

# Project Memorandum #5: Beneficiaries Analysis – Overview of Approach and Methods

May 19, 2016

## Overview

This memorandum is the fourth in a series of project memoranda that describes the approach and analysis to be used in the Delta Flood Risk Management Assessment District Feasibility Study (DFRMADFS). More specifically, this memorandum identifies the main categories of beneficiaries of levee investment and flood protection actions in the Delta, and outlines the methods and data to be used to estimate the economic value of the benefits received. Subsequent memoranda describe how we will use our benefit estimates as a basis for determining flood protection needs, and for allocating those costs to the beneficiaries. Altogether, these memoranda lay out our approach to analyzing the feasibility of different financial mechanisms and identifying those that are most promising for financing future improvements to Delta levees.

Unlike previous studies of the benefits of Delta levees, this study explicitly considers a wide range of potential benefits and beneficiaries, including public and indirect benefits such as transportation networks, water supply conveyance, and ecosystem services. We have employed this comprehensive approach in order to fully explore the effects of applying the ‘beneficiary-pays’ principle to financing Delta levee improvements. By casting a wide net for beneficiaries, we expect to maximize the number of potential beneficiary/financial mechanism combinations, which we will refine by screening the financial mechanisms for legal, political, economic, and institutional feasibility in the four archetypes that have been developed for this study.

This study focuses on identifying and characterizing potential *beneficiaries* of improved flood protection from a levee investment program or individual projects, as opposed to just an accounting of the potential *benefits*. Thus, the key task for this study is to identify and evaluate the beneficiaries to which benefits accrue. It describes how beneficiaries are linked to purposes and how benefits are estimated by analyzing the economics associated with those purposes.

## Summary of Potential Beneficiaries

We define beneficiaries as entities that generally own, use or control assets used for specific purposes (i.e., activities) that benefit from Delta flood control measures. For example, growers (beneficiaries) avoid flood damages (benefits) to their fields where they grow crops (purposes or activities) through protection provided by levees. We can attach benefits to purposes or activities through different

economic analytic methods depending on the types of purposes. Some of these purposes are part of individual or private transactions or activities for which economic value can be readily estimated (e.g., buying and selling of agricultural products); other purposes create more broad public benefits for which a price is not easily determined (e.g., public enjoyment of habitat and all of the various concurrent benefits from enjoying species existence and recreation).

We use ten broad categories of beneficiaries:

- Community Beneficiaries;
- Agricultural Land Owners, Producers, and Water Users;
- Municipal Water Providers and End Users;
- Infrastructure Owners and End Users;
- Upstream Dischargers;
- Instream Water Diverters;
- General Public Beneficiaries;
- State and Local Governments and Special Districts;
- State Economy; and
- Other Indirect Beneficiaries

We also describe sub-categories of beneficiaries within in terms of their geographic location in proximity to the Delta and the types of benefits received. As described more thoroughly below, proximity to the Delta is important not only to better understand the relationship between flood protection and the benefits received, but also to determine the feasibility of using specific financing mechanisms. Based on a review of the relevant literature, we identify the level of analysis (quantitative or qualitative) that we believe is appropriate and feasible for each category of beneficiary.

### The Many Types of Beneficiaries and Benefits

Linking benefits, and therefore beneficiaries, to flood protection activities involves tracing economic relationships that may not be immediately obvious. As described in DWR's *Handbook for Assessing Value of State Flood Management Investments*,<sup>1</sup> categories of benefits of flood risk management include inundation-reduction benefits, intensification benefits, and location benefits. Typically, a benefit analysis for a flood risk management program focuses on evaluating the inundation-reduction benefits, which include the benefits associated with reducing damages (property, natural resources, or human health) associated with existing or future land uses. Reduced damages are most often reported in annualized terms (expected annual damages). Intensification benefits measure the potential value associated with improving the suitability of a particular land use for development (without changing the land use), whereas locational benefits can occur if flood protection measures result in the potential changing

---

<sup>1</sup> California Department of Water Resources. *Handbook for Assessing Value of State Flood Management Investments*. 2014.

(presumably increasing the value) of a particular land use. Each of these benefits may then induce other benefits among related beneficiaries, such as avoiding a reduction in equipment purchases from a local dealer by a grower on a Delta island.

Flood protection benefits to beneficiaries can be differentiated and categorized in many ways, depending on program purpose or the types of actions subject to a benefits analysis. We use these categories as a means to capture all of the potential beneficiaries of investments in Delta levees and their relationships. In this study, we adopt DWR's<sup>2</sup> typology to characterize important categories of benefits:

- **Primary and secondary benefits** - *Primary benefits* are the increased value of goods and services to beneficiaries immediately affected by a flood control project or program. Benefit categories include flood risk management, water supply, water quality, and recreation. *Secondary benefits* of constructing flood control facilities are the values of goods and services that subsequently accrue to other parties (beneficiaries) that interact with the primary beneficiaries. Secondary benefits can include changes in economic activity (e.g., regional or state-level jobs and income) and fiscal effects, such as taxes or other revenues, that are important to local stakeholders.<sup>3</sup> Secondary beneficiaries are identified in Table 1 below; otherwise beneficiaries are considered to be primary.
- As a corollary, benefits can be separated into **direct, extended and peripheral**.<sup>4</sup> *Direct* are primary benefits realized in the immediate locality that is being protected against flooding, e.g., agricultural land next to a levee. *Extended* are neighboring beneficiaries connected in some networked fashion but directly impacted by a flood event. Highways and pipelines are examples where the impacts are felt elsewhere directly. *Peripheral* are akin to secondary benefits.
- **Private and public benefits** – Characteristics of *public goods* (and services) are non-excludability (i.e., it is not possible to exclude non-payers from consuming the good), and non-rivalry in consumption (i.e., consumption of a good by one consumer does not diminish the benefit to other consumers). If a 'good' does not have both of these characteristics, it is considered a *private good*. Goods can fall across the spectrum of this definition; for example, fishing in the Delta can diminish the availability of the fish to others, but it can be difficult to restrict access to the fishery..
- **Tangible and intangible benefits** – *Tangible benefits* can be quantified in monetary or other quantifiable units (such as loss of Delta smelt habitat), whereas *intangible benefits* cannot be directly expressed in quantifiable terms or metrics (for example, trauma or reduced peace of mind resulting from a flood event). Table 2 below identifies the range of quantified data available to measure tangible benefits.

---

<sup>2</sup> California Department of Water Resources. Economic Analysis Guidebook. January 2008.

<sup>3</sup> This typology follows regional economic input-output analysis. In that framework, *direct* effects arise from immediate economic activity, *indirect* effects derive from transactions with directly-affected parties, and *induced* effects are more broad, general economy-wide impacts from changes in direct and indirect activity.

<sup>4</sup> We emphasize that two of these terms which were included in the requested scope of work for this study, "extended" and "peripheral" benefits, do not have applicable definitions in the flood protection or economic impacts literature that we have reviewed. Consequently, we have defined these terms specifically for use in this study.

## Previous Studies of Delta Levee Benefits

The economic, political, and legal feasibility of assessment districts and other approaches to finance flood protection measures in the Delta have not, to date, been thoroughly examined. For this study, we reviewed more than 20 studies on Delta flood protection in order to develop a thorough understanding of the range of issues and level of analytical rigor undertaken in each study.<sup>5</sup> (A complete list of these studies is included in Appendix D.)

Although these studies collectively provide a solid foundation for a benefits analysis of Delta flood protection, none of them considered the broad range of beneficiaries that are the subject of this study. Most of the studies consider the benefits of flood protection rather than conducting a comprehensive assessment of beneficiaries, allocating cost responsibility and evaluating the feasibility of financial mechanisms.<sup>6</sup>

### Important Distinctions from the DLIS Approach

Our approach to Delta levee beneficiaries is more comprehensive than that being used in the Delta Stewardship Council's Delta Levee Investment Strategy (DLIS). Our beneficiary categories, identified in Table 1 below, go beyond those listed in the DLIS Technical Memorandum 2.1 because we more broadly interpret the linkages of benefits derived from flood protection investments to include indirect, secondary, and extended beneficiaries. We also include direct beneficiaries regardless of whether their activities are included in the stated purpose of the levee investments. For example, recreational users clearly benefit from the marinas built on levees that protect agricultural lands. The DLIS omitted these recreational benefits because the levees would be built regardless of whether the marinas were built. In the DLIS analysis, such recreational users are able to “free ride” on the levee investments—however, the “beneficiaries-pay” approach will evaluate financial mechanisms that might be able to capture such benefits.

Other differences include:

- The DLIS considers only local, direct benefits of reductions in flood risk, whereas our study includes indirect and secondary economic benefits (at both the local and state level) of flood protection in the Delta, i.e., how the state and local economies are impacted by flood events;

---

<sup>5</sup> The following studies are the most relevant to identifying appropriate categories of beneficiaries for this study:

- Delta Risk Management Strategy (Department of Water Resources 2008)
- Economic Sustainability Plan for the Sacramento-San Joaquin Delta (Delta Protection Commission 2011)
- 2012 Central Valley Flood Protection Plan (Department of Water Resources 2012)
- Asset Exposure Information to Support Delta Levee Improvement Prioritization (David Ford Consulting 2013)
- The Delta Plan (Delta Stewardship Council 2013)
- Handbook for Assessing Value of State Flood Management Investments (Department of Water Resources 2014)
- State Investments in Delta Levees (Delta Stewardship Council 2015)
- Basin-Wide Feasibility Studies – Sacramento River Basin (Department of Water Resources 2016)

<sup>6</sup> Appendix C lists the categories of beneficiaries and assets identified in three of the eight studies listed in the previous footnote, and compares them to this study's proposed categories of beneficiaries. Although not intended to be a comprehensive evaluation of the similarities and differences in the metrics used to evaluate beneficiaries, Appendix C highlights the key differences in the breadth and characterization of benefits associated with different recent studies of Delta levees.

- This study further refines “benefits to community and public beneficiaries” identified in the DLIS. For example, our beneficiary categories explicitly acknowledge public entities engaged in emergency response.
- This study includes sub-categories of general public benefits, such as the protection and restoration of Delta ecosystem resources that are affected by both the existence of levees and impacted by flood events.

This study will also take an analytical step forward by evaluating each beneficiary class’ relative economic benefit, and consider the ability of beneficiaries to pay and their incentives to contribute toward a levee investment program for the Delta.

### Key Terms and Definitions

Generally, we have strived to develop categories of beneficiaries and to use terms and definitions consistent with the principles and approaches used in recent flood protection studies conducted for the California Department of Water Resources.<sup>7</sup>

For certain categories of beneficiaries considered in this study, especially some of the sub-categories comprising the General Public Beneficiaries (see Table 1), we have determined that the data for estimating the potential monetary benefits of Delta flood protection are too limited and/or insufficient for developing reasonably accurate estimates of benefits from Delta flood management. In those cases, we propose to at least qualitatively describe the benefits from a broad levee improvement program. Benefit estimates will be developed consistent with the cost allocation methods to be applied for assigning costs to beneficiaries; the cost allocation methods to be used will be described in a separate project memorandum.

Attachment A (Table A-1) identifies all of the relevant terms and definitions used for this beneficiary analysis. We define two terms specifically for this study:

- “Delta” in this memorandum means the Legal Delta, unless designated otherwise.
- “Public” is intended to have a broad general meaning that benefits (or costs) cannot be easily assigned to specific individuals or entities. Importantly, our use of the term does *not* refer to publicly-owned enterprises such as municipal water agencies or utility districts—those are considered “private” entities.

### Geographic Context and Risk Considerations

The value of benefits of flood protection from Delta levee investments is affected by the geographic location of the beneficiary. Consequently, this analysis groups beneficiaries by region because the benefits received vary with proximity to the Delta, as does the monetary value of these benefits. For example, the indirect benefits received from Delta levees by upstream beneficiaries such as the

---

<sup>7</sup> We use the DLIS Technical Memo 2.1 as the starting point for constructing categories of beneficiaries, as directed in our scope of work. Then, to better meet the economic valuation needs of our study, we have expanded the categories identified in the DLIS Technical Memorandum 2.1. In the original contractual scope, estimates of expected annual damages in the Delta from flooding events were to be developed in the DLIS. The project schedule for the DLIS study, however, has been extended so this project is moving forward with a different method of estimating those risks. That method is described in a separate memorandum

Sacramento Regional Wastewater Treatment Agency or Sacramento Area Flood Control Agency depend on these agencies' ability to discharge treated wastewater or stormwater into Delta waters. The value of a fully functioning Delta levee system to these beneficiaries depends on the costs of alternative disposal options and methods of reducing river discharges. These indirect benefits to upstream beneficiaries fundamentally differ from the more direct flood protection benefits received by agricultural operations and landowners in the Delta.

To address these important geographic distinctions, our study will use geographic regions to develop appropriate monetary (and non-monetary) values for potentially affected beneficiaries, but also for assessing the feasibility of different funding mechanisms for different types of beneficiaries. We also note that Delta flood protection provides benefits to state and national beneficiaries; however, quantifying the value to potential beneficiaries outside of the state is not included in the scope of this study.

This study will group beneficiaries according to the following regions (the group assignments are included in Table 1):

- in-Delta, as defined by the legal boundaries of the Delta (ID);
- other areas within the Bay-Delta region but outside of the legal Delta (OBD);
- upstream of the (legal) Delta (UD); and
- downstream of the Delta (DD).

These geographic distinctions correlate to some degree with the separations of benefits and beneficiaries by primary/secondary and direct/extended/peripheral. We discuss these relationships in more detail in the background memoranda prepared for this study that will be included in the appendices. Beneficiaries in the Delta are more likely to receive direct and primary benefits, while those outside of the Delta are more likely to be peripheral and secondary. The category of benefits also is likely to vary. For example, a beneficiary located upstream is more likely a stormwater discharger while one downstream is probably a water contractor.

This study uses the same approach to evaluating risk as used in the DLIS—that understanding the risks to the Delta levee system requires understanding the hazards to (and vulnerabilities of) Delta levees and their level of performance in protecting assets from flooding. Simply stated, risk equates to the exposed economic value of assets and resources multiplied by the exposure to the hazard of flood control failure. For example, if a building is valued at \$1 million and flood damage would reduce the value by 50%, the exposed economic value is \$500,000. If the probability of a flood damaging event is one in a hundred in a given year, or 1%, then the flood risk is \$5,000 at the current level of protection.

## CATEGORIES OF BENEFICIARIES

Table 1 presents our initial summary of all entities, whether private or public, that receive “benefits or services (i.e., asset protection, protection from water supply disruption, ecosystem enhancements) from the existing Delta levee system, or that would receive benefits or services from future investments in

the Delta levee system.”<sup>8</sup> We intend this list of beneficiaries to be comprehensive. The table includes the primary regional assignment for each category of beneficiary.

Table 1 also identifies the primary types of benefits that accrue to each category of beneficiaries. As presented in Appendix A, economic benefits are defined as a measure of an entity’s willingness to pay for flood protection, or conversely, their willingness to pay to avoid the impacts of flooding in the Delta. The types of benefits include, but are not limited to, avoidance or reduction in direct damage to in-Delta assets from flood events, avoided service interruptions associated with resources that move through the Delta, secondary economic impacts, and non-market benefits associated with protection of ecosystem resources.<sup>9</sup> Conceptually, measures of benefits are commensurate with the economic and social value (as typically measured by willingness to pay) of the production of goods and services, or of the assets and resources at risk to Delta flooding. Benefits can be measured in terms of the value added to a beneficiary (entity or person), or in terms of the monetary value of costs or damages avoided by implementing actions to reduce flood risk.

**Table 1. Beneficiaries of Flood Protection in the Sacramento/San Joaquin River Delta**

Category of Beneficiary/Entity	Type of Benefit(s)	Primary Regions*
<b>Community Beneficiaries</b>		
Delta Residents	Avoid/reduce potential for loss of life	ID
Delta Commercial and Residential Property Owners	Avoid/reduce potential for property damage	ID
Delta Public Facilities	Avoid/reduce potential for property damage	ID
Delta Schools	Avoid/reduce potential for property damage	ID
Local economy	Avoid/reduce disruptions on local economic activity. These are secondary beneficiaries.	ID
<b>Agricultural Land Owners, Producers and Water Users</b>		
In-Delta Agricultural Operators	Avoid/reduce potential loss of revenue; avoid/reduce potential loss of property value	ID
South of Delta and North Bay Agricultural Water Users	Avoid/reduce potential for water supply disruption	OBD, DD
<b>Municipal Water Providers and End Users</b>		
In-Delta Municipal Water Users	Avoid/reduce potential for water supply disruption	ID
South of Delta Municipal Water Users	Avoid/reduce potential for water supply disruption	DD
<b>Infrastructure Owners and End Users</b>		
EBMUD	Avoid/reduce potential for damage to Mokelumne Aqueduct; avoid/reduce potential for water supply disruption	ID, OBD
Oil and Gas Companies	Avoid/reduce potential for damage to in-Delta property; avoid/reduce potential for supply interruptions to Bay	ID, OBD

<sup>8</sup> Delta Stewardship Council. *Delta Levee Investment Strategy: Technical Memorandum 2.1: Baseline Information on Islands and Tracts, Assets, Hazards, and Beneficiaries*. 2015.

<sup>9</sup> The beneficiaries listed in the table experience direct and primary impacts unless noted otherwise.

## Delta Flood Risk Management Assessment District Feasibility Study

Category of Beneficiary/Entity	Type of Benefit(s)	Primary Regions*
	Area and Northern California	
Power Plant Owners	Avoid/reduce potential damage to in-Delta property; avoid/reduce potential for supply interruptions to the electricity market	ID
Electricity Infrastructure Owners	Avoid/reduce potential for damage to in-Delta property; avoid/reduce potential for supply interruptions to the electricity market	ID, OBD
Telecommunications Companies	Avoid/reduce potential for damage to in-Delta property; avoid/reduce potential for service interruptions to local users	ID, OBD
Railroad companies	Avoid/reduce potential for damage to in-Delta property; avoid/reduce potential for freight interruptions to agricultural markets and Ports of Stockton and West Sacramento; avoid/reduce potential for service interruptions in passenger rail lines	ID, OBD
Caltrans and State Highway Users	Avoid/reduce potential for damage to in-Delta property; avoid/reduce potential for disruptions to truck freight operations	ID, OBD
Ports of Stockton and West Sacramento	Avoid/reduce potential for disruptions to port operations and businesses that utilize port services	ID
<b>Upstream Dischargers</b>		
Wastewater dischargers	Avoid/reduce potential for costs of alternative storage, treatment, and discharge methods	ID, UD
Storm water dischargers	Avoid/reduce potential for incurring costs of alternative storage, treatment, and discharge methods	ID, UD
<b>Instream Water Diverters</b>		
	Avoid/reduce potential for costs of obtaining water from alternative water supply sources	ID, UD, OBD
<b>Other Indirect Beneficiaries</b>		
Hydropower owners and operators	Avoid or reduce potential reductions in hydropower production on water bodies that would be affected by flood protection and water supply operations, through requirements for greater flood control storage requirements.	UD, OBD
<b>General Public Beneficiaries</b>		
Public concerned for the protection/restoration of Delta ecosystem resources (as indicated by their willingness to pay)	Avoid/reduce negative impacts on aquatic and terrestrial resources that provide a wide array of goods and services supported by functioning ecosystem resources.	ID, OBD, UD, DD
Commercial and recreation fishers	Avoid/reduce potential harm to aquatic and aquatic-related terrestrial habitat that support fisheries	ID, OBD, UD
Recreational participants (water contact and non-contact water-based activities), including Delta residents and out-of-area visitors	Maintain high quality recreation conditions by protecting the quantity and quality of water resources and other resources that support recreation opportunities and activities	ID, OBD, UD
Delta as Place beneficiaries (visitors and residents)	Maintain Delta-as-Place values by protecting Delta's geography of low-lying islands and tracts, rural heritage, agricultural economy, coexistence of unique native ecosystem with expanding cities in a region characterized by maritime ports, commercial agriculture associated with maintaining rural life-style, opportunities for recreation and tourism, and a multicultural tradition,	ID, OBD

## Delta Flood Risk Management Assessment District Feasibility Study

Category of Beneficiary/Entity	Type of Benefit(s)	Primary Regions*
	legacy communities and family farms	
State and Local Government and Special Districts		
State government	Avoid/reduce secondary impacts from disruptions to services and revenues through the Delta; reduce long-term system maintenance costs	ID, OBD, UD, DD
Local government	Avoid/reduce secondary impacts on local government entities from disruptions to services and revenues in the Delta region; reduce long-term system maintenance costs	ID, OBD, UD
Special districts (e.g., reclamation and flood protection)	Avoid/reduce potential cost impacts from unexpected disruptions to services and revenue losses; reduce long-term system maintenance costs	ID, OBD, UD
State Economy	Avoid or reduce disruptions to statewide economic activity, as measured by industrial output, jobs, and personal income. These are secondary beneficiaries.	ID, OBD, UD, DD
<p>*Regions: (refer to descriptions below for location-specific information concerning different categories of beneficiaries)</p> <p>ID = In-Delta, as defined by the legal boundaries of the Delta</p> <p>OBD = Other areas within the Bay-Delta region but outside of the legal Delta</p> <p>UD = Upstream of the (legal) Delta</p> <p>DD = Downstream of the Delta</p>		

## MEASUREMENT OF BENEFITS

Table 2 below presents the expected level of analysis to be conducted for each beneficiary in Table 1. The levels of analysis identified in Table 2 takes into account the availability of data and the general understanding of the underlying relationships between flood events and the associated effects on assets and resources at risk of flooding in the Delta. The table shows whether the level of analysis for each category of beneficiaries is expected to be more qualitative or more quantitative with, in many cases, expectations of analytical results being presented in monetary terms.

Delta Flood Risk Management Assessment District Feasibility Study

Table 2. Expected level of analysis for the benefit assessment for different categories of Delta flood protection beneficiaries

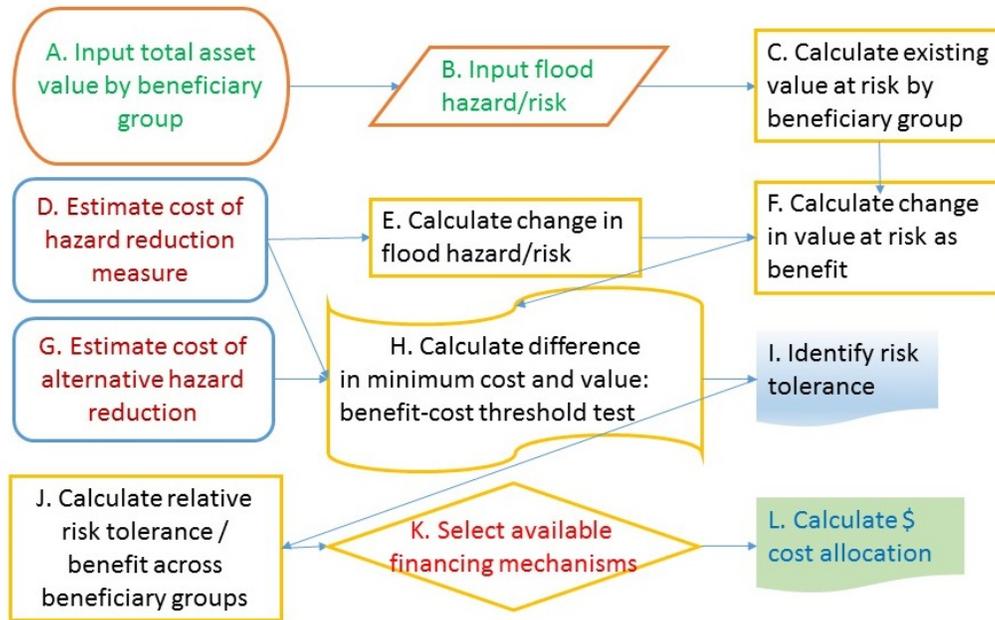
Category of Beneficiary	Level of Analysis of Benefit Assessment			Key Data Limitations
	Quantitative with high-level of monetization	Quantitative with potential for limited monetization	Mostly qualitative	
Community beneficiaries	XX			Typically available for flood control cost allocations. Property assessment data limited by Prop 13 reassessment restrictions and generally do not accurately reflect market values.
Agricultural landowners, producers and water users	XX			Typically available for flood control cost allocations. Data on crop value generally good; determining temporal effects of flooding on permanent crops not well developed
Municipal water providers and end users		XX		Estimates of effects on water supply deliveries and associates economic values currently imprecise and dependent on assumptions about flood conditions and circumstances
Infrastructure owners and end users	XXX			Typically available for flood control cost allocations. Inventory of assets at risk largely complete; replacement cost data generally available
Upstream dischargers		XXX		Determining potential effect from upstream flood flows and discharges not modeled yet in the Delta.
Instream water diverters			XXX	Data on number of diverters and amount of diversions is incomplete and unreliable; effect of Delta flooding events on diversions will be difficult to assess
General public beneficiaries			XXX	Potential effects on terrestrial habitat generally easy to quantify (acres of certain habitat types inundated) but not to monetize; effects on resources dependent on habitat not well defined; wide ranges of monetary values per unit available for habitat types
State and local government and special districts	XX			Generally good and reliable data on emergency preparedness and response costs; scale of potential effects of flooding events may be difficult to predict
State economy	XX			Understanding of relationship between affected beneficiaries, economic activities and state economy well developed; determining temporal effects on economic activities not well developed
Other indirect beneficiaries			XX	Indirect relationships between flooding events and beneficiaries (e.g., hydropower generators) not yet well defined;
<p>Notes concerning scale indicated by number of X's:                      Three X's should be interpreted to mean substantial capability to successfully achieve level of analysis indicated.                      Two X's should be interpreted to mean moderate capability to successfully achieve level of analysis indicated.                      One X should be interpreted to mean low capability to successfully achieve level of analysis indicated</p>				

## APPLICATION AND NEXT STEPS

As illustrated in Figure 1, we will use results from the beneficiary analysis at four key stages in the study process.<sup>10</sup>

Figure 1.

### Mapping Benefits to Costs



- First, we are developing a database of asset values (Step A in Figure 1) for the categories and sub-categories of beneficiaries identified in Table 1. This database serves as the foundation for establishing a snapshot of economic values of the resources and assets potentially affected by Delta flooding events. It also provides a baseline to determine the values at risk to flooding events, by beneficiary (Step C) and *changes* in the values at risk (Step F) as we integrate into the study process our evolving understanding of Delta flood risks.
- We anticipate refining the beneficiaries’ database in Step J (Relative risk tolerance/benefits across beneficiaries) by populating it with information characterizing the risk tolerance of assets belonging to and managed by different beneficiaries. As described in the study overview, Project Memorandum #4, these quantified benefits are to be compared with benefits that are not easily quantified but enter into the discussion of cost allocation (Step L).

<sup>10</sup> Figure 1 is a more detailed and application specific version of the generalized process described in the “Project Memorandum #4: The Relationship of Benefits and Costs to Financing Mechanisms.”

## Delta Flood Risk Management Assessment District Feasibility Study

- We are developing the beneficiary database with appropriate data on the economic value of different assets potentially at risk that will allow us to conduct a trial-run evaluation of two of the study Archetypes. (Data sources that we are using to develop benefit estimates by beneficiary will be listed in a forthcoming Appendix to this memo.) We constructed these Archetypes to provide an analytical framework for simulating the entire study evaluation process outlined in Figure 1. We anticipate that this “trial run” will reveal limitations with the data used to assess the economic benefits of flood protection measures. These limitations will indicate either a “fatal flaw” in assessing the feasibility of a mechanism, or will suggest a need to refine certain methods and data sources as part of implementing a chosen mechanism.
- We further expect to develop a better understanding of the relative economic importance of different beneficiaries. This will, in turn, shed light on the potential need for supplementing the database with more robust values when moving to implementation, and for developing appropriate evaluation criteria to assess flood protection benefits that we cannot analyze quantitatively in this study.