and flood control and watershed management capital projects. Since 1980, when funding began, the State's program has encumbered over \$31 million, removed over 500 homes from the floodplain, completed numerous watershed studies, and funded many other projects in cooperation with local jurisdictions.

When the Community Assistance Program - State Support Services Element (CAP-SSSE) was created in 1980 as part of the National Flood Insurance Act, FEMA delegated responsibility to implement the NFIP in the State of Maryland. Planning funds were provided in the early 1980's for developing a master plan of mitigation and public education activities. Regular funding was provided in 1985 to assist communities wishing to enter the program and adopt floodplain management ordinances. The services provided in the NFIP were taken over by the State with funding provided by FEMA. In 1990, a State Model Floodplain Management Ordinance was developed incorporating both the NFIP and State requirements, and a major effort began to have all communities adopt a new ordinance over the next two years. Currently, the State Coordinating Office, now in MDE, serves 116 communities participating in the NFIP in the State. Visits are conducted with each community every 2-3 years to assure adequate implementation and enforcement of local floodplain management ordinances. The Coordinating Office provides general technical assistance to citizens about flood insurance, building standards, flood mapping, and flood safety.

Today, the State NFIP Coordinating Office in the Wetlands and Waterways Program of the Water Management Administration (WMA) administers the Community Assistance Program (CAP) for the NFIP, manages the Comprehensive Flood Management Grant Program (CFMGP), maintains the floodplain management database, including the repetitive loss database, and assists with the map modernization effort. Since the Coordinating Office has been re-aligned with the Program that administers the State's Waterway Construction Law, the unique coordination opportunities of the past are now available to advance the goals of the business plan, including the State's approximately \$550,000 financial commitment to regulate proposed activities in the 100-year nontidal floodplain.

Current Programs and Capabilities Within MDE:

- **National Flood Insurance Program (NFIP) Community Assistance Program (CAP):** In conjunction with the NFIP, MDE through the CAP provides on-going monitoring and technical assistance to communities in regulating their floodplain areas. The goal is to insure safer communities by reducing the impact of flood damage. This is accomplished through better floodplain management planning, stringent building standards, and proper enforcement. The program supports mitigation of flood risks through education, providing data, assessing mapping needs, and coordinating with local jurisdictions.

- **Comprehensive Flood Management Grant Program (CFMGP):** This Program was created in 1976 to promote the development of local flood management plans, fund studies of watersheds, and support capital projects for flood control and watershed management. Some of the studies for existing flood maps were partially funded by this program. Currently, the program mainly provides grants to local governments after floods for acquisition of flood-damaged owner-occupied dwellings, often in conjunction with federal mitigation funding. Elevation and relocation of homes are also eligible for funding. Acquired land is converted to open space in perpetuity to support beneficial functions of floodplains. Other methods of floodproofing may be considered when acquisition/relocation or elevation is not feasible. Since it began in 1976, the CFMGP has encumbered approximately \$31 million for mitigation projects, and removed more than 500 homes from the 100-year floodplain.
- **Floodplain Management and Repetitive Loss Database:** MDE maintains a Geographic Information System (GIS) based database of useful floodplain management information. It contains orthophoto quarter quads, Q-3 floodplain lines, property parcel information, repetitive loss properties, and other data useful in floodplain management. It is used to produce maps of areas of interest to floodplain managers. For example, MDE has provided, upon request, maps to towns for planning purposes. Within the GIS database, information about each structure on the National Flood Insurance Program's repetitive loss list is stored, including the dates of losses, number of losses, loss amounts, and the 100-year base flood elevations. The types of flood problems suffered were assessed and recommendations made as to what type of mitigation is needed to reduce damage in the future. The overall goal is to create a priority list so, as grant monies become available, MDE can quickly target those structures that have been deemed most severe.
- **Wetlands and Waterways Program Waterway Construction Permit:** A State permit is required for any activity in the nontidal 100-year floodplain. Currently, seven engineers review engineering studies submitted by permit applicants for proposed changes to the floodplain and other staff review wetland impacts. A decision to issue a permit is based on a demonstration of no impact to upstream or downstream properties, as well as environmental considerations. The State permit requirement for floodplain activities does not extend into tidal waters of the State.
- **Dam Safety Program:** The Maryland Dam Safety Division issues permits for new dams and ponds, and permits for alterations to existing impoundment structures. Periodic reviews are conducted of existing dams to ensure proper maintenance. The major goals of this program are to ensure that dams are built and operated properly to protect public safety and that Emergency Action Plans exist for all high-hazard dams.
- **Enforcement:** MDE provides for the enforcement of the permit requirements to develop in the floodplain. The Enforcement Division is empowered to force removal of any obstruction in the floodplain that does not meet permit requirements.

Other State Partners In Mapping Effort:

- **Department of Natural Resources -** The Geographic Information Services (GIS) Division produces, manages and distributes some of the State's geospatial data. DNR is interested in acquiring digital elevation model (DEM) data using airborne LiDAR equipment suitable for the production of 2-foot topographic contours. The DEM is consistent with FEMA specifications for producing flood maps. DNR has acquired State funding for much of the LiDAR data collected to date. So far, LiDAR coverage is available for Worcester, Wicomico, Somerset, Dorchester, Talbot, and Queen Anne's Counties. Additional LiDAR coverage will be collected in 2004 for St. Mary's, Howard, Anne Arundel, and part of Charles Counties. All data produced is open access. The

Coastal Zone Management Division of DNR has expressed interest in assisting in the collection of LiDAR data. Other funding sources will be necessary for Statewide coverage, since the DNR's Waterway Improvement and Coastal Zone funds are limited primarily to tidal areas. The following map illustrates the location where LiDAR has been collected by DNR prior to 2004 in six eastern shore counties (green), and where DNR plans to collect LiDAR in 2004 in Howard, Anne Arundel, and St. Mary's Counties (purple).

LiDAR Data in Maryland

- **Maryland Emergency Management Agency** - The State Hazard Mitigation Office conducts studies of flooding event scenarios, and mitigation and response strategies. Discussions have been held with MEMA regarding using Homeland Security funding for LIDAR acquisition. However, specific funding has not been identified and details have not been discussed at this time.
- **Maryland State Geographic Information Committee (MSGIC)** - This Committee was formed to prevent duplication of effort and promote use of common standards in the creation of geospatial data by State agencies. Its membership has broadened, and it now provides coordination in a "vertical" sense from local to federal levels, and creates new public and private partnership opportunities for the creation and use of geospatial data. An Implementation Team strategy plan has been developed which will reduce costs and improve coordination through a cooperative effort to unite public and private organizations into a common purpose. The flood studies and geospatial data necessary to produce them will be coordinated through MSGIC. The MSGIC should be able to assist in forming partnerships to produce the needed data.
- **Maryland Department of Transportation** - The State Highway Administration (SHA) is the State's largest producer and user of flood studies. Their involvement in the process of producing and keeping flood maps current will be critical. MDE is coordinating with staff of SHA to ensure that compatible methods are used. SHA could become a strong financial and technical partner. SHA has developed a GIS model for determining hydrologic discharges across the State. The model (GIS Hydro) utilizes TR-20, regression equations, and HEC-1.
- **University of Maryland, Baltimore County** - Dr. Andrew Miller has studied urban stream networks and is now concentrating on watersheds in Baltimore City and County. Dr. Miller is using LiDAR to do hydrologic studies, and has developed stream discharge models using automated technology. MDE expects to use Dr. Miller's expertise to find the best technology to predict stream depths without the expense of extensive fieldwork.

Partnerships will play a significant role in the development of the new flood studies for the State. A number of local jurisdictions have provided funding for the acquisition of LiDAR, and have the data necessary to develop the flood studies using automated technology. MDE expects to build on these partnerships. As flood studies progress, MDE expects other State agencies to assist with funding, especially MEMA and SHA, which have a vested interest in having better and more current flood studies. In addition, MDE will explore involving other federal agencies as partners in helping with LiDAR acquisition. It is our intent to build the partnerships necessary to provide the Statewide LiDAR coverage that will be necessary for the flood study project to succeed.

The Problem:

The average age of the FEMA floodplain maps in Maryland is 18 years. Most of these studies were conducted in the late 1970's to the mid 1980's. However, in the ensuing 20-30 years, much development has occurred in a large number of the watersheds, and the rivers and streams and their floodplains have changed with time. Also, as development occurred, the peak flooding has increased downstream of the development due to increased flows from impervious surfaces. Therefore, many of the older studies may not depict current conditions nor accurately estimate risk in terms of flood heights.

Currently, almost all of the flood panels in Maryland are in a paper format. Only Harford and St. Mary's Counties have Digital Flood Insurance Rate Maps (D-FIRMS). FEMA wishes to produce D-FIRMS, by digitizing or transferring existing flood lines from the paper flood maps. Maryland questions doing this, since the digital data will not be "live", and cannot be used to model changes and keep the flood study data current. The only way to have "live" flood studies is to use accurate topographic data (as from LiDAR) and route water through the watershed using hydrologic models and calculate the water surface elevation using hydraulic models. Automated technology is now available to do much of what is needed to produce new flood studies inexpensively. All watersheds will need to be analyzed using this technology to produce the "live" studies.

FEMA floodplain maps depict flooding based on conditions existing at the time the study was done in the 1970's. State regulations require that ultimate development be modeled to ensure that a structure can accommodate new development. To make flood maps compatible with State regulatory requirements, the ultimate floodplain must be depicted on the maps along with the present updated floodplain. MDE believes that many communities will be willing to regulate the ultimate development 100-year floodplain. A number of watersheds are reaching ultimate development. However, MDE realizes that the present development, or existing conditions, should be shown for flood insurance purposes.

The Solution:

Maryland is interested in entering into a partnership with FEMA to manage or oversee countywide remapping of all flood studies in the State using automated technology to minimize costs. MDE will work to develop the most cost effective techniques while maintaining the quality of the flood data to FEMA's standards. MDE will cooperatively set standards for studies in the State, seek additional sources of funding for LiDAR acquisition, manage the studies, maintain the currency of the studies, and seek solutions to house the data and disseminate it to users. The newly generated flood data will allow the State to model changes as permits are issued which will keep the studies current.

MDE is interested in forming partnerships to fund LiDAR acquisition prior to Map Modernization in each county that does not have adequate topography to support the new mapping standards. DNR has taken the lead in gathering LiDAR data, in coordination with MDE. DNR has acquired 2-foot contour data meeting Map Modernization Standards for the middle and lower Eastern Shore, which will be essential for accurate mapping of the coastal flood zones. In addition, the improved topography will allow the use of automated hydraulic techniques to improve riverine floodplain analysis.

MDE is researching the feasibility of using this technology to do automated studies on many of the approximate flood zones that currently have no flood elevations. A number of communities have more than 50% of their stream miles mapped as approximate or unstudied flood zones. In localities where accurate elevation data (Topo) exists, all approximate A-zones will be studied by limited detailed methods of sufficient accuracy to produce and map base flood elevations to meet FEMA's and the State's needs.

It is in the State's interest to maintain the flood studies and update them as permits are issued. In the process, the State could issue LOMCs for FEMA, provided that the State would be reimbursed for its cost. The Wetlands and Waterways Program currently reviews engineering data submitted by applicants for proposed activities in the nontidal floodplain. MDE engineers could take a proposed change and model it into our inventory of flood studies. MDE could issue the permit faster, update the flood study, and issue a LOMC in a one step process. It should allow the State to make better permit decisions because all changes would be in the system as they are made, and extensive modeling could be done with the existing staff by changing from a review function to a modeling function. Although MDE does not regulate activities in the tidal floodplain, the Department will consider, as part of this business plan, taking over FEMA's responsibilities relating to the issuance of LOMC's in these areas.

This effort would generate an enormous amount of data. A suitable repository would have to be identified - along with a way to disseminate the data. MDE would be willing to seek a cooperative solution with FEMA and other partners. Other partners, such as SHA, would assist in keeping the study data current as it models its changes into the database. Other State agencies, such as MEMA, could access the data and use it to model different flooding scenarios to determine response options. Local jurisdictions would have a role in maintaining the database as they issue permits. They will be able to use the data to develop better mitigation plans by modeling different flooding scenarios. MDE feels that as more data is produced and its usefulness demonstrated, interest in continuing the effort will lead to more partnerships and leverage of costs. The other important aspect of Map Modernization to the citizens of Maryland will be better estimation of the risk of flooding and more accurate determination of who needs flood insurance from the NFIP.

Therefore, the State of Maryland is interested in working cooperatively with FEMA to determine the feasibility of taking over the mapping program. To allow transition into the new program, MDE will request funding under CAP-MAP for the necessary software and hardware to allow management of the data, a Coordinating Engineer (to assemble the data, develop procedures to analyze it, and train our staff engineers in the system), a GIS-map production position (to assemble, analyze, and assist generally in the development of the study data and maps), and partial funding for a combined CAP/CAP-MAP position (to assist generally with CAP and CAP-MAP activities, as needed). MDE envisions that funding will be needed for at least the five years of transition. The State will explore with FEMA how the functions can be maintained in future years, most likely through the use of LOMC fees and/or a CTP agreement.

Maryland will continue to provide the necessary support through the Community Assistance Program (CAP) to communities in planning for revisions to the ordinances triggered by adoption of a new study, public outreach, training, and general support to communities through the adoption of the new maps. MDE plans to increase the information on its web site to support these additional activities and to increase training to support communities' use of the GIS flood study data. In order to take on this workload, additional financial support for CAP will be necessary on a continuing basis to support another position.

Strategy and Methodology:

More than half of the counties in Maryland have been ranked by FEMA as a "decile" 1 or 2. This decile ranking defines these jurisdictions as having a high priority in the map modernization program due to the large number of insurance policies and a large population. The following map outlines the decile 1 and 2 counties in Maryland (gold).

Maryland Decile 1 or 2

Under the Cooperating Technical Partnership (CTP) agreement, MDE will receive funding from FEMA to conduct flood studies and develop preliminary D-FIRM maps. MDE intends to use the performance based contracting process to initially select a Contractor. Under this process, the amount of the initial award will be known. Contractors will compete by detailing their innovative approach to address the quality and quantity of studies they will produce for the award amount. Each bid will be scored on the approach that both shares the vision and shows the expertise to develop the flood studies that will benefit both FEMA and the State. Bidders will be evaluated on the use of innovative technology to complete the goals while reducing cost. The understanding will be that if the selected Contractor performs well, the contract will be extended with additional awards.

In general, the Contractor will prepare a preliminary countywide D-FIRM product delineating all streams in the County with a flood depth of one foot or more and provide base flood elevations, using the best available technology and new topography from LiDAR data or a suitable digital elevation model (DEM). Approximate floodplains will be provided with base flood elevations based on new topography, rainfall routing through GIS based hydrology, and hydraulic models (H & H). The limited detailed methods will include enough measurements on waterway obstructions to flow to allow for the mapping of base flood elevations. Existing detailed studies will be compared to the new data generated by automated H & H, and may be digitized and used to the extent that they are consistent with the new studies. Existing studies known to have errors will be corrected. Where discrepancies exist, more detailed study data must be generated to resolve the differences. The decision to require that floodways be mapped will be determined at the scoping meeting and will be based on each county's regulation of floodplains (some counties regulate floodplains as floodways). Both current (insurance requirement) and ultimate development floodplains (State regulatory requirement) will be mapped. Planimetric features must correlate reasonably to the best available aerial photos or other suitable imagery. The data must reasonably reflect the flood hazard and meet all pertinent local, State, and federal technical standards. The final product must be submitted in a timely manner, as outlined in the proposal.

A scoping meeting with each county will help determine where more accurate data is needed and where approximate A-zones will be upgraded. The Contractor must develop the hydrologic and hydraulic analyses based on the best available automated technology, including approximate A-zones and detailed study areas, using new topography, and determine the amount of fieldwork necessary to support the accuracy of the study and provide verification for each county. Enough field data will be provided to establish BFEs accurately enough to be mapped on the D-FIRM. MDE will work with each county and the Contractor to get the best base mapping information to develop the preliminary D-FIRM panels. Provided that coastal studies are not to be changed, coastal flood elevations will be overlain on new topography. The Contractor will be responsible for developing the D-FIRM map product, including the paper panels to the appropriate scale, and the accuracy of the study data.

MDE will assist the Contractor in assembling as much data to support the flood study as possible, including base maps, LiDAR, or other suitable topographical data, data on bridges and culverts and other data layers available to support flood mapping. MDE and the Contractor will coordinate with the counties to be studied to access and make effective use of local data layers and studies. Measurements of obstructions (bridges, culverts, etc.) and a limited number of cross sections will be obtained to enhance the studies. The sequence of completing studies will be based on FEMA's criteria and the availability of suitable topography to support the study. If topography is not adequate, LiDAR must be completed first. A funding source for LiDAR acquisition or topo must be identified in these cases.

The collection of the LiDAR data is seasonally dependent (collected during leaf-off and low stage winter season, but without snow), and the analyzed data currently is taking about 9 months to be delivered. The current data is being delivered with neither break-lines nor contours. The research conducted by UMBC and the input of our Contractor will refine what is essential from the

LiDAR data to get the most from the flood studies, and may help further define the deliverables from the LiDAR contractor.

MDE will handle the contracting and negotiations to select a Contractor to do the study. Once selected, the Contractor will assist in making future modifications to this plan. The Contractor will be responsible for delivering the initial studies negotiated within 12 months of the initiation of the contract. The Contractor will be responsible for supplying the State with the necessary software and hardware to allow the review and use of the data. FEMA, the State, and the Contractor will determine a suitable method for validating the study data delivered. Success will be measured by timely completion of a D-FIRM product meeting both FEMA's and the State's needs. MDE will seek to continue its relationship with the Contractor on an ongoing basis to complete the State's countywide D-FIRMs. However, this program will be unique, will require adjustment as problems are encountered, and will require close coordination between FEMA, the State, and the Contractor.

The FEMA funding required to make the program successful would have to cover the cost of a minimum of two thirds of the State's total D-FIRMs. There are a total of 23 counties. For the State to have an interest in pursuing the required level of involvement, at least 16 countywide D-FIRMs would need to be funded by FEMA. MDE requests that FEMA consider funding both the mapping project and the data need to complete all of the counties.

As funding for preliminary mapping is made available, MDE will insure that all "live" studies are kept up to date. This will be accomplished through the Wetlands and Waterways Program in MDE, where 7 engineers currently review engineering studies for proposed activities in the nontidal floodplain. With the "live" studies, the engineers will be able to model proposed changes, and make changes to the studies to keep them updated. As part of the review process, LOMCs could be issued, as well. As previously noted, MDE will consider taking over the responsibility of issuing LOMC's in the tidal floodplain. LOMCs processing fees could support the function of keeping flood data current. MDE will coordinate with the State Highway Administration and local jurisdictions to insure that any significant changes to the "live " studies will be processed through the Wetlands and Waterways Program. MDE feels that it will be to FEMA's and the State's advantage to maintain current flood studies which will no longer require updating.

Once the D-FIRM is available for each county, the State NFIP Coordinating Office is committed to helping the county through the adoption process. We will review the ordinance to assure that it is current and in compliance with the new map, and will attend adoption meetings and public meetings to assist the county through the adoption process. If any problems should develop, MDE will seek to solve them with the county. A public relations campaign to inform the public of the impact of map changes, and flood insurance workshops could be coordinated through the State Coordinating Office. Once preliminary D-FIRMs have been developed, MDE will provide the digital product to FEMA for final processing including community review and adoption.

MDE has shown its commitment to Map Modernization by updating the MINUS database for Maryland, listing communities that have floodplain, but are not identified as flood prone, and providing a previous plan. In that plan, MDE had stated that Maryland does not believe that undertaking Map Modernization without better topography would be prudent. MDE had submitted a plan to acquire Statewide LiDAR prior to undertaking studies, and remains committed to that concept. MDE realizes that other sources of funding must be found to meet this objective, and has been moving in that direction. One of the major match benefits Maryland brings to the effort is a viable program of cost sharing to provide LiDAR (or recent topography) to support Map Modernization. By 2004, MDE expects to have topography that exceeds Map Modernization standards in approximately half of the counties and Baltimore City, using State and local funds. This effort will continue, but some funding from FEMA will be required to complete the State, unless MEMA is able to assist through Homeland Security funding.

In order to increase involvement of CAP in Map Modernization, the State Coordinating Office has requested additional funding through CAP to fund another position beginning in FY 2004. Initially, this person will assist in both CAP and with the flood study program. As more D-FIRMS become available for adoption, the position will shift more to assisting the local jurisdictions through the adoption process, reviewing ordinances, and conducting CAVs. The addition of another staff position in CAP funded by FEMA will be essential to providing our communities the necessary support through the adoption process, as well as in the development of the D-FIRMS.

MDE will work cooperatively with the University of Maryland, the Contractor, and other State partners to develop an Information Technology (IT) solution to house and disseminate the information collected during this effort. The concept is that the data will be housed on a central server, but be available to all users through the internet as needed. Partners with the responsibility to keep the data current will have access to the system to make changes; all others will have read only access. The system should be state-of-the-art and scalable, so that additions can be made without scrapping the system and starting over. Included will be a plan for funding the IT system, including the necessary partners to provide the funding. MDE estimates that \$1.0 - \$2.0 million will be required to develop such a system in the State. FEMA will be asked to be a permanent partner in the funding. FEMA's National Service Provider (NSP) can provide a portion of this solution by housing the final maps and distributing the data. In order to maintain and review live studies, MDE estimates that an initial \$1.0 million will be necessary to upgrade our current IT system. MDE envisions that direct access to GIS data, engineering models, and LiDAR data is the best solution is facilitated by housing the data at MDE or another State agency. A full IT solution will require an additional \$1.0 million for a total of \$2.0 million over the 5 year period to house the data in a State agency.

Costs:

Although it is difficult to estimate the cost of the 5-year Map Modernization plan until a Contractor is selected through the bidding process, MDE estimates the flood study and D-FIRM production costs at an average of approximately \$500,000 per county. Harford County and St. Mary's County currently have D-FIRMS. However, Harford and St. Mary's Counties will need to be upgraded to include a D-FIRM database and the State's "live" study capability. FEMA is presently working on a Frederick County D-FIRM and has Cooperative Technical Partnerships with Prince George's, Montgomery, and Baltimore Counties. Montgomery and Baltimore Counties need "live" D-FIRMS, but Prince George's will have one. This places the study and the preliminary D-FIRM production cost at approximately \$10.0 million to complete the State (excluding St. Mary's, Frederick, and Prince George's Counties). Some counties, such as the Eastern Shore counties, will cost less, while others may cost more, assuming that coastal studies will not have to be redone. The \$10 million is being requested under the CTP and will go toward hiring a contractor to conduct the flood studies and produce the D-FIRM panels.

LiDAR costs have been averaging approximately \$250,000 per county with breaklines for a total of approximately \$4.0 million for the remaining 16 counties without LiDAR. The State anticipates that the bulk of the cost for LiDAR will not be borne by FEMA, and the portion paid by other partners will be used as MDE's match for Map Modernization. For example, if the entire cost of LiDAR coverage is borne by partners other than FEMA, the match could be as high as 40%, based on MDE's cost estimates. The State will continue to seek partnerships to share the cost of LiDAR acquisition and brakelines, but expects FEMA to pick up some LiDAR costs, especially if other funding does not become available. FEMA's current standard is to pay up to 20% of the project cost for LiDAR acquisition, creditable on a Statewide basis. The LiDAR data will not only result in a better product, but in 30-40% savings in the flood study phase of the project. MDE anticipates that further cost savings will be achieved by using automated technology to reduce fieldwork in the studies undertaken.

MDE has contracted with University of Maryland Baltimore County (UMBC) to assess the use of LiDAR for developing stream cross-sections suitable for floodplain analysis. Evolving technology and the fact that the project is likely to take longer than 5 years may further lower costs. The \$500,000 preliminary D-FIRM mapping estimate per county may turn out to be an over-estimate for the desired results.

To increase State capability, MDE requests that FEMA fund 2 (1/2) positions under CAP-MAP: (1) a five-year position as Coordinator of Flood Data (at least \$80,000 per year) - an engineering/data management position responsible for scoping and planning, seeking additional leverage of funding and partnerships, finding ways to manage and use the data, promoting use of the data among State and local partners, ensuring that standards for compatibility of data exchange are in place, providing training in its use, and seeking the IT solution; (2) a five year position as GIS-GPS-Flood Data Technician (at \$55,000 per year) - to assemble, develop, and truth data in cooperation with the Contractor and counties, assist in scoping and planning, and assist in training; and (3) a CAP - CAP-MAP position (\$25,000 from CAP-MAP and \$30,000 from CAP) to assist both programs, as needed. After five years (or the completion of the mapping process), the State and FEMA will decide if and how to continue to fund the positions, depending on the need at the time. Other staff positions to create and maintain the data will be borne by the State. The State's further involvement will depend on the completion of "live" D-FIRMS for at least 16 counties funded by FEMA. If the State becomes involved in issuing LOMCs, MDE expects to collect the review fees, or be reimbursed under a CTP agreement to cover our costs. One of the major savings to the NFIP that must be considered under the State's plan is that the study data will be kept current, eliminating the cost of future revisions.

The initial IT solution costs associated with the State's business plan are estimated to be \$1 million. MDE will determine, with the input of FEMA, their NSP, our Contractor, our partners, and University of Maryland, the best and most cost effective solution. If an in-State solution is preferred, MDE will seek the best solution and expect the partners to share in the cost of maintaining the system.

Timeline - Schedule of Completion of D-FIRMS:

MDE is developing a performance-based contract allowing the selected Contractor to continue to produce D-FIRMS under the contract as long as performance remains acceptable. The Contractor will be selected on the basis of how well the latest technology will be utilized to develop a study and D-FIRM that meets FEMA's and the State's requirements at the lowest cost. MDE expects to have a Contractor selected by the fall of 2004. The Contractor would have a year to complete the work on the initial contract. The procurement process is expected to save time overall by selecting one Contractor for the duration, and awarding additional work without further selection. MDE anticipates that the preliminary D-FIRM final product will be delivered within approximately one year of the award.

The State is proposing the following schedule for the initiation of flood studies and awards from the **CTP agreement** (which requires no match):

YEAR	D-FIRMS	COST (\$)	COUNTIES
04	2	1,000,000	Anne Arundel; Howard
05	4	1,750,000 *	Baltimore County, Carroll *, Montgomery
06	4	2,500,000 *	Charles , Cecil *, Washington *, Worcester Co.
07	4	2,250,000 *	Calvert *, Queen Anne's, Talbot, Wicomico Co.
08	4	2,500,000	Allegany *, Dorchester, Kent *, Somerset
09	2+	1,500,000 *	Caroline *, Garrett *, (Harford), (Frederick)

* This figure includes a cost of \$1.75 million for LiDAR acquisition for the counties in need.

The above table assumes that the St. Mary's and Prince George's D-FIRMs will be acceptable, but that Harford County's D-FIRM needs to be updated to include the D-FIRM database and that the product currently being prepared in Frederick County will need some improvements. The total cost is estimated to be approximately \$11.5 million for the production of the studies and D-FIRMs. As indicated in the footnote, these figures include an extra \$250,000/county for those counties in need of LiDAR acquisition. The counties listed by year will be subject to change, based on the availability of sufficient topographic data to support the restudy effort. Baltimore City is currently seeking an independent watershed assessment and floodplain mapping contractor. It is likely that their contract is above the scope of Maryland's CTP plan and may not be compatible with the system developed in Maryland. We support Baltimore City's plan for updated floodplain maps and feel that the two projects are more likely to succeed independently with the final data exchanged.

Additional support from **CAP-MAP** (which requires an in-kind match of 25%) to increase State capability is anticipated as follows: Table includes \$160,000 for CAP-MAP positions defined earlier.

YEAR	AMOUNT **	PURPOSE
04	\$200,000	Acquire hardware and software to develop 4 workstations, upgrade servers, hiring CAP-MAP positions, training
05	\$300,000	Support 2 1/2 positions, develop training materials, add 2 additional workstations equipped with contractor's solution, software licenses
06	\$350,000	Support 2 1/2 positions, raises, add and equip 2 workstations workstations, software licenses, training
07	\$350,000	Support 2 1/2 positions, software licenses, add 2 more workstations
08	\$400,000	Support 2 1/2 positions, raises, train engineers, software licenses, upgrade workstations compatible with IT solution
09	\$300,000	Support 2 1/2 positions, software licenses, training

** This table's total includes the initial \$1.0 million (spread out over 6 years) IT solution necessary for MDE to conduct live studies, and maintain the data in the system.

If the mapping program extends beyond the anticipated 5 years because of insufficient funding, MDE expects the CAP-MAP funding to extend to the end of the project period. This will be reflected in future plan updates.

As mentioned earlier, a final (full) IT solution will need to be addressed, and the State anticipates that a total of \$2.0 million should be allocated if an in-State solution is desired, as well continuing support from the partners. A timetable is not supplied; MDE is unsure what form the solution will take at this time. This will be determined at a later date, after discussions with FEMA, their NSP, and our Contractor, and will be contained in an update to the plan.