

Attachment D

Maurepas Diversion Project Cost Estimates

This attachment summarizes the basis for estimates of cost for the proposed river diversion into the swamps south of Lake Maurepas. A summary of total project costs, with a line item for each major cost component based on standard CWPPRA format, is presented in Tables D-1a and b. The following paragraphs explain the basis for each line item estimate.

Structure

Structure costs include costs for materials, labor, and equipment for construction of the actual diversion structure at the river. Because this is a Phase 0 feasibility study, and not funded at a level nor intended to accomplish full engineering and design, structure costs were based on comparison to detailed cost estimates developed for several alternative diversions along the Mississippi River as part of the MRSNFR study.

Table D-2 summarizes estimated structure costs from three different diversion proposals for two different sites evaluated in the MRSNFR study. These were a 2,000 cfs diversion at Convent using siphons (based on 6 - 72" siphon pipes), a 5,000 cfs freshwater diversion at Myrtle Grove using 4 - 10' x 10' box culverts, and a 15,000 cfs sediment diversion at Myrtle Grove using 5 - 16' x 16' box culverts. Both sites are relatively close to the Hope Canal site proposed for the Maurepas diversion. Three different estimates were evaluated as a check on magnitude of the estimates, and also to allow comparison between costs estimated for siphons and box culverts.

To scale each of the three existing cost estimates to a size appropriate for the proposed Maurepas diversion, components of structure costs that are not directly related to number of culverts or siphons were separated from costs that are related to number of culverts or siphons. That is, estimated costs for mobilization and demobilization, dewatering and other site work, and instrumentation were assumed to be directly applicable to the Maurepas diversion, and were not scaled based on size of the diversion. Components of cost that are related to the number of structures, such as gates, foundation, and concrete, were divided by the number of structures included in the estimate for each diversion, and re-apportioned for Maurepas to approximate a target diversion size of about 2,000 cfs. So for example, from the Myrtle Grove 5,000 cfs diversion, costs for Maurepas were estimated by assuming use of 2 rather than 4 - 10' x 10' box culverts, which nominally would allow diversion of about 2,500 cfs. Note that WVA benefits were evaluated based on a 1,500 cfs diversion. If the diversion is actually constructed at 2,000 cfs, benefits are likely to be greater than those assessed.

Unscaled and scaled costs were then re-summed to get an estimate applicable to the Maurepas diversion. Since these cost estimates were made in 1996, a cost index inflation factor was applied to increase these costs to 2001 dollars based on USACE Construction Cost Indices.

Resulting structure cost estimates applicable to a diversion at Maurepas ranged from \$3,891,110 for a single 16' x 16' box culvert, to \$4,858,377 for two 10' x 10' box culverts. The estimated cost for siphons falls between these two costs for box culverts.

The costs for box culverts were selected for application to the Maurepas project because box culverts would allow the most flexibility for operations in all seasons, would allow the greatest control over volume of discharge, and would provide the greatest potential sediment benefits. The higher estimate for two smaller culverts rather than one larger culvert was applied, again to maximize the potential for flexibility of design and operations.

The costs determined in this fashion provide for a structure that will exceed the target capacity for the project. The Hope Canal site is upriver of Myrtle Grove, and two 10 foot by 10 foot box culverts should be capable of flowing more than the nominal 2,500 cfs at the Hope location. The designs for Myrtle Grove as well as for Davis Pond (also downriver of Hope Canal) include box culverts at an invert of -10 feet. Similar design criteria will be applied to the Maurepas diversion, to assure that sufficient flow can be passed at low flow conditions to assure ability to benefit salinity. Examination of the rating curve developed for Davis Pond and apportioning estimated flows for specified head differences to the cross-sectional area that would be available in the Maurepas structure suggests that with only a 1-foot head (i.e. the difference in water level elevation between the river and the lake), the two 10' x 10' box culverts assumed for the Maurepas diversion could flow at least 1,100 cfs. Similarly, with only 0.5 feet of head, the diversion could flow about 780 cfs.

Sediment Basin

Cost is included for a sediment basin at the head of the channel, receiving the diverted water from the diversion structure at the river. The function of the sediment basin is to slow water velocities enough to get settlement of coarse sediments in a defined space proximal to the diversion structure, in order to minimize future channel maintenance costs. The basin was sized based on a similar basin planned for the Myrtle Grove 5,000 cfs freshwater diversion that was evaluated in MRSNFR. It would be 100 feet by 100 feet bottom dimension, with an average depth of 10 feet and 1:3 side slopes. It would be reinforced with a 20-foot layer of riprap. The cost estimate from the Myrtle Grove project of \$495,000 was increased from 1996 to 2001 dollars, yielding the estimate of \$549,000.

Channel Work

Channel work includes construction of a new channel from the diversion structure at the river to a point just north of Airline Highway, where the new channel would meet the existing Hope Canal. It then includes improvement of Hope Canal to I-10, where water would be released from the improved channel and flow to the swamps. The proposed channel was sized to carry about 2,000 cfs of flow fully contained from the river to the point of release north of I-10. Channel dimensions were estimated assuming a 2.5 fps average velocity, side slopes of 1:3, and an average depth of 10 feet, giving a top width of 110 feet and a bottom width of 50 feet.

Table D-3 summarizes lengths of channel segments and total length of the required conveyance channel. This table also summarizes assumptions on depths of cuts required to achieve needed channel cross-sections, and the resulting estimate of total cubic yards of material that would be excavated.

Costs for this portion of channel work were then estimated assuming a unit cost of \$3.10 per cubic yard. This cost incorporates a basic dredging unit cost of \$2.75 per cubic yard, that covers

costs for dredging, and for placement and/or removal of material. A substantial portion of material dredged from the channel would be placed along the banks for development of improved levees to contain diverted flow. Thus, it is anticipated that dredging will probably be accomplished using a bucket dredge. It is possible that the amount of material dredged for channel construction would slightly exceed the amount needed for levee development, and would have to be removed. The additional \$0.35 per cubic yard represents the estimated cost for building a board road between Airline Highway and I-10 to provide access for the dragline dredge through the swamp. This cost was estimated at \$15-\$20 per linear foot, with a requirement for about 18,550 linear feet (see the channel lengths for the two segments from Highway 61 to the terminus of the channel in Table D-3). This yields a total (rounding off) of \$280,000 to \$370,000. A round figure of \$350,000 was used, and distributed over the estimate of total cubic yards of material to be dredged of 1,032,300 cy. The area between the river and Airline Highway is mainly upland, and is expected to be able support dredging operations without the need for a board road.

Flapgated Culverts

Cost is also included for a structure in Hope Canal at the point just north of Airline Highway where the new diversion channel from the river will meet Hope Canal (items 4, 5, and 6 in Table D-1a). This is needed to prevent backwater flow of diverted water into Hope Canal back toward the river. This structure was planned as a set of four 72" flapgated culverts. It was estimated that each of the four pipes would need to be about 70 feet long, at a cost of about \$65/linear foot. NRCS supplied a recent estimate of cost for a 72" flapgate at \$20,000 per gate. Twenty percent of these material costs was added to cover costs of site preparation.

Riprap at I-10 Bridge

The improved diversion channel will stop at the I-10 bridge. Although an attempt was made in planning and model evaluations to keep water velocities below about 3 fps, which should not cause excessive scour, the I-10 bridge is recognized as a channel constriction, and costs for armoring the channel under the bridge were included to assure the ability to safely discharge water under the bridge and into the target swamps. The area to be armored was estimated at 25,000 ft². This was based on a channel bottom width of about 50 ft, with 30 ft up the side slope on each side (10 ft channel depth with a 3:1 side slope), for a total width of 110 ft. Length of channel to be armored was estimated at 225 ft. Riprap needed was then estimated at 1 ton/ft², at a cost of \$25/ton.

Relocations

Relocations include the costs associated with crossing River Road (LA Highway 44), Airline Highway (LA Highway 61), the two railroads, and the numerous utility and product pipelines that have been identified between the river and I-10. Each relocation identified is itemized with an associated cost in Table D-4.

The assumptions for relocations of the roads and railroads are fairly conservative, assuming that the grade and alignment would be moved completely while construction of the structures or

the channel is completed, and then moved back. Separate costs for construction of new bridge spans are included for Airline Highway and the two railroads. This is not needed for River Road, as this road would be replaced on its grade over the new culvert structures, and costs for this are incorporated in the estimated relocation cost.

Outfall Management

Two components of outfall management have been included in the Maurepas diversion cost estimates. These are channel constrictions (item 9 in Table D-1a) to minimize the amount of diverted water that remains in the Hope Canal channel system and reaches the lake without entering sheet-flow through the swamp; and gapping of existing banks (item 10 in Table D-1a), also to remove possible impediments to flow across the swamps. Table D-5 summarizes the cost estimates for these components.

The existing bank of concern is the embankment for a remnant railroad that runs north from the vicinity of I-10 just west of and parallel to Hope Canal. There are at present several gaps in this embankment; however, numerous others would be added to optimize sheet flow of water that leaves Hope Canal and moves west through the swamps. To develop costs, it was estimated that 20 additional gaps would be needed. Costs shown in Table D-1a include mobilization and demobilization of a small dredge to dig the gaps at \$75,000; and an estimate of the average cubic yardage of material that would be removed to create each gap (20 gaps at 20 cubic yards each, or about 400 cubic yards), and an associated cost per cubic yard (\$2.75/cy, for a cost of about \$1,100).

One of the guiding criteria for developing the Maurepas diversion project concept was to maximize nutrient removal from diverted water. While denitrification and other nutrient removal dynamics occur in channel flow, and the Hope Canal-Tent Bayou-Dutch Bayou channel from I-10 to Lake Maurepas is relatively long (about 8 miles), the principle adhered to was to maximize sheet flow of diverted water through the swamps, to maximize efficiency of nutrient removal and assimilation, as well as to maximize benefits to the swamps.

Hydrologic surveys and UNET modeling accomplished for this study show that the existing Hope Canal channel north of I-10 will carry about 100-150 cfs; thus, at any flow greater than about 150 cfs, about this much water would stay in the channel all the way to the lake. Some form of channel constriction at strategic locations was proposed. Considerations for selecting an approach for constricting the channel included maintenance of access for small boat traffic, weight and size of structures considering their placement in a swamp situation, and cost. The simple approach of using riprap to reduce channel cross-section was selected on a preliminary basis for inclusion of costs. It will be appropriate during Phase I engineering and design to further consider options for achieving channel constriction that might allow greater management flexibility.

Costs for two such constrictions have been included for the Maurepas project (Table D-1a). Costs were based on an estimated tonnage of riprap needed per constriction, and a unit cost for riprap.

Contingency

A contingency for unforeseen costs or variations from estimates of 25% of total construction costs was included, as is standard for all CWPPRA projects.

Engineering and Design

Costs for engineering and design, the primary component of Phase 1 of a CWPPRA project, were estimated using best professional judgment, supported by review of a detailed engineering and design cost estimate developed by the New Orleans district USACE for the Ft. Jackson diversion project. As summarized in Table D-1a, it includes engineering (from preliminary design to final plans and specifications), geotechnical studies, surveys, hydrologic and ecological modeling, data collection (continuation of the swamp ecological and nutrient studies initiated in Phase 0), environment compliance (including cultural resources, permitting, and NEPA), real estate studies, and management costs (federal and state supervision and administration). Costs associated with development of a standard CWPPRA monitoring program, and for one year of pre-construction monitoring also are included.

Supervision and Inspection

This component of project cost was estimated as a monthly applied over the four years anticipated for project construction.

Supervision and Administration

Each of federal and state supervision and administration are estimated as lump-sum costs, as is standard for all CWPPRA projects.

Easements and Land Rights Costs

These cover the estimated costs for land acquisition and obtaining rights-of-way for the structure and channel, as well as for the relocations associated with the two roads and two railroads. These cost estimates are summarized in Table D-4, presented above. No inflation factor is applied to these costs, as they are recent (i.e., 2001 dollar) estimates.

Annual Operation and Maintenance

The estimate for annual operation and maintenance cost (Table D-1b) was taken from the cost estimate for the Myrtle Grove 5,000 cfs diversion evaluated in MRSNFR. The cost estimate of \$63,000 per year includes basic structure maintenance, some years with larger structure “overhaul” costs, and costs for periodic cleaning of the sediment basin, as well as channel maintenance. It should be noted that this cost estimate applies to a structure that includes four 10’ x 10’ box culverts rather than the two planned for the Maurepas diversion. On the other hand, some cost must be included to cover a part-time parish employee to handle the occasional operations activities. It was assumed that at this Phase 0 level of estimation, this cost was covered by the over-estimate of including maintenance for twice as many box culverts.

Other Annual Costs

Other annual costs associated with a diversion project into Maurepas include annual inspections, monitoring, and administration by USACE. Annual inspections and USACE administration were estimated based on interactions with USACE and previous project experience. Monitoring costs are estimated based on standard monitoring requirements for CWPPRA projects that are based on project type and objectives.

Annualized Cost

The cost-benefit comparison used for evaluation of CWPPRA projects is annualized costs compared to annualized benefits (as habitat units gained). To support this comparison, estimated project costs are amortized over a 20 year period, using an estimated interest rate based on the current government standard. The estimate of annualized costs is summarized in Table D-5. Note that engineering and design (Phase 1) costs are distributed over a two-year period, construction costs are distributed over the next four-year period, and then project operations are continued for 20 years. The resulting estimate of annualized cost is \$4,885,855. At this time, this estimate is still subject to review by the CWPPRA Economic Workgroup.

Table D-1a. Estimated project costs, in 2001 dollars, for a diversion into the swamps south of Lake Maurepas at the Hope Canal location, using box culverts.

Item No.	Work or Material	Quantity	Unit	Unit Cost	Amount
1	Siphon Structure 2- 10'x10' box culverts	1		4,858,377	4,858,000
2	Sediment Basin	1		549,000	549,000
3	Channel work	1,032,300	cu-yd	3.10	3,200,000
4	72" Flapgate	4		20,000.00	80,000
5	Pipe for Culverts	280	ft	65	18,000
6	Site Prep for culverts 20% of gates and pipe				20,000
7	Riprap I-10 bridge	25,000	tons	25	625,000
8	Relocations	1		20,349,030	20,349,000
9	Rock for channel constrictions	10,000	tons	25	250,000
10	Spoil Bank Gapping	1		76,000	76,000
ESTIMATED CONSTRUCTION COST					30,025,000
ESTIMATED CONSTRUCTION + 25% CONTINGENCY					37,531,000

TOTAL ESTIMATED PROJECT COSTS

PHASE I

<i>Engineering and Design</i>		\$3,442,000
Engineering	\$1,300,000	
Geotechnical Investigation	\$380,000	
Surveys	\$300,000	
Hydrologic Modeling	\$712,000	
Ecological modeling	\$150,000	
Data Collection	\$360,000	
Cultural Resources	\$40,000	
Permitting	\$50,000	
NEPA Compliance	\$150,000	
<i>Federal Supervision and Administration</i>		\$750,500
<i>State Supervision and Administration</i>		\$750,500
<i>Easements and Land Rights Studies</i>		\$210,000
<i>Monitoring</i>		\$46,281
Monitoring Plan Development	\$12,943	
Monitoring Protocol Cost *	\$33,338	
Total Phase I Cost Estimate		\$5,199,000

* Monitoring Protocol requires a minimum of one year pre-construction monitoring at a specified cost based on project type and area.

PHASE II

<i>Estimated Construction Cost +25% Contingency</i>		\$37,531,000
<i>Supervision and Inspection</i> \$20,000/month for 4 years		\$960,000
<i>Federal Supervision and Administration</i>		\$750,500
<i>State Supervision and Administration</i>		\$750,500
<i>Easements and Land Rights Costs</i>		\$2,530,000
Total Phase II Cost Estimate		\$42,522,000

TOTAL ESTIMATED PROJECT FIRST COST **47,721,000**

Table D-1b. Estimated annual costs for a diversion into the swamps south of Lake Maurepas at the Hope Canal location, using box culverts.

Template for Operation & Maintenance and Monitoring

O&M Cost Considerations:

Annual Costs

Annual Inspections	\$3,546
Annual Cost for Operations and Maintenance	\$63,000

Specific Intermittent Costs

Annual Project Costs:

Corps Administration	\$644
Monitoring	\$33,338

Construction Schedule:

E&D Start November-01
 E&D End April-03
 Const. Start November-03
 Const. End November-07

Table D-2. Structure Cost Comparison

MRSNFR Project Name	Flow	Structures	1996 Cost	adjustment from 1996 to 2001
Covent Siphon	2,000 cfs	6 - 72" pipes	\$4,257,600	\$4,715,718
Myrtle Grove FW Div	5,000 cfs	4 - 10'x10' culverts	\$7,702,800	\$4,858,377
	2,500 cfs	2 - 10'x10' culverts **	\$4,386,400	
Myrtle Grove Sed Div	15,000 cfs	5 - 16'x16' culverts	\$13,285,500	\$3,891,110
	3,000 cfs	1 - 16'x16' culvert **	\$3,513,100	

**Costs were estimated by proportional reduction of structure cost estimates in the MRSNFR report. Estimates for reduced numbers of culverts did not include reductions in the cost for mob & demob, dewatering, or instrumentation.

Table D-3. Maurepas Diversion Sites Channel Lengths and Associated Costs ¹

	Segment Lengths Starting at Mississippi River						Channel Cost ⁴	Adjustment from 1996 to 2001	Sediment Basin	Subtotal Cost
	River to Hwy. 61	Hwy. 61 Bavou des Acadiens	B. des Acadiens Hwy. 3125	Hwy. 61 to Drainage Canal	Drainage Canal to Terminus	Total Length				
Hope Canal	8,950			2,700	15,850	27,500				
x-sec area (ft ²) ^{2,3}	1,750			1,000	1,000 (.6)					
Yards*3	580,100			100,000	352,200	1,032,300	\$3,200,130	\$3,544,464	\$549,000	\$4,093,464
Reserve Relief Canal	9,100			2,650		11,750				
x-sec area (ft ²) ^{2,3}	1,750			1,000						
Yards*3	589,800			98,200		688,000	\$2,132,800	\$2,362,289	\$549,000	\$2,911,289
Convent		11,300	6,300	4,500		22,100				
x-sec area (ft ²) ^{2,3}		1,750	1,750 (.6)	1,000 (.6)						
Yards*3		732,400	245,000	100,000		1,077,400	\$3,339,940	\$3,699,318	\$549,000	\$4,248,318
Romeville			9,550		5,800	15,350				
x-sec area (ft ²) ^{2,3}			1,750		1,000					
Yards*3			619,000		215,000	834,000	\$2,585,400	\$2,863,589	\$549,000	\$3,412,589

- 1 - All assumptions were developed from information taken from the MRSNFR report.
- 2 - X-section areas average depth of cut on upland of 17.5' and 12.5' in swamp.
- 3 - Improvements to existing channels were assumed to require excavation of 60% of the channel section.
- 4 - A unit cost of \$3.10 per cubic yard was assumed. This includes \$2.75 per cubic yard for main dredging work, plus cost for board road from Highway 61 to I-10.

Table D-4. Relocations for Maurepas Diversion Project.

Item	Reserve	Hope Canal	Convent	Romeville	Bridges
	Relief Canal				
U.S. Highway 61	\$4,814,000	\$3,851,200			\$1,200,000
LA Highway 3125		\$0	\$4,814,000	\$4,814,000	
U.S. Highway 44		\$2,500,000			
Illinois Central Railroad (ICRR)	\$2,777,000	\$2,221,600	\$2,777,000	\$2,777,000	\$1,500,000
Kansas City Southern Railroad (KCSRR)	\$1,879,500	\$1,503,600			\$1,500,000
12" Water Main @ LA Hwy 44	\$211,000		\$211,000	\$211,000	
12" Water Mains N & S of Hwy 61	\$260,000				
8" Sewer line N of Hwy 44	\$200,000		\$200,000	\$200,000	
8" Sewer lines N & S of Hwy 61	\$221,000				
6" Gas line N of Hwy 44	\$193,000	\$193,000	\$193,000	\$193,000	
6" Gas lines N & S of Hwy 61	\$184,000				
12" Shell Oil Products Line	\$238,000	\$190,400	\$238,000	\$238,000	
24" Koch Gateway Natural Gas Line	\$419,000	\$335,200	\$419,000	\$419,000	
BGD 20" Gas Line		\$350,000			
Marathon 20" Product Line		\$350,000			
Marathon 30" Crude Line		\$500,000			
Enterprise 6" Propane Line		\$184,000			
Enterprise 6" Butane Line		\$184,000			
BT 2-12" O ₂ N ₂ lines north of Hwy 61		\$476,000			
Texaco 2-6" LPG lines		\$400,000			
Entergy Powerlines & Poles N & S of Hwy 61	\$150,000	\$120,000			
BellSouth Service S side of Hwy 61	\$381,000	\$304,800			
Reserve Tele. Co. S side of ICRR	\$305,500	\$244,400	\$305,500	\$305,500	
Reserve Tele. Co. N side of ICRR	\$237,000	\$189,600	\$237,000	\$237,000	
Reserve Tele. Co. S side of Hwy 61	\$15,000				
Reserve Tele. Co. Copper Feeder N side of Hwy 61	\$190,000				
Reserve Tele. Co. Fiber Optic Trunk N side of Hwy 61	\$275,000				
Wil-Tel Co. Fiber Optic Trunk N side of KCSRR	\$297,000	\$237,600			
AT&T Fiber Optic Trunk N side of KCSRR	\$297,000	\$237,600			
Time-Warner Cable Co. Aerial Lines N & S of Hwy 61	\$9,000	\$7,200			
TOTAL	\$13,553,000	\$14,580,200	\$9,394,500	\$9,394,500	
Adjusted from 1996 to 2001 \$	\$15,011,303	\$16,149,030	\$10,405,348	\$10,405,348	
Bridges	\$4,200,000	\$4,200,000	\$4,200,000	\$4,200,000	
TOTAL	\$19,211,303	\$20,349,030	\$14,605,348	\$14,605,348	

Real Estate for Maurepas Diversion Project

Item	Reserve	Hope Canal	Convent	Romeville
	Relief Canal			
Structure & Channel	\$7,261,000	\$1,689,000	\$1,102,000	\$1,933,000
U.S. Highway 61 Relocation	\$343,000	\$343,000		
LA Highway 3125 Relocation			\$96,000	\$19,000
LA Highway 44 Relocation	\$96,000	\$96,000	\$96,000	\$96,000
Illinois Central Railroad (ICRR) Relocation	\$201,000	\$201,000	\$201,000	\$201,000
Kansas City Southern Railroad (KCSRR) Relocation	\$201,000	\$201,000		
TOTAL- Real Estate (in 2001 \$)	\$8,102,000	\$2,530,000	\$1,495,000	\$2,249,000

Figure D-5. Annualized costs for a diversion at Hope Canal into the Maurepas swamps, assuming box culverts.

Interest Rate 6.375% Base Year 2007 Project Life 20 Ave. Ann. Cost \$ 4,885,855						Interest Rate 6.375% Base Year 2008 Project Life 20 Ave. Ann. Cost \$ 60,925					
Operation Year	Fiscal Year	First Costs	O&M Costs	Interest Factor *	PV of Total Costs	Operation Year	Fiscal Year	First Costs	O&M Costs	Interest Factor *	PV of Total Costs
-5	2001	\$ 2,599,500		1.3621	\$ 3,540,688	-5	2001			1.3621	\$ -
-4	2002	\$ 2,599,500		1.2804	3,328,497	-4	2002			1.2804	-
-3	2003	10,630,500		1.2037	12,795,946	-3	2003			1.2037	-
-2	2004	10,630,500		1.1316	12,029,092	-2	2004			1.1316	-
-1	2005	10,630,500		1.0638	11,308,194	-1	2005			1.0638	-
0	2006	10,630,500		1.0000	10,630,500	0	2006			1.0000	-
1	2007		66,546	0.9401	62,558	1	2007			0.9401	-
2	2008		66,546	0.8837	58,809	2	2008		66,546	0.8837	58,809
3	2009		66,546	0.8308	55,284	3	2009		66,546	0.8308	55,284
4	2010		66,546	0.7810	51,971	4	2010		66,546	0.7810	51,971
5	2011		66,546	0.7342	48,857	5	2011		66,546	0.7342	48,857
6	2012		66,546	0.6902	45,929	6	2012		66,546	0.6902	45,929
7	2013		66,546	0.6488	43,176	7	2013		66,546	0.6488	43,176
8	2014		66,546	0.6099	40,589	8	2014		66,546	0.6099	40,589
9	2015		66,546	0.5734	38,156	9	2015		66,546	0.5734	38,156
10	2016		66,546	0.5390	35,870	10	2016		66,546	0.5390	35,870
11	2017		66,546	0.5067	33,720	11	2017		66,546	0.5067	33,720
12	2018		66,546	0.4763	31,699	12	2018		66,546	0.4763	31,699
13	2019		66,546	0.4478	29,799	13	2019		66,546	0.4478	29,799
14	2020		66,546	0.4210	28,014	14	2020		66,546	0.4210	28,014
15	2021		66,546	0.3957	26,335	15	2021		66,546	0.3957	26,335
16	2022		66,546	0.3720	24,756	16	2022		66,546	0.3720	24,756
17	2023		66,546	0.3497	23,273	17	2023		66,546	0.3497	23,273
18	2024		66,546	0.3288	21,878	18	2024		66,546	0.3288	21,878
19	2025		66,546	0.3091	20,567	19	2025		66,546	0.3091	20,567
20	2026		66,546	0.2905	19,334	20	2026		66,546	0.2905	19,334
Total					\$ 54,373,492	Total					\$ 678,016

* For simplicity, expenditures are assumed to be made at the end of each year.