

## **Take Alternative Cost Estimation**

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# 22 Acronyms and Abbreviations

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CER	Conceptual Engineering Reports
cfs	cubic feet per second
DHCCP	Delta Habitat Conservation and Conveyance Plan
MAF	million acre-feet
MW	megawatts
O&M	operation and maintenance

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# Appendix 9.B

## Take Alternative Cost Estimation

### 9.B.1 Introduction

The purpose of the *Take Alternative Cost Estimation* appendix is to describe methods and assumptions applied to calculate the costs for each take alternative evaluated in the *Cost Practicability Analysis* in Chapter 9 *Alternatives to Take*. Costs for each take alternative were developed from information taken from Delta Habitat Conservation and Conveyance Program (DHCCP) Conceptual Engineering Reports (CER) and the Plan implementation cost estimates in Chapter 8, *Implementation Costs and Funding Sources*.

Water facilities construction and operational costs were adjusted to reflect the physical differences in the type (e.g., pipelines/tunnels, canal, or through-Delta) and diversion capacity (e.g., 3,000 cubic feet per second [cfs] to 15,000 cfs) of conveyance included in each take alternative. The primary type of conveyance and capacity of each take alternative is shown in Table 9.B-1.

**Table 9.B-1. Type and Capacity of Water Facilities by Take Alternative**

Chapter 9 Take Alternative	Primary Type of Conveyance	Capacity (cfs)
BDCP Proposed Action	pipelines/tunnels	9,000
A: W Canal 15,000 cfs	west canal	15,000
B: Tunnels 6,000 cfs	pipelines/tunnels	6,000
C: Tunnels 15,000	pipelines/tunnels	15,000
D: Tunnels 3,000 cfs	pipelines/tunnels	3,000
E: Isolated 15,000	pipelines/tunnels	15,000
F: Through Delta	through Delta	15,000
G: Less Tidal Restoration	pipelines/tunnels	9,000
H: More Restoration	pipelines/tunnels	9,000
I: Fixed Spring Outflow	pipelines/tunnels	9,000

cfs = cubic feet per second

There are six unique conveyance configurations listed in Table 9.B-1. These are:

- Pipelines/tunnels, 3,000 cfs (**Take Alternative D: Tunnels 3,000 cfs**)
- Pipelines/tunnels, 6,000 cfs (**Take Alternative B: Tunnels 6,000 cfs**)
- Pipelines/tunnels, 9,000 cfs (**BDCP Proposed Action**)
- Pipelines/tunnels, 15,000 cfs (**Take Alternative C: Tunnels 15,000 cfs**)
- West canal, 15,000 cfs (**Take Alternative A: W Canal 15,000 cfs**)
- Through-Delta separated corridors option, 15,000 cfs (**Take Alternative F: Through Delta 15,000 cfs**)

1 This appendix describes the data and methods used to develop the construction costs for each of these  
2 configurations.

### 3 **9.B.1.1 Water Facilities Construction Costs**

#### 4 **9.B.1.1.1 Pipelines/Tunnels Configurations**

5 Construction cost estimates for the pipelines/tunnels configurations with capacities other than 9,000  
6 cfs (the **BDCP Proposed Action**) were last estimated by the Delta Habitat Conservation and  
7 Conveyance Program (DHCCP) in 2010 under RFI-240. These estimates were rescaled to make them  
8 consistent with the construction cost estimate for the **BDCP Proposed Action**, which reflects the most  
9 current design, engineering, and construction cost information for the pipelines/tunnels  
10 configurations. Rescaling was performed at the cost line-item level. This was done in two steps. First,  
11 the RFI-240 line-item costs were normalized to the RFI-240 **BDCP Proposed Action** cost estimate by  
12 dividing the line item costs of each pipeline/tunnels configuration by its corresponding **BDCP**  
13 **Proposed Action** line-item costs. Second, the normalized RFI-240 line item costs were multiplied by  
14 the corresponding line-item cost for the **BDCP Proposed Action**, as described in Chapter 8,  
15 *Implementation Costs and Funding Sources*. The rescaled line-item costs were then summed to get the  
16 rescaled construction cost estimate for each pipeline/tunnels configuration.<sup>1</sup>

17 Two adjustments had to be made to the cost data prior to rescaling.

- 18 • First, because the RFI-240 estimates embed contingency cost within each line item while the  
19 Chapter 8 **BDCP Proposed Action** estimate treats contingency as a separate cost, the Chapter 8  
20 contingency costs had to be allocated to the appropriate direct construction cost line items. The  
21 resulting allocation of contingency cost is shown in Table 9.B-2.
- 22 • Second, because there is not a one-to-one correspondence between the Chapter 8 **BDCP**  
23 **Proposed Action** and RFI-240 line-item costs, they had to be consolidated to create the necessary  
24 one-to-one correspondence. The original Chapter 8 and RFI-240 line items are shown in  
25 Table 9.B-3. The mapping of these cost line items to the consolidated cost line items is shown in  
26 Table 9.B-4.

27 The normalized RFI-240 line item costs are shown in Table 9.B-5. The normalized costs clearly show  
28 the presence or absence of scale economies for certain line items. For example, river intake structures  
29 show roughly constant returns to scale whereas tunnels and pipelines exhibit very significant  
30 increasing returns to scale (e.g., doubling the capacity from 3,000 cfs to 6,000 cfs increases tunneling  
31 cost by only 18%).

32 The rescaled line item cost estimates for each pipeline/tunnels configuration are shown in  
33 Table 9.B-6. The last line of the table shows the original RFI-240 cost estimate.

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<sup>1</sup> Between the time this analysis was conducted and the release of the public draft BDCP, DHCCP made small refinements to the construction cost estimate for the BDCP Proposed Action. The difference between the refined construction cost estimate and the one used for this analysis is less than 0.05 percent. The rescaled construction cost estimates for the other pipeline/tunnel configurations have not been adjusted to account for this change since doing so would not meaningfully affect the results of the *Cost Practicability Analysis* in Chapter 9, *Alternatives to Take*.

1 **Table 9.B-2. Allocation of Chapter 8 Contingency Cost to Direct Construction Cost Line Items**

ID	Construction	Direct Cost*	Allocated Contingency	Direct Cost with Contingency
a	River Intake #2 with pumping plant	\$365,564,000	\$125,426,919	\$490,990,919
b	River Intake #3 with pumping plant	\$331,528,000	\$113,748,990	\$445,276,990
c	River Intake #5 with pumping plant	\$312,227,000	\$107,126,716	\$419,353,716
d	Intermediate forebay, flow control structure	\$179,593,000	\$61,619,297	\$241,212,297
e	Byron Tract Forebay, flow control structure	\$199,758,000	\$68,538,014	\$268,296,014
f	North tunnels & shafts	\$365,351,000	\$133,358,483	\$498,709,483
g	Main tunnels & shafts	\$7,035,373,000	\$2,568,014,517	\$9,603,387,517
h	Access, power delivery & utility relocation	\$316,468,000	\$108,581,825	\$425,049,825
i	Communications & control	\$23,425,000	\$8,037,240	\$31,462,240
<b>Subtotal Direct Cost Items</b>		<b>\$9,129,287,000</b>		<b>\$12,423,739,000</b>
j	Tunneling contingency	\$2,701,373,000		
k	All other contingency	\$593,079,000		
<b>Total Construction</b>		<b>\$12,423,739,000</b>		<b>\$12,423,739,000</b>
l	Project/construction management, design	\$1,919,905,000		\$1,919,905,000
<b>Total Capital</b>		<b>\$14,343,644,000</b>		<b>\$14,343,644,000</b>

\*See footnote 1 for explanation of difference in cost of Proposed Action reported in Chapter 8 compared to estimate shown here.

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3 **Table 9.B-3. Chapter 8 and RFI-240 Cost Line Items**

Chapter 8 Construction Cost Estimate		RFI-240 Construction Cost Estimate	
ID	Cost Line Item	ID	Cost line item
a	River Intake #2 with pumping plant	A	River intake structures
b	River Intake #3 with pumping plant	B	Pumping plants
c	River Intake #5 with pumping plant	C	Conveyance pipelines
d	Intermediate forebay, flow control structure	F	Tunnels
e	Byron Tract Forebay, flow control structure	H	Utilities and infrastructures
f	North tunnels & shafts	I	Forebays
g	Main tunnels & shafts	M	Controls and communication
h	Access, power delivery & utility relocation	N	Power supply and grid connections
i	Communications & control		<b>TOTAL</b>
<b>Subtotal Direct Cost Items</b>		Q	Engineering, project/construction management, LA
l	Project/construction management, design		<b>TOTAL</b>
<b>Total Capital</b>			

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1 **Table 9.B-4. Consolidated Cost Line Items Used for Rescaling Pipelines/Tunnels Option Cost**  
 2 **Estimates**

Consolidated Cost Line Items	Chapter 8 Line Items	RFI-240 Line Items
River intake structures	a+b+c	A
Forebays & flow control structures	d+e	B+I
Tunnels & pipelines	f+g	C+F
Controls and communications	i	M
Utilities, power delivery	h	H+N
<b>TOTAL</b>		
Engineering, project/construction management, LA	l	Q
<b>TOTAL</b>		

3

4 **Table 9.B-5. Normalized RFI-240 Line Item Costs**

Consolidated Cost Line Items	Take Alternative D: Tunnels 3,000 cfs	Take Alternative B: Tunnels 6,000 cfs	BDCP Proposed Action 9,000 cfs	Take Alternative C: Tunnels 15,000 cfs(modified)
River intake structures	0.3815	0.6667	1.0000	1.6691
Forebays & flow control structures	0.5837	0.8109	1.0000	1.3756
Tunnels & pipelines	0.8102	0.9564	1.0000	1.0981
Controls and communications	0.5993	0.8217	1.0000	1.3565
Utilities, power delivery	0.9449	0.9724	1.0000	1.0551
<b>Total</b>	<b>0.7482</b>	<b>0.9147</b>	<b>1.0000</b>	<b>1.1787</b>
Engineering, project/construction management, LA	0.7297	0.9000	1.0000	1.2070
<b>Total</b>	<b>0.7450</b>	<b>0.9122</b>	<b>1.0000</b>	<b>1.1836</b>

5



1 **Table 9.B-6. Rescaled Pipelines/Tunnels Options Construction Costs**

Consolidated Cost Line Items	Take Alternative D: Tunnels 3,000 cfs	Take Alternative B: Tunnels 6,000 cfs	BDCP Proposed Action <sup>a</sup> 9,000 cfs	Take Alternative C: Tunnels 15,000 cfs(modified)
River intake structures	\$517,176,824	\$903,747,748	\$1,355,621,624	\$2,262,669,039
Forebays & flow control structures	\$297,395,200	\$413,180,255	\$509,508,311	\$700,855,986
Tunnels & pipelines	\$8,185,094,491	\$9,661,993,935	\$10,102,097,000	\$11,092,897,879
Controls and communications	\$18,853,905	\$25,854,089	\$31,462,240	\$42,677,879
Utilities, power delivery	\$401,628,198	\$413,339,012	\$425,049,825	\$448,471,452
<b>Total</b>	<b>\$9,420,148,618</b>	<b>\$11,418,115,040</b>	<b>\$12,423,739,000</b>	<b>\$14,547,572,234</b>
Engineering, project/construction management, LA	\$1,400,994,881	\$1,727,905,082	\$1,919,905,000	\$2,317,274,666
<b>Rescaled Total Cost</b>	<b>\$10,821,143,499</b>	<b>\$13,146,020,122</b>	<b>\$14,343,644,000</b>	<b>\$16,864,846,901</b>
Original RFI-240 Estimate	\$7,634,936,666	\$9,348,072,584	\$10,248,262,465	\$12,129,465,810

<sup>a</sup> See footnote 1 for explanation of difference in cost of Proposed Action reported in Chapter 8 compared to estimate shown here.

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### 3 **9.B.1.1.2 Take Alternative A: W Canal 15,000 cfs and Take Alternative F: 4 Through Delta**

5 The RFI-240 estimates for **Take Alternative A: W Canal 15,000 cfs** and **Take Alternative F:  
6 Through Delta 15,000 cfs** currently provide the best available information on the expected  
7 construction costs for these two conveyance options. Because of significant differences in construction  
8 elements, rescaling these costs using the Chapter 8 **BDCP Proposed Action** estimate is expected to  
9 introduce large inaccuracies in the cost estimates for these two take alternatives. Therefore, the only  
10 adjustment made to the RFI-240 estimates was to update the costs to 2012 dollars. This was done  
11 using the U.S. Army Corps of Engineers Civil Works Construction Cost Index.<sup>2</sup>The rescaled costs are  
12 shown in Table 9.B-7.

13 **Table 9.B-7. Updated Construction Cost Estimates for W Canal 5 Intakes and Through Delta Take  
14 Alternatives**

Conveyance Configuration	Original RFI-240 Cost Estimate	Cost Update Factor <sup>a</sup>	Rescaled Cost Estimate
Take Alternative A: W Canal 15,000 cfs	\$10,390,529,745	1.0721	\$11,942,858,368
Take Alternative F: Through Delta 15,000 cfs	\$4,387,314,308	1.0721	\$5,042,772,090

Notes:  
<sup>a</sup> from U. S. Army Corps of Engineers Civil Works Construction Cost Index

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<sup>2</sup><http://planning.usace.army.mil/toolbox/library/EMs/em1110.2.1304.pdf>

## 1 **9.B.1.2 Water Facilities Operational Costs**

2 In Chapter 8, conveyance operation and maintenance (O&M) costs are composed of three components.

- 3 • Labor and equipment costs for operations and maintenance.
- 4 • Power costs for conveyance pumping.
- 5 • Major capital replacement costs.

6 Rescaling is done separately for each of these cost categories.

### 7 **9.B.1.2.1 Labor and Equipment Costs for Operations and Maintenance**

8 DHCCP previously prepared cost estimates for this O&M cost category for **Take Alternative A: W**  
9 **Canal 15,000 cfs, Take Alternative F: Through Delta 15,000 cfs, and Take Alternative C: Tunnels**  
10 **15,000 cfs** in 2010 under RFI-195. In 2012, DHCCP developed an estimate for the **BDCP Proposed**  
11 **Action** under RFI-246. These estimates are reproduced in Table 9.B-8.

12 DHCCP provided low and high estimates for the **BDCP Proposed Action** and **Take Alternative C:**  
13 **Tunnels 15,000 cfs**. The low estimate is the sum of the line-item cost estimates rounded to the  
14 nearest hundred thousand dollars. The high estimate is 1.75 times the low estimate. In Table 9.B-8, the  
15 low and high estimates for **Take Alternative A: W Canal 15,000 cfs** and **Take Alternative F:**  
16 **Through Delta 15,000 cfs** are presented based on the same method. The last row of Table 9.B-8  
17 shows the annual operating and maintenance cost used in Chapter 8 for the **BDCP Proposed Action**.

1 **Table 9.B-8. DHCCP RFI-195 and RFI-246 Labor and Equipment O&M Cost Estimates**

ID	Cost Item	Take Alternative A: W Canal 15,000 cfs RFI-195	Take Alternative F: Through Delta 15,000 cfs RFI-195	BDCP Proposed Action* 9,000 cfs RFI-246	Take Alternative C: Tunnels 15,000 cfs RFI-195
A	Operations and maintenance management	\$1,040,000	\$1,040,000	\$1,040,000	\$1,040,000
B	Intakes: one crew handles all 5 intakes	\$1,476,800	\$1,476,800	\$1,476,800	\$1,476,800
C	Intake pumping plants: one crew each shift covers all 5 pumping plants	\$4,430,400		\$2,953,600	\$4,430,400
D	Intermediate pumping plant: one crew each shift	\$4,430,400	\$1,476,800		\$4,430,400
E	Intermediate and Byron Tract Forebays control structure: one crew each shift			\$884,000	
F	All pumping plants: one maintenance crew handles the yards and shops for all pumping plants			\$1,684,800	\$884,000
G	Conveyance pipelines				
H	Canals: divided into operational sections, one crew each section, each crew handles approximately 8 miles of canal	\$4,420,000			
I	* Tunnels: major dewatering and physical inspection	\$147,822		\$1,950,720	\$295,644
J	* Tunnels: yearly gate maintenance and remotely operated vehicle inspection	\$127,400		\$254,800	\$254,800
K	Power supply: one crew for system		\$884,000	\$884,000	\$884,000
L	Barriers: four crews handle all 13 barriers and siphons		\$5,907,200		
	<b>Total Operations and Maintenance</b>	<b>\$16,072,822</b>	<b>\$10,784,800</b>	<b>\$11,128,720</b>	<b>\$13,696,044</b>
	Low estimate	\$16,100,000	\$10,800,000	\$11,100,000	\$13,700,000
	High estimate	\$28,175,000	\$18,900,000	\$19,425,000	\$23,975,000
	Source of estimate	a	a	b	a
	Estimate DHCCP provided to Cost Analysis Team <sup>c</sup>			\$18,850,000	
Sources:					
<p><sup>a</sup> <i>RFI-195: operations and maintenance comparison.xlsx</i>. Estimates prepared in 2010 and presented to BDCP Steering Committee in 2011. Assume cost is denominated in 2011 dollars. Low estimate rounds to nearest 100k. High estimate = 1.75 x low estimate Low and high estimate assumptions developed by DHCCP only for <b>Take Alternative C: Tunnels 15,000</b>. These are applied to <b>Take Alternative A: W Canal 15,000</b> and <b>Take Alternative F: Through Delta 15,000</b> take alternatives for consistency.</p> <p><sup>b</sup> <i>RFI-246: operations and maintenance costs for 9k cfs Gravity fed PTO conveyance alternative.pdf</i> (<b>BDCP Proposed Action</b>) DWR did not provide this source document to the Cost Analysis Team. It was received from Brattle Group, Inc., March 2013.</p> <p><sup>c</sup> <i>CM1 Line Item Costs (DWR) 10-01-12.xlsx</i>. DWR provided the Cost Analysis Team a single line item cost of \$754,000,000 for the entire 50-year permit period for <b>BDCP Proposed Action</b> operations and maintenance. This was divided this cost over 40 years of facility operation to get \$18,850,000.</p>					
cfs = cubic feet per second					

1 The rescaled labor and equipment O&M cost estimates are shown in Table 9.B-9. Rescaling involved  
2 the following adjustments to the original RFI 195 and RFI 246 cost estimates.

- 3 • Line-item costs were scaled by a factor of 1.694, the ratio of the Chapter 8 **BDCP Proposed Action**  
4 estimate to the RFI-246 estimate. This was done for four reasons.
  - 5 ○ It ensures the line item costs for the **BDCP Proposed Actions** sum to the Chapter 8 estimate of  
6 \$18,850,000.
  - 7 ○ It ensures that line-item costs that do not vary by take alternative (e.g., O&M management)  
8 stay that way.
  - 9 ○ It ensures that the estimate for each take alternative is drawn from roughly the same location  
10 between the low and high estimates.
  - 11 ○ It updates the RFI-195 estimates to 2012 dollars.
- 12 • The **Take Alternative C: Tunnels 15,000 cfs** line item cost for intermediate pumping plant  
13 operation (item D) was removed. It is assumed that all the pipelines/tunnels take alternatives  
14 would be gravity-fed.
- 15 • The **Take Alternative C: Tunnels 15,000 cfs** line item cost for maintenance yards and shops for  
16 pumping plants (item F) was increased to match the **BDCP Proposed Action**.
- 17 • The line item cost for operation of the intermediate and Byron Tract Forebay control structures  
18 (item E) was added to the **Take Alternative C: Tunnels 15,000 cfs** estimate and set to match the  
19 **BDCP Proposed Action** cost. It is assumed that this cost would be the same across the  
20 pipelines/tunnels take alternatives.
- 21 • The line item costs for tunnel dewatering and inspection (items I and J) for the **Take Alternative**  
22 **C: Tunnels 15,000 cfs** were increased to match the **BDCP Proposed Action** costs.

23 For **Take Alternative D: Tunnels 3,000 cfs** and **Take Alternative B: Tunnels 6,000 cfs**, the  
24 following assumptions were made.

- 25 • Costs are assumed the same across all pipelines/tunnels take alternatives for line items other than  
26 item C, operation of the intake pumping plants. This assumption was adopted because the RFI-195  
27 and RFI-246 estimates show these costs to be the same for the **BDCP Proposed Action** and **Take**  
28 **Alternative C: Tunnels 15,000 cfs**.
- 29 • Line item C cost is assumed to consist of a fixed and a variable component such that for the **BDCP**  
30 **Proposed Action** and **Take Alternative C: Tunnels 15,000 cfs** take alternatives the following  
31 equalities hold:
  - 32 ○ **Take Alternative C: Tunnels 15,000 cfs** Line Item C Cost =  $F + 5V = \$7,504,281$
  - 33 ○ **BDCP Proposed Action** Line Item C Cost =  $F + 3V = \$5,002,854$

34 These equations were solved for F and V, which were then used to estimate the item C cost for the  
35 **Take Alternative D: Tunnels 3,000 cfs** and **Take Alternative B: Tunnels 6,000 cfs**.

**Table 9.B-9. Rescaled Labor and Equipment Operations and Maintenance Cost Estimates**

<b>ID</b>	<b>Cost Item</b>	<b>Take Alternative A: W Canal 15,000 cfs Rescaled</b>	<b>Take Alternative F: Through Delta 15,000 cfs Rescaled</b>	<b>Take Alternative D: Tunnels 3,000 cfs Rescaled</b>	<b>Take Alternative B: Tunnels 6,000 cfs Rescaled</b>	<b>BDCP Proposed Action 9,000 cfs Rescaled</b>	<b>Take Alternative C: Tunnels 15,000 cfs Rescaled</b>
A	Operations and maintenance management	\$1,761,568	\$1,761,568	\$1,761,568	\$1,761,568	\$1,761,568	\$1,761,568
B	Intakes: one crew handles all intakes	\$2,501,427	\$2,501,427	\$2,501,427	\$2,501,427	\$2,501,427	\$2,501,427
C	Intake pumping plants: one crew each shift covers all 5 pumping plants	\$7,504,281		\$2,501,427	\$3,752,140	\$5,002,854	\$7,504,281
D	Intermediate pumping plant: one crew each shift	\$7,504,281	\$2,501,427				
E	Intermediate and Byron Tract Forebays control structure: one crew each shift			\$1,497,333	\$1,497,333	\$1,497,333	\$1,497,333
F	All pumping plants: one maintenance crew handles the yards and shops for all pumping plants			\$2,853,741	\$2,853,741	\$2,853,741	\$2,853,741
G	Conveyance pipelines						
H	Canals: divided into operational sections, one crew each section, each crew handles approximately 8 miles of canal	\$7,486,665					
I	Tunnels: major dewatering and physical inspection	\$250,383		\$3,304,160	\$3,304,160	\$3,304,160	\$3,304,160
J	Tunnels: yearly gate maintenance and remotely operated vehicle inspection	\$215,792		\$431,584	\$431,584	\$431,584	\$431,584
K	Power supply: one crew for system		\$1,497,333	\$1,497,333	\$1,497,333	\$1,497,333	\$1,497,333
L	Barriers: four crews handle all 13 barriers and siphons		\$10,005,708				
	<b>Total Operations and Maintenance</b>	<b>\$27,224,397</b>	<b>\$18,267,463</b>	<b>\$16,348,573</b>	<b>\$17,599,287</b>	<b>\$18,850,000</b>	<b>\$21,351,427</b>

## 1        **9.B.1.2.2            Power Costs for New Intakes and Pumping Plants**

### 2        **9.B.1.2.2.1           Pipelines/Tunnels Alternatives**

3        Chapter 8 uses an average annual cost of \$6,250,000 for power costs for north Delta pumping for the  
4        **BDCP Proposed Action**. The estimate was provided to the Cost Analysis Team by DHCCP in October  
5        2012. The estimate is only for the incremental cost for north Delta pumping. It does not include  
6        power costs for pumping out of the south Delta. Rescaling power costs for the pipelines/tunnels  
7        configurations assumes that power costs for north Delta pumping will be proportional to volume  
8        pumped. The north Delta pumping volumes listed in Table 9-4 of Chapter 9, *Alternatives to Take*,  
9        were used to calculate annual power costs for the other pipelines/tunnels take alternatives using  
10       this proportionality assumption. Results are shown in Table 9.B-10.

### 11       **9.B.1.2.2.2           Take Alternative A: W Canal 15,000 cfs**

12       The power cost estimate for **Take Alternative A: W Canal 15,000 cfs** is derived from the 2009  
13       DHCCP power cost estimate presented to the Steering Committee on December 3, 2009. This  
14       estimate is for an average hydrologic year and is based on a pumping volume of 3.6 million acre-feet.  
15       This cost was rescaled to be consistent with the north Delta pumping volume for **Take Alternative**  
16       **C: Tunnels 15,000 cfs** listed in Table 9-4 of Chapter 9. Results are shown in Table 9.B-11.

### 17       **9.B.1.2.2.3           Take Alternative F: Through Delta 15,000 cfs**

18       DHCCP has estimated **Take Alternative F: Through Delta 15,000 cfs** will have a total electrical  
19       demand of 77 megawatts (DHCCP Thru-Delta Facility Conveyance Option CER, 2009). Most of this —  
20       66 megawatts—is associated with the San Joaquin River Pumping Plant and the Victoria Canal  
21       Pumping Plant. The remainder —11 megawatts —is required for the operable barriers. An annual  
22       energy cost study for this alternative has not been completed. Annual energy cost for this alternative  
23       is therefore scaled to the cost of the **BDCP Proposed Action** using the ratio of the electrical  
24       demands for the two alternatives. The **BDCP Proposed Action** has an electrical demand of 55  
25       megawatts and an estimated annual energy cost of \$6.25 million. The annual energy cost of **Take**  
26       **Alternative F** is therefore estimated to be 1.4 times this amount (77 megawatts /55 megawatts), or  
27       \$8.75 million. The estimate is shown in Table 9.B-12.

### 28       **9.B.1.2.3            Major Capital Replacement Costs**

29       Annual capital replacement cost for the **BDCP Proposed Action** was provided to the Cost Analysis  
30       Team by DHCCP in October 2012. In Chapter 8, annual replacement costs are assumed to start in  
31       year 21 of Plan implementation. It is assumed capital replacement cost will be proportional to initial  
32       capital cost for all of the conveyance alternatives. Therefore, the ratio of the annual replacement cost  
33       to initial capital cost for the **BDCP Proposed Action** is used to calculate annual capital replacement  
34       for the other take alternatives. The estimates are shown in Table 9.B-13.

1 **Table 9.B-10. North Intake Power Costs for Pipelines/Tunnels Take Alternatives**

Chapter 9 Take Alternative	Capacity (cfs)	North Delta Mean Total Project Deliveries (MAF)	Scaling Factor	North Intake Power Cost
BDCP Proposed Action	9,000	2.144	1.000	\$6,250,000
B: Tunnels 6,000 cfs	6,000	1.676	0.782	\$4,885,728
C: Tunnels 15,000 cfs	15,000	2.469	1.152	\$7,197,411
D: Tunnels 3,000 cfs	3,000	1.085	0.506	\$3,162,896
E: Isolated 15,000 cfs	15,000	3.758	1.753	\$10,954,991
G: Less Tidal Restoration	9,000	2.144	1.000	\$6,250,000
H: More Restoration	9,000	2.144	1.000	\$6,250,000
I: Fixed Spring Outflow	9,000	Unknown		

Notes:  
cfs = cubic feet per second; MAF = million acre-feet

2

3 **Table 9.B-11. North Intake and Intermediate Pumping Plant Power Cost for Take Alternative A: W Canal 15,000 cfs**

4

Chapter 9 Take Alternative	Alignment	Capacity (cfs)	North Delta Mean Total Project Deliveries (MAF)	Scaling Factor	North Intake & Intermediate Pumping Plant Power Cost
12.03.09 DHCCP Estimate	West	15,000	3.600	1.000	\$26,900,000
A: W Canal 15,000 cfs	West	15,000	2.469	0.686	\$18,453,400

Notes:  
cfs = cubic feet per second; MAF = million acre-feet

5

6 **Table 9.B-12. North Intake and Intermediate Pumping Plant Power Cost for Take Alternative F: Through Delta 15,000 cfs**

7

Chapter 9 Take Alternative	Capacity (cfs)	Energy Demand (MW)	Scaling Factor	North Intake & Intermediate Pumping Plant Power Cost
BDCP Proposed Action	9,000	55	1.000	\$6,250,000
F: Through Delta	15,000	77	1.400	\$8,750,000 <sup>a</sup>

Notes:  
cfs = cubic feet per second; MW = megawatts  
<sup>a</sup> Includes annual energy cost for intakes, intermediate pumping, and operable barriers.

8

1 **Table 9.B-13. Annual Capital Replacement Cost by Take Alternative**

<b>Conveyance Configuration</b>	<b>Applicable Take Alternative</b>	<b>Rescaled Capital Cost Estimate</b>	<b>Capital Replacement Scaler</b>	<b>Capital Replacement<sup>a</sup></b>
Pipelines/Tunnels 3,000 cfs	D: Tunnels 3,000 cfs	\$10,685,988,369	0.001050407	\$11,224,637
Pipelines/tunnels 6,000 cfs	B: Tunnels 6,000 cfs	\$13,083,722,795	0.001050407	\$13,743,234
Pipelines/tunnels 9,000 cfs	BDCP Proposed Action; G: Less Tidal Restoration; I: Fixed Spring Outflow	\$14,343,644,000*	0.001050407	\$15,066,664
Pipelines/tunnels 15,000 cfs	C: Tunnels 15,000 cfs; E: Isolated 15,000 cfs	\$16,976,608,483	0.001050407	\$17,832,348
West Canal 15,000 cfs	A: W Canal 15,000 cfs	\$14,542,763,726	0.001050407	\$15,275,821
Separated corridors 15,000 cfs	F: Through Delta	\$6,140,560,389	0.001050407	\$6,450,088
<sup>a</sup> In Chapter 8, annual replacement costs are assumed to start in year 21 of Plan implementation				

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