Flood Control Benefits

Narrative description of the project's economic costs:

The estimated capital cost to construct the project is $4.46 million, which will be incurred between 2011 and 2013.

Operation and maintenance costs are estimated to be $14,700 per year, starting in 2013. An additional maintenance cost of $18,400 is incurred every 5 years.

The present value of the total cost of the Fancher Creek Flood Control Improvement project (the "Project"), assuming a useful life of 30 years, is $4.22 million. Furthermore, the net present value of the quantifiable flood prevention benefits and water supply benefits over the same useful life is $13.17 million. Therefore, the overall cost-benefit ratio of the project is 3.12.

Cost details for the entire project using Table 10 and the information in Table 6:

[See Table 10]

Estimates of historical flood damage history:

The area downstream of the Fancher Creek Detention Basin (excluding the channel itself) has been subject to periodic flooding. At this time, no estimates are available to quantify the historical damage to homes as a result of this flooding. However, as noted herein, flood scenarios have been modeled to predict the intensities of various flood events.

Estimates of without-project conditions; e.g., current and future water supplies and demand:
Without Project:

Without the Project, the entire Fancher Creek Drainage Area (the "Project Area") would be susceptible to 100-year flood risk, and an additional 99.8 acres formerly in Drainage Area "Y" (the "Drainage Area 'Y' Segment") would be susceptible to the effects of smaller flood and storm events. A 100-year flood event would result in approximately $25 million in damages to residential property, which would include damage to flooring and interior walls, appliances, furniture, and personal property. A flood of this magnitude might also force residents to temporarily leave their homes and be sheltered elsewhere during the cleanup process. Currently, the flood zone is home to approximately 1,484 residents who would potentially need to be relocated and sheltered.

Existing businesses would also be heavily impacted by a 100-year flood event. The estimated damage to non-residential property is approximately $23.1 million. Additionally, a 100-year flood would cause existing businesses to temporarily shut down during the recovery and cleanup period, which could result in revenue losses of approximately $153,858 per month.

Vast sections of the Project, or potentially all of it, would be affected by road closures resulting from damaged or blocked roads, eroded and defecated landscapes, power outages from fallen power lines, and a compromised water supply resulting from local run-off. Restoring these facilities would require

substantial manpower and substantial and generous financial assistance from the City, County, and State. The additional cost of clearing roadways and repairing other public infrastructure, such as streetlights, traffic lights, and sign posts, as well as the cost of replacing drainage infrastructure in parts of Drainage Area "Y" Segment is estimated to be $518,105 for a 100-year flood.

As part of the Project, the easterly section of Basin "Y" will be connected to the Basin "BO" drainage system. The Drainage area "Y" Segment has been susceptible to flood risk because of the substandard pipelines and inadequate basin capacity currently in place. Without the Project, storms larger than a 2-year storm event will compromise the existing pipelines, overflow Basin "Y," and result in localized flooding. After a 2-year event, the cost of restoring neighborhood streets is estimated to be $2,000. In a larger 25-year storm event, the cost of neighborhood street restoration, which would include pipeline repair and replacement in the Drainage Area "Y" Segment, would be approximately $510,105.

Combining flood event probabilities with flood event costs to determine the Expected Annual Damage (EAD), results in a without-project cost of $763,683 per year.

Estimates of with-project conditions; e.g. improvements in new water supplies made available to meet demand:

The Project will remove approximately 682 acres in the County and City of Fresno from the 100-year flood plain. A 100-year event would then be controlled within Fancher Creek Detention Basin, and Fancher Creek Canal would convey releases from the detention basin into Central Canal. Furthermore, areas surrounding Basin "Y" and the formerly exempt area will be integrated into Drainage Area "BO", and therefore would be protected from localized flooding in storms greater than 2-year events. Therefore, with the Project, the resulting damage from 2-year, 25-year, and 100-year flood events would be insignificant.

Description of methods used to estimate without- and with-project conditions:

In coming up with the with- and without project conditions, three flood events (2-year, 25-year, and 100-year) were analyzed to determine the effects of each on the Project Area. The Project Area consists of 682 acres, with approximately 479 homes, and 200,000 square feet of non-residential buildings. Approximately 354 homes are located in the Drainage Area "Y" Segment. In 2009, the District determined that the Drainage Area "Y" Segment is lined with pipelines that are substandard and past their useful life. As a result, localized flooding is expected to occur in the 2-year and 25-year storm events. The remaining 125 homes are located in Drainage Area "BO" and are fully protected from 2-year and 25-year storm events. In order to estimate the costs incurred for these events, the following steps were taken:

1. For the 100-year flood that would affect the entire Project area, the effect on all residential and non-residential property was estimated. Residential flood damage was based on information provided on www.floodsmart.gov, which estimates flood damage based on the size of the home and the depth of the flood. For the Project area, the depth of the flood was estimated to be approximately one (1) foot, and the average size of the home was assumed to be 2,000 square feet. From these inputs the flood damage for residential property was estimated to be $52,220 per home, or a total of approximately $25 million for the Project Area.

Additionally, the existing non-residential development in the Project Area (as of 2010) was identified. This development includes a Chevron Station with a Johnny Quick Market, the Fancher Creek Business Park that houses a 102,000 SF Ferguson Plumbing Supply warehouse and showroom, and a GW School Supply - all totaling approximately 185,000 square feet. Average replacement cost per square foot data is plentiful, but after thorough research, the figures were ultimately drawn from www.saylor.com. Saylor presents multiple construction styles for various building uses, and indentifies a construction cost dollar amount for each.

Generally, estimates for discount stores similar to the GW School Supply outlet have an average construction cost between $153 and $159 per square foot. Warehouses and show rooms similar to Ferguson's Supply have an average replacement cost between $125 and $149 per square foot. Based on this data, this analysis conservatively assumes a blended replacement cost of $125 per square foot. Using the estimated flood depth of one (1) foot, the structural damage to non-residential property was estimated to be $23.1 million for the Project.

Finally, the loss of revenues for businesses in the Project Area resulting from the closure of facilities was estimated. Retail data specific to the Project was provided by the Neilson Company. The data shows that the annual retail supply located within the boundaries of the Project Area is approximately $1.8 million. The analysis further assumes 30 days of lost revenue during a 100-year event per the hydrology analysis prepared by the US Army Corps of Engineers (a 100-year storm event was modeled as a 30 day storm consisting of six five day periods). The estimated loss of revenue for a 100-year flood event amounts to approximately $153,858.

2. The 2-year and 25-year storm events would also have a quantifiable effect on the Drainage Area "Y" Segment. Due to substandard piping, it has been assumed that a 2-year event would cause "ponding" in neighborhood streets that span approximately 4 lane miles. The cost of this street restoration was estimated at $500 per lane mile based on a review of available road damage estimates filed with FEMA.

The 25-year storm event would result in even greater damage to the streets and landscaping within the Drainage Area "Y" Segment and would thus require an even larger cleanup effort. It has been assumed that this storm event would cause the existing pipeline in the Drainage Area "Y" Segment to completely fail. As a result, the District would be forced to either immediately replace the pipeline or to pursue the proposed Project to connect the Drainage Area "Y" Segment to Basin "BO." It is reasonable to assume that the latter project would be ultimately chosen. The cost of this task is estimated at $508,105 based on the cost estimates prepared for the Project.

Description of the distribution of local, regional, and statewide benefits:

Local/Regional Benefits:

1. The Project removes approximately 682 acres from the 100-year flood plain
2. The Project provides drainage capacity in 100-year flood events.
3. The Project will protect the Drainage Area "Y" Segment from localized flooding in 2-year and 25-year storm events.
4. The Project protects residents and businesses from property damage and lost income and wages.

5. The Project protects public infrastructure and utilities, and minimizes the restoration cost of public facilities to the City and County.

Statewide Benefits:

1. The Project protects existing residents and businesses from 100-year flood risk, and minimize the cost to the State of disaster response and relief.

Identification of beneficiaries:

1. Approximately 479 residents will be protected from 2-year, 25-year, and 100-year flood events.
2. Approximately 185,000 SF of non-residential uses will be protected from similar flood events.
3. The City and County of Fresno will reduce the risk of incurring future costs of restoring public infrastructure after flood events.
4. Future residential and non-residential projects, which will revitalize existing communities, will also benefit from the 100-year flood protection and this will allow them to develop and flourish.

When the benefits will be received:

The benefits of the Project will be received no later than December 2013. The application to the FEMA to remove the Project Area from flood plain will likely be approved very soon and become an immediate benefit. The benefit of drainage facilities improvement within Drainage Area "BO" will be achieve incrementally as various features of the project are implemented. Anticipating that the grant will be approved in the fall of 2011, it will be necessary to wait for the winter rainy season before constructing elements of work with the Basin "BO" and the pipeline construction within existing paved streets. Portions of the pipeline not within existing streets can be constructed very shortly after the grant approval. However, the pipeline must be constructed to the floor of the storm water basin, so effective use of the pipeline will likely not occur until the summer of 2012. The majority, if not all construction, will occur in the dry period of the summer of 2012. Landscaping the top perimeter will be in the fall of 2012.

Uncertainty of the benefits:

Project benefits are estimates that utilize various sources of data. While these sources are customarily used in the industry and reliable, the actual damage incurred in a flood event is nevertheless uncertain and still depends on numerous factors. However, the Project will provide definite and substantial protection from a 100-year flood event.

Description of any adverse effects:

The Project will have one-time construction impacts. Performance provisions have been included in the specifications for Basin "BO" and will be included in the project contract language to minimize adverse effects.

The District has developed various performance standards that are routinely implemented during the construction and operation of projects, as applicable. Therefore, the standards are considered to be part

of the project, rather than mitigation measures. Please see "Water Quality – Description of any adverse effects" Section for details on the standards.

Narrative discussion that describes, qualifies, and supports the values entered in the tables:

The following flood events were analyzed in Table 11: 2-year, 25-year, and 100-year. These events were evaluated in this order to highlight various issues of increasing gravity that could arise without the Project. Several of those issues are; (1) the substantial effects of a 2-year event on the section of Drainage Area "Y" that does not meet the technical standards of a 2-year event, (2) the effects of a much larger 25-year event on the that same section, and (3) the effects of a 100-year flood on the entire Project area. To be clear, a more significant flood event will envelope the costs of all lesser-included events, e.g., a 25-year flood must include the damage estimates of a 2-year event, whereas a 100-year event results in a combination of all damage estimates for all lesser flood events.

1. The effects of the 2-year storm were only limited to neighborhood street restoration. The area that will be affected by the 2-year storm consists of approximately 4 lane miles of neighborhood streets. Based on the estimated cost of restoring streets at $500 per lane mile, the total damage in a 2-year event was estimated to be approximately $2,000.

2. The 25-year flood would have similar neighborhood street restoration costs. However, the analysis further assumes that an event of this magnitude would prompt the development of a project to fully rectify the substandard pipeline in Drainage Area "Y" that would most certainly be severely impacted under this scenario. It is reasonable to assume that the project pursued will be the one proposed for this Project, and not the more expensive alternative of replacing the existing pipeline. Therefore, an additional cost to be considered under the 25-year event would be the construction of the pipeline from Drainage Area "Y" to Basin "BO". This cost is estimated to be $508,105, and brings the total combined damage to $510,105.

3. The 100-year flood would affect the entire project area. As described earlier, the Project area is comprised of 479 homes and approximately 185,000 square feet of non-residential property, see Table 11, column (c) and column (e). Without the Project, structural damage will occur to both residential and non-residential property. This estimated residential damage per home is estimated to be $39,150, and the non-residential damage is estimated to be $125 per square foot. Therefore, the total without-project cost of construction and property restoration is approximately $41.8 million, see column (g) of Table 11. Since the proposed Project removes the entire area from the 100-year flood plain, and provides sufficient drainage for that event, the estimated with-project damage is zero, as shown in column (h) of Table 11.

Additionally, a 100-year flood will impact the continued operation of business in the Project area. Per the assumptions described earlier, the without-project revenue losses are estimated to be $153,858, shown in column (i) of Table 11.

Finally, the cost of public infrastructure restoration is estimated in column (k) and column (l) of Table 11. Similar to the 25-year event, costs will include road restoration and development of the drainage project for the affected section of Drainage Area "Y". The entire Project area consists of approximately 20 lane miles of roadways, which would cost approximately $10,000 to restore ($500 per lane mile). Including the necessary drainage project, the total public infrastructure restoration cost is approximately $518,105, shown in column (k) of Table 11.

The resulting total event benefit for the 100-year flood event is estimated to be $42.5 million, shown in column (m) of Table 11. This amounts to an Expected Annual Damage (EAD) of $763,683.

If possible, quantify estimates of economic flood damage reduction benefits using Table 11 as applicable.

[See Table 11]

Documentation to support information presented in the project(s), including studies, reports, and technical data, which will be used to assess the project's ability to produce the benefits claimed.

- City of Fresno 2008 Urban Water Management Plan Update (Attachment 3: Work Plan - Exhibit 16)
- Final Environmental Impact Report (Attachment 3: Work Plan - Exhibit 17)
- Fresno Metropolitan Flood Control Service Plan (Attachment 3: Work Plan - Exhibit 18)
- Resolution of Support (Attachment 3: Work Plan - Exhibit 19)
- California Regional Water Quality Control Board NPDES Permit (Attachment 3: Work Plan - Exhibit 20)

Table 10- Annual Cost of Project

(All costs should be in 2009 Dollars)

Project: Fancher Creek Flood Control Improvements

	Initial Costs	Operations and Maintenance Costs						Discounting Calculations	
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
YEAR	Grand Total cost From Table 6 (row (i), column (d))	Admin	Operation	Maintenance	Replacement	Other	Total Costs (a) +...+ (f)	Discount Factor	Discounted Costs (g) x (h)
2009	$1,136,132	$1,200	$350	$1,700	$0	$0	$1,139,382	1.000	$1,139,382
2010	$638,103	$1,300	$375	$1,700	$0	$0	$641,478	0.943	$605,168
2011	$671,985	$1,400	$400	$1,700	$0	$0	$675,485	0.890	$601,179
2012	$1,343,968	$1,500	$1,100	$3,600	$100	$0	$1,350,268	0.840	$1,133,711
2013	$671,985	$1,600	$3,000	$9,600	$500	$0	$686,685	0.792	$543,919
2014	$0	$1,600	$3,000	$9,600	$500	$0	$14,700	0.747	$10,985
2015	$0	$1,600	$3,000	$28,000	$500	$0	$33,100	0.705	$23,334
2016	$0	$1,600	$3,000	$9,600	$500	$0	$14,700	0.665	$9,776
2017	$0	$1,600	$3,000	$9,600	$500	$0	$14,700	0.627	$9,223
2018	$0	$1,600	$3,000	$9,600	$500	$0	$14,700	0.592	$8,701
2019	$0	$1,600	$3,000	$9,600	$500	$0	$14,700	0.558	$8,208
2020	$0	$1,600	$3,000	$28,000	$500	$0	$33,100	0.527	$17,437
2021	$0	$1,600	$3,000	$9,600	$500	$0	$14,700	0.497	$7,305
2022	$0	$1,600	$3,000	$9,600	$500	$0	$14,700	0.469	$6,892
2023	$0	$1,600	$3,000	$9,600	$500	$0	$14,700	0.442	$6,502
2024	$0	$1,600	$3,000	$9,600	$500	$0	$14,700	0.417	$6,134
2025	$0	$1,600	$3,000	$28,000	$500	$0	$33,100	0.394	$13,030
2026	$0	$1,600	$3,000	$9,600	$500	$0	$14,700	0.371	$5,459
2027	$0	$1,600	$3,000	$9,600	$500	$0	$14,700	0.350	$5,150
2028	$0	$1,600	$3,000	$9,600	$500	$0	$14,700	0.331	$4,859
2029	$0	$1,600	$3,000	$9,600	$500	$0	$14,700	0.312	$4,584
2030	$0	$1,600	$3,000	$28,000	$500	$0	$33,100	0.294	$9,737
2031	$0	$1,600	$3,000	$9,600	$500	$0	$14,700	0.278	$4,079
2032	$0	$1,600	$3,000	$9,600	$500	$0	$14,700	0.262	$3,848
2033	$0	$1,600	$3,000	$9,600	$500	$0	$14,700	0.247	$3,631
2034	$0	$1,600	$3,000	$9,600	$500	$0	$14,700	0.233	$3,425
2035	$0	$1,600	$3,000	$28,000	$500	$0	$33,100	0.220	$7,276
2036	$0	$1,600	$3,000	$9,600	$500	$0	$14,700	0.207	$3,048
2037	$0	$1,600	$3,000	$9,600	$500	$0	$14,700	0.196	$2,876
2038	$0	$1,600	$3,000	$9,600	$500	$0	$14,700	0.185	$2,713
2039	$0	$1,600	$3,000	$9,600	$500	$0	$14,700	0.174	$2,559
2040	$0	$1,600	$3,000	$28,000	$500	$0	$33,100	0.164	$5,437
2041	$0	$1,600	$3,000	$9,600	$500	$0	$14,700	0.155	$2,278
2042	$0	$1,600	$3,000	$9,600	$500	$0	$14,700	0.146	$2,149
2043	$0	$1,600	$3,000	$9,600	$500	$0	$14,700	0.138	$2,027
2044	$0	$1,600	$3,000	$9,600	$500	$0	$14,700	0.130	$1,913
Project Life								…	
							Total Present Value of Discounted Costs (Sum of Column (i))		$4,227,933
							Transfer to Table 20, column (c), Exhibit F: Proposal Costs and Benefits Summaries		

Comments:

Table 11- Flood Event Damage

Project: Fancher Creek Flood Control Improvements

Hydrologic Event	Event Probability	Homes Flooded		SF of Commercial/Industrial		Building Restoration & Property Losses Estimates [1]		Loss in Business Revenues Estimates [2]		Public Infrastructure Restoration Estimates [3]		Event Damage		Event Benefit (Million $)
		Without Project	With Project	Without Project	With Project	Without Project	With Project	Without Project	With Project	Without Project	With Project	Without Project	With Project	
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)
												(g) + (i) + (k)	(h) + (j) + (l)	(m) – (n)
2-Year	0.50	0	0	0	0	$0	$0	$0	$0	$2,000	$0	$2,000	$0	$2,000
25-Year	0.04	0	0	0	0	$0	$0	$0	$0	$510,105	$0	$510,105	$0	$510,105
100-Year	0.01	479	0	185,000	0	$48,138,380	$0	$153,858	$0	$518,105	$0	$48,810,342	$0	$48,810,342
											Expected Annual Damage:	**$857,591**	**$0**	**$857,591**

1. Residential: Based on damage per home of $52,220 for a one(1) foot flood. Source: www.floodsmart.gov.
Non-Residential: Based on a estimated replacement cost of $125 per square foot. Source: www.saylor.com

2. Based on average annual sales in Project Area of $1.87M. Source: Neilson Company Inc.
Revenue losses in a 100-year flood, are estimated to be 30 days based on the length of the flood.

3. Maintenance per lane mile estimated to be $500. Esitmates derived from past FEMA filings by other agencies. Restoration costs for 25-year and 100-year floods assumed to include the costs to link the Drainage Area "Y" Segment to Basin "BO".

Table 12 - Present Value of Expected Annual Damage Benefits Project: Fancher Creek Flood Control Improvements			
(a)	Expected Annual Damage Without Project (1)		**$857,591**
(b)	Expected Annual Damage With Project (1)		**$0**
(c)	Expected Annual Damage Benefit	(a) – (b)	**$857,591**
(d)	Present Value Coefficient (2)		**$13.76**
(e)	**Present Value of Future Benefits** **Transfer to Table 20, column (e), Exhibit F: Proposal Costs and Benefits Summaries.**	**(c) x (d)**	**$11,804,592**

(1) This program assumes no population growth thus Expected Annual Damage will be constant over analysis period.

(2) 6% discount rate; 30-year analysis period (could vary depending upon life cycle of project).