POSEIDON WATER

Appendix N
Life Cycle Cost Analysis

Renewal of NPDES CA0109223
Carlsbad Desalination Project

APPENDIX N

NET INCREMENTAL ANNUAL LIFE CYCLE COST

The Ocean Plan Amendment requires that the regional water board shall consider a host of factors in determining feasibility of subsurface intakes, including project life cycle cost. A detailed analysis of the life-cycle cost for the Expanded CDP intake/discharge alternatives is presented in this Appendix N. The life cycle costs provide a relative comparison of the net incremental cost and savings of each of the alternatives. Costs considered include permitting, design, land acquisition, financing, construction, operations, maintenance, mitigation, equipment replacement, insurance, taxes, management, and energy consumption over the lifetime of the facility. Savings considered include construction and operating allowances provided for in the Water Purchase Agreement (WPA) that are applicable to each of the intake/outfall alternatives and operational savings due to reduced chemical consumption, extended membrane life, and reduced membrane cleaning frequency that is applicable to the intake/discharge alternatives. The findings of this analysis are summarized in Table 1 which provides the net incremental annual cost of each of the intake/discharge alternatives after deducting the maximum revenue potentially available under the WPA. The total annual cost represents the amount of money that would need to be added to the annual operating budget of the CDP to pay for the capital and operating costs associated with each of the intake/discharge alternatives. The WPA pricing terms provide for recovery of a predetermined dollar amount for intake retrofit capital and operating costs incurred due to the retirement of the EPS. The net annual cost represents the unfunded annual cost for each of the alternatives after deducting the maximum allowance provided under the WPA.

TABLE 1
Expanded CDP Subsurface Intake/Discharge Alternatives
Net Incremental Annual Life-Cycle Cost/ (Savings)
($/Year)

Annual Cost	Surface Intake with Flow Augmentation	Surface Intake with Multiport Diffuser	Subsurface Intake with Flow Augmentation	Subsurface Intake with Multiport Diffuser
Capital Charge	$ 3,806,058	$ 34,314,716	$ 107,982,781	$ 60,209,040
O&M Charge	$ 2,897,960	$ 1,690,000	$ 8,868,050	$ 5,477,125
Other Charges	$ 391,997	$ 4,638,120	$ 10,720,844	$ 8,198,981
Total Annual Cost	$ 7,096,016	$ 40,642,836	$ 127,571,675	$ 73,885,146
WPA O&M Offset	$ (2,759,512)	$ (2,759,512)	$ (2,759,512)	$ (2,759,512)
WPA Capital Offset	$ (1,897,879)	$ (1,968,003)	$ (2,134,297)	$ (1,994,291)
Net Annual Cost	$ 2,438,626	$ 35,915,322	$ 122,677,866	$ 69,131,344

The determination of Net Incremental Annual Life Cycle Cost is composed of five separate charges: Capital Charge, O&M Charge, Other Charges, WPA O&M Offset and WPA Capital Offset. Each intake and outfall technology features unique engineering and constructability characteristics which will impact total annual cost. For example, longer construction and permitting periods will not only incur additional expense, but the total cost of the project will be spread over fewer operating years, resulting in a higher unit water cost.

TABLE 2
Permitting, Construction, and Operating Term

Project Duration	Surface Intake with Flow Augmentation	Surface Intake with Multiport Diffuser	Subsurface Intake with Flow Augmentation	Subsurface Intake with Multiport Diffuser
Permitting Term (yrs)	1.5	3.0	3.0	3.0
Construction Term (yrs)	2.0	3.0	7.2	3.8
Total Duration	3.5	6.0	10.2	6.8
Operating Term (yrs)	26.5	24.0	19.8	23.2
Total Term	30.0	30.0	30.0	30.0

Capital Charge:

The Capital Charge is established by first calculating the total project cost and then amortizing the total project cost over the years of remaining water sales. Total Project Cost shown in Table 3 is determined by summing direct and indirect expenses associated with the construction of the intake and outfall.

TABLE 3
Total Project Cost

Construction Costs	Surface Intake with Flow Augmentation	Surface Intake with Multiport Diffuser	Subsurface Intake with Flow Augmentation	Subsurface Intake with Multiport Diffuser
Additional Permitting	$ 3,150,000	$ 5,000,000	$ 10,000,000	$ 10,000,000
Additional Mitigation	$ -	$ 4,400,000	$ (3,500,000)	$ 3,500,000
Additional 1 Mo O&M Reserve	$ 241,497	$ 140,833	$ 739,004	$ 456,427
Additional 6 Mo Debt Reserve	$ 1,255,786	$ 11,339,105	$ 34,036,463	$ 19,884,149
Debt Underwriting	$ 386,090	$ 3,486,197	$ 10,464,477	$ 6,113,362
Transactions Costs / Legal	$ 941,684	$ 8,502,919	$ 25,523,115	$ 14,910,639
Intake/Outfall Construction	$ 31,699,730	$ 326,312,000	$ 792,540,433	$ 545,126,147
Capitalized Interest	$ 3,860,903	$ 52,292,953	$ 376,721,176	$ 116,153,879
Construction Management	$ 3,000,000	$ 5,000,000	$ 9,200,000	$ 6,800,000
Construction Insurance	$ 1,000,000	$ 2,000,000	$ 10,000,000	$ 7,500,000
Construction Rent	$ -	$ 1,500,000	$ 7,527,168	$ 3,886,336
Post Construction Entrainment Study	$ 1,200,000	$ -	$ 1,200,000	$ -
Outstanding Equity Fee	$ 372,907	$ 5,050,734	$ 34,043,173	$ 11,218,765
Total Project Cost	$ 47,108,597	$ 425,024,742	$ 1,308,495,009	$ 745,549,704

Project Costs were determined as follows:

Additional Permitting: Lump sum cost associated with additional permits required for intake and outfall construction and operation.

Additional Mitigation: Lump sum cost associated with the mitigation of construction impacts and permanent loss of habitat.

Additional One Month O&M Reserve: Capitalized Reserve for one month of operations and maintenance for the applicable intake/outfall facilities.

Additional 12 Month Debt Reserve: Capitalized Reserve for 12 months of debt service for the applicable intake/outfall facilities.

Debt Underwriting: Underwriting expenses associated with placing debt on project. Cost assumed to be 1% of total debt.

Transactions Costs / Legal: Underwriting expenses associated with placing equity on the project and other deal expenses. Cost assumed to be 2% of total project cost.

Intake/Outfall Construction: Lump sum of intake and outfall construction cost.

Capitalized Interest: Capitalized account for interest expense during construction period. Expense varies with construction term.

Construction Management: Annual expense associated with project construction oversight. Expense varies with construction term.

Construction Insurance: Annual expense associated with insuring project construction. Riskier construction is assumed to incur escalated insurance costs. Expense varies with construction term.

Rent: Annual Expense associated with permanent and temporary land needed for the applicable intake/outfall facilities. Expense varies with construction term.

Post Construction Entrainment Study: As required per the Ocean Plan (Section III.m.2.d.(2)(c)(4))

Outstanding Equity Fee: Annual fee of 2.2% on outstanding equity commitment for credit support.

Once Total Project Cost is determined, the cost is amortized over the remaining operating term of the project after permitting and construction. The amortization of the Total Project Costs has two components, a debt component and an equity component. The Carlsbad Desalination Facility was originally financed with 82% debt and 18% equity. For consistency, this analysis also assumes 82% debt and 18% equity, with an annual interest rate of 5% and 15% respectively. The Annual Capital Charge shown in Table 4 is the Total Project Cost split into debt and equity components amortized over the remaining operating term.

TABLE 4
Annual Capital Charge
($/Year)

Annual Charge	Surface Intake with Flow Augmentation	Surface Intake with Multiport Diffuser	Subsurface Intake with Flow Augmentation	Subsurface Intake with Multiport Diffuser
Debt Component	$ 2,511,573	$ 22,678,211	$ 68,072,925	$ 39,768,297
Equity Component	$ 1,294,486	$ 11,636,505	$ 39,909,855	$ 20,440,743
Total Capital Charge	$ 3,806,058	$ 34,314,716	$ 107,982,781	$ 60,209,040

O&M Charge:

As shown in Table 5, the O&M charge is determined by summing the following annual expenses:

Chemicals: The subsurface intakes would allow for a 50% reduction in Fe2SO4 consumption at $0.30/kgal of seawater processed by the pretreatment system.

Pump Station: Maintenance, repair and replacement.

Dredging Maintenance: Includes maintenance dredging of the Agua Hedionda Lagoon inlet and additional dredging associated with the subsurface intake.

Membrane Replacement and disposal: Expected 10% increase in membrane life with the subsurface intake.

Reduced Membrane Cleaning: Expected 30% reduction in cleaning frequency with the subsurface intake.

Operator Fee: Includes labor costs associated with maintenance and operation of applicable intake/outfall alternatives.

Power: Assumes $0.12 cents per kWh for energy demand associated with applicable intake/outfall facilities.

Biological Monitoring: As required per the Ocean Plan (Section III.m.4)

Marine Life Mitigation: Annual cost (savings) associated with mitigation maintenance and management.

TABLE 5
Annual Operation and Maintenance Expense
($/Year)

Annual Operation and Maintenance	Surface Intake with Flow Augmentation	Surface Intake with Multiport Diffuser	Subsurface Intake with Flow Augmentation	Subsurface Intake with Multiport Diffuser
Chemicals	$ -	$ -	$ (300,000)	$ (300,000)
Pump Station	$ 150,000	$ 100,000	$ 1,000,000	$ 600,000
Dredging Maintenance	$ 800,000	$ 800,000	$ 2,400,000	$ 2,000,000
Membrane Replacement and disposal	$ -	$ -	$ (150,000)	$ (150,000)
Reduced Membrane Cleaning	$ -	$ -	$ (84,000)	$ (84,000)
Operator Fee	$ 200,000	$ 500,000	$ 2,500,000	$ 1,750,000
Power	$ 1,497,960	$ -	$ 3,274,050	$ 1,396,125
Biological Monitoring	$ 250,000	$ 250,000	$ 250,000	$ 250,000
Marine Life Mitigation	$ -	$ 40,000	$ (22,000)	$ 15,000
Total O&M Impact	$ 2,897,960	$ 1,690,000	$ 8,868,050	$ 5,477,125

As shown in Table 6, Other charges are determined by summing the following annual expenses:

Management Overhead: Incremental project oversight, accounting and reporting.

Rent: Annual expense for additional land needed.

Intake Insurance: Incremental insurance for new system

Outfall Insurance: Incremental insurance for new system

Property Taxes: Assumed 1% of Construction Cost

TABLE 6
Other Annual Expenses
($/Year)

Other Annual Cost	Surface Intake with Flow Augmentation	Surface Intake with Multiport Diffuser	Subsurface Intake with Flow Augmentation	Subsurface Intake with Multiport Diffuser
Management Overhead	$ 50,000	$ 100,000	$ 250,000	$ 225,000
Rent	$ -	$ 500,000	$ 1,045,440	$ 1,022,720
Intake Insurance	$ 25,000	$ 25,000	$ 1,500,000	$ 750,000
Outfall Insurance	$ -	$ 750,000	$ -	$ 750,000
Property Taxes	$ 316,997	$ 3,263,120	$ 7,925,404	$ 5,451,261
Total Other Costs	$ 391,997	$ 4,638,120	$ 10,720,844	$ 8,198,981

SDCWA Water Purchase Agreement O&M and Capital Offset

Pursuant to the Water Purchase Agreement between Poseidon and the San Diego County Water Authority, certain funds have been allocated to offset the anticipated need of retrofitting the CDP intake in response to the retirement of the Encina Power Station. A lump sum capital amount of $21,331,214 and an annual operation and maintenance amount of $2,663,900 can be used to offset the expense of the intake/discharge alternatives, subject to CPI adjustment. The lump sum capital cost credit is amortized for the life of the operation with 80% debt and 20% equity, with an annual interest rate of 5% and 15% respectively.

TABLE 7
SDCWA O&M and Capital Offsets
($/Year)

Amortized Capital Offset	Surface Intake with Flow Augmentation	Surface Intake with Multiport Diffuser	Subsurface Intake with Flow Augmentation	Subsurface Intake with Multiport Diffuser
Debt Component	$ 1,218,233	$ 1,281,101	$ 1,426,948	$ 1,304,436
Equity Component	$ 679,646	$ 686,901	$ 707,349	$ 689,855
Total WPA Capital Offset	$ 1,897,879	$ 1,968,003	$ 2,134,297	$ 1,994,291

Life Cycle Cost Summary

The life cycle costs provide a relative comparison of the net incremental cost and savings of each of the alternatives. Costs considered include permitting, design, land acquisition, financing, construction, operations, maintenance, mitigation, equipment replacement, insurance, taxes, management, and energy consumption over the lifetime of the facility. Savings considered include construction and operating allowances provided for in the Water Purchase Agreement (WPA) that are applicable to each of the intake/outfall alternatives and operational savings due reduced chemical consumption, extended membrane life, and reduced membrane cleaning frequency that is applicable to the intake/discharge alternatives. The findings of this analysis are summarized in Table 8 and Table 9. Table 8 provides a relative comparison of the net incremental annual cost of each of the intake/discharge alternatives after deducting the maximum revenue potentially available from offsets under the WPA. The total annual impact represents the amount of money that would need to be added to the annual operating budget of the CDP to pay for the capital and operating costs associated with each of the intake/discharge alternatives.

TABLE 8
Expanded CDP Subsurface Intake/Discharge Alternatives
Net Incremental Annual Life-Cycle Cost/ (Savings)
($/Year)

Annual Cost	Surface Intake with Flow Augmentation	Surface Intake with Multiport Diffuser	Subsurface Intake with Flow Augmentation	Subsurface Intake with Multiport Diffuser
Capital Charge	$ 3,806,058	$ 34,314,716	$ 107,982,781	$ 60,209,040
O&M Charge	$ 2,897,960	$ 1,690,000	$ 8,868,050	$ 5,477,125
Other Charges	$ 391,997	$ 4,638,120	$ 10,720,844	$ 8,198,981
Total Annual Cost	$ 7,096,016	$ 40,642,836	$ 127,571,675	$ 73,885,146
WPA O&M Offset	$ (2,759,512)	$ (2,759,512)	$ (2,759,512)	$ (2,759,512)
WPA Capital Offset	$ (1,897,879)	$ (1,968,003)	$ (2,134,297)	$ (1,994,291)
Net Annual Cost	$ 2,438,626	$ 35,915,322	$ 122,677,866	$ 69,131,344

Table 9 provides a relative comparison of the net incremental unit cost ($/acre-foot) of each of the intake/discharge alternatives after deducting the maximum revenue potentially available from offsets under the WPA. The total impact represents the amount of money that would need to be added to the cost of each acre-foot of water produced at the CDP to pay for the capital and operating costs associated with each of the intake/discharge alternatives.

TABLE 9
Expanded CDP Subsurface Intake/Discharge Alternatives
Net Incremental Annual Life-Cycle Cost/ (Savings)
($/AF)

Annual Cost	Surface Intake with Flow Augmentation	Surface Intake with Multiport Diffuser	Subsurface Intake with Flow Augmentation	Subsurface Intake with Multiport Diffuser
Capital Charge $/AF	$63.43	$571.91	$1,799.71	$1,003.48
O&M Charge $/AF	$48.30	$28.17	$147.80	$91.29
Other Charges $/AF	$6.53	$77.30	$178.68	$136.65
Total Cost Increase $/AF	$118.27	$677.38	$2,126.19	$1,231.42
WPA O&M Offset $/AF	($45.99)	($45.99)	($45.99)	($45.99)
WPA Capital Offset $/AF	($31.63)	($32.80)	($35.57)	($33.24)
Net Cost Increase $/AF	$40.64	$598.59	$2,044.63	$1,152.19