TO: Water Use Efficiency Branch
California Department of Water Resources

FROM: Lisa Cuellar, Senion Program Manager
California Water Efficiency Partnership

Christopher Tull, Project Manager
California Data Collaborative

DATE: November 24, 2021

SUBJECT: CII-DIM Performance Measures Comments

The California Water Efficiency Partnership (CalWEP) is a statewide non-profit member-based organization representing over 220 California water agencies, businesses, and other organizations. Collectively our water agency members provide services to over 6.6 million connections across the state. With a mission and commitment to maximize water efficiency, CalWEP has a deep history working on customer side conservation and efficiency programs. We believe that data-driven conservation and efficiency are paramount to ensuring that California has a reliable and resilient water future.

The California Data Collaborative (CaDC) is a statewide non-profit founded by water managers to facilitate data-centric policy and operational decisions that enable a sustainable water future for all. The CaDC helps its member agencies improve the reliability and sustainability of their water supply by producing sophisticated data analytics tools to address some of the most pressing water use efficiency issues facing suppliers.

CalWEP and CaDC appreciate the opportunity to review and comment on the CII-DIM performance measures considerations presented most recently by DWR as part of the water conservation legislation. In a collaborative effort CalWEP and CaDC have prepared the attached technical memo that offers a limited economic feasibility analysis for the splitting of mixed-use meters (MUMs) on CII accounts by installing DIMs. The results of the analysis were produced using an Excel-based Feasibility Tool for splitting MUMs produced by the California Urban Water Conservation Council (now CalWEP) in 2013. The tool accounts for applied irrigation, capital costs of installation, water and sewer rates, and agency funded DIM program incentives, amongst other factors. Ultimately, the results contained in our technical memo can help identify conditions under which splitting MUMs at CII accounts is cost-effective for a water agency.

Please note that this feasibility analysis was initiated following the October 25, 2021 DWR meeting where a CII DIM threshold of 20,000 square feet was first introduced. This allowed only 21 working days to gather and analyze data. However, given this relatively narrow window to conduct the analysis, both CalWEP and CaDC are confident that the output generated by the Feasibility Tool is sufficient to provide baseline economic feasibility data for split meter programs.

CalWEP and the CaDC recommend that DWR review and consider these findings to inform the CII-DIM threshold currently under consideration by the Department and prior to recommending a threshold for splitting meters on CII accounts as required by *WC 10609.10 (b)(2)*.

Please contact either of us if you have any questions regarding this information.

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cc: Charlotte Ely, California State Water Resources Control Board

Economic Feasibility of CII DIM Installations

Prepared by the California Water Efficiency Partnership and California Data Collaborative
November 2021

This memo discusses the results of using the California Water Efficiency Partnership's (CalWEP) Dedicated Irrigation Meter (DIM) Feasibility Tool to explore the cost-effectiveness of installing DIMs to split the water demand from mixed-use meters (MUMs) into indoor and outdoor volumes at individual commercial, industrial and institutional (CII) accounts. Different model assumptions and thresholds for landscape size are examined, and outstanding questions with regards to meter splitting are summarized based on the Feasibility Tool results.

We find that, in most of the scenarios examined for CII landscapes of 20,000 square feet, meter splitting does not appear to be cost-effective at the parcel level from an avoided water cost perspective. This result is site and agency specific and varies in the magnitude of economic infeasibility. In some instances, sites that are large (40,000 square feet), where splitting requires minimal construction on the customer side, and where DIM installation reduces irrigation water use, meter splitting may be a cost-effective approach.

This memo does not consider the feasibility of equivalent or in-lieu technologies as defined by the California Department of Water Resources (DWR) during the October 25, 2021 Water Use Efficiency Standards Meeting.

<u>Feasibility Tool Background</u>

The DIM Feasibility Tool is an Excel-based worksheet created in 2013 by the California Urban Water Conservation Council (now the California Water Efficiency Partnership) with lead technical support from Matt Lyons, Director of Planning and Conservation for the Long Beach Water Department (retired). The tool was designed for agency staff looking to assess the cost-effectiveness of an incentive program for splitting MUMs at CII accounts by installing DIMs. By conducting an economic analysis, the tool helps practitioners identify scenarios where the benefit to an agency that comes from conserving water (accounted for as the avoided cost of water) is greater than the costs (accounted for as incentives) to an agency. The Feasibility Tool performs the analysis at the individual CII parcel level, although the data can be compiled manually to perform an aggregate analysis for multiple CII accounts. The tool was vetted by volunteers that served on the Council's Utility Operations Committee and was approved by the Council Board as an acceptable tool for conservation best management practice (BMP) reporting.

By estimating an agency's net present value (NPV) over a project life typically spanning 15 to 20 years, and under different CII parcel conditions and cost scenarios, the tool enables users to identify candidate sites for splitting meters. The NPV calculation takes into account a diverse array of factors including:

- The estimated water saved, based on the size of the landscape and average applied irrigation.
- Benefits to the agency in terms of avoided water costs and reduced runoff.
- One-time costs to the customer to install the new meter and connect their irrigation system.
- Recurring costs and benefits to the customer caused by a change in rates and addition of new service and backflow charges.
- One time and recurring costs to the agency to manage the program, as well as to incentivize the customer to achieve an attractive return on investment. Incentives include subsidies to a CII customer's water bill and/or capital cost offsets for DIM installation.

A split meter conversion that is modeled to have a positive NPV is determined to be economically feasible, while a conversion with a negative NPV is determined to be economically infeasible.

Economic Feasibility for Area Thresholds:

On October 25, 2021, during a Water Use Efficiency Standards Meeting, DWR suggested a landscape area threshold for DIM installation on CII accounts of 20,000 square feet. Using a set of standard assumptions (see Tables 1 and 2 below), CalWEP utilized the Feasibility Tool to assess DIM installation feasibility for theoretical CII accounts of 20,000 and 40,000 square feet.

Table 1: General Model Inputs

Input	Value
Discount Rate	2.5%
Water Rate	$3.00 / HCF
Vol. Sewer Charge	$0.33 (85% assessed)
DIM Daily Service Charge	$0.60
Annual Sewer Fee Reduction	-$100
Avoided Cost of Water	$700
SW Benefit	$20 / AF conserved
Program Costs + Account Mgmt.	$2,500

Table 2: Customer Cost Model Inputs

Input	Value
Meter Installation Fee	$5,000
Backflow Device Installation	$100
Capital Cost per Tie-in	$4,000
Permit Inspection Fee	$100
Backflow Inspection Fee	$200

In addition, the California Data Collaborative (CaDC) ran separate DIM installation feasibility analyses in Python™, using the same algorithms from the Feasibility Tool, for three California water suppliers located in geographically distinct regions: 1) Northern Coast 2) East Bay and 3) Southern Coast. Each agency submitted data inputs based on best available cost and CII irrigation data (See Appendix A for model data). Similar to the theoretical example, CaDC's analyses were performed for CII accounts of 20,000 and 40,000 square feet.

Methodology

Forty-eight model iterations were conducted for both a 20,000 and 40,000 square foot CII landscape area in the theoretical trials as well as the three water provider trials and in accordance with the scenarios presented in Table 3. The theoretical results were independently verified by CaDC. CalWEP also spot-checked select iterations from CaDC's Python™ analysis using the Feasibility Tool.

Model results were generated at three levels of applied annual irrigation on CII accounts post DIM installation and equal to 50, 70 and 90 inches. Two project life periods of 15 and 20-years were assessed and are based on agencies' reported periods for meter inspection and change-out. Percent of irrigation water savings post-DIM installation was evaluated at 10 and 20 percent. Finally, individual iterations were run for various irrigation lateral tie-ins to the new DIM: 1, 2, 3, and 10 tie-ins.

The NPV was generated using a fixed 20 percent rate of return (5-year payback period) and a 10 percent reduction on water bills for the CII account. In order to achieve these benefits, the model adjusts agency costs in the form of incentives as either water bill subsidies, capital cost offsets or both.

Table 3: Feasibility Tool Model Scenarios

Landscape Area	20,000 & 40,000 square feet															
Irrigation	50, 70, 90 inches															
Project Life	15 yr								20 yr							
% Savings	10%				20%				10%				20%			
No. Laterals	1	2	3	10	1	2	3	10	1	2	3	10	1	2	3	10

Results

Theoretical CII-DIM Feasibility Results

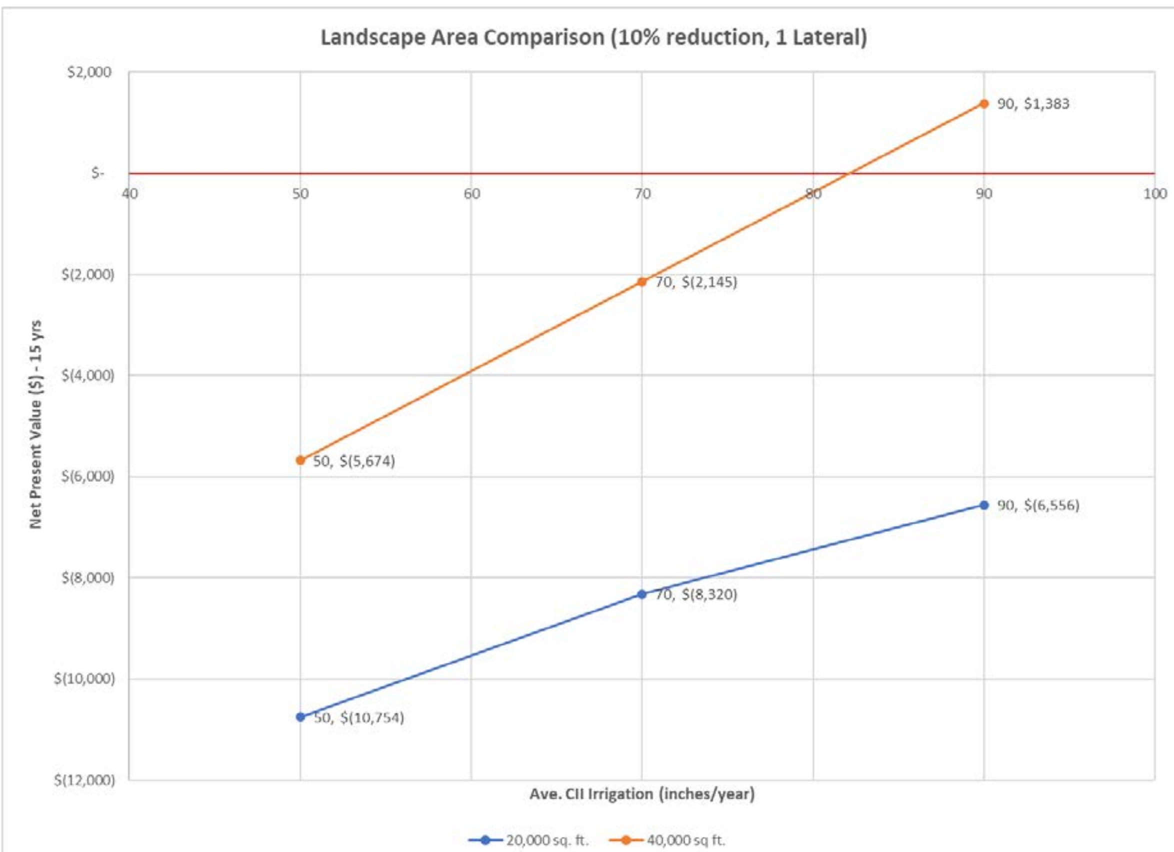
In total, forty-eight model iterations were completed for two theoretical 20,000 square foot and 40,000 square foot CII landscapes. Select findings are provided below in Graphs 1 to 4. See Table 4 for a breakdown of scenarios presented in each of the graphs.

Table 4: Scenarios Presented in Graphs 1 - 4

Graph No.	10% Reduction	20% Reduction	1 Lateral	2 Lateral
1	✓		✓	
2		✓	✓	
3	✓			✓
4		✓		✓

Graphs 1 and 2 below compare the net present value in dollars over a **15-year** project life for two theoretical CII landscape areas of 20,000 and 40,000 square feet respectively and assuming an avoided cost of water of $700.

Graph 1: *NPV comparison of 40,000 and 20,000 CII landscape area with variable applied landscape irrigation representing a 10% reduction in water use and one tie-in to the DIM*

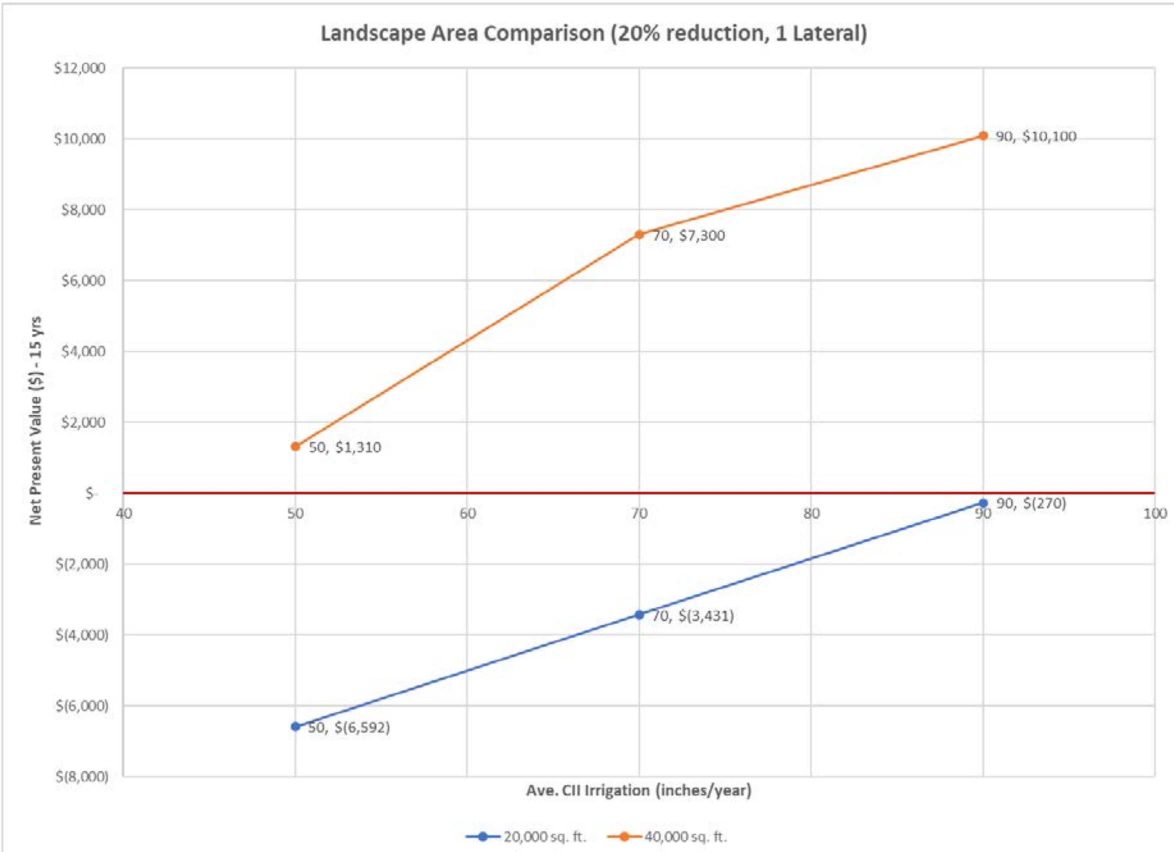


The following observations can be made from the data presented in Graph 1:

- For **40,000** square feet of CII landscape area, and an assumed 10% irrigation reduction from DIM installation, NPV’s are only **positive** for accounts with more than **80 inches** of applied irrigation.

- For **20,000** square feet of CII landscape area, and an assumed 10% irrigation reduction from DIM installation, NPV's are **negative** for **ALL** accounts regardless of the amount of irrigation water applied.

Graph 2: *NPV comparison of 40,000 and 20,000 CII landscape area with variable applied landscape irrigation representing a 20% reduction in water use and one tie-in to the DIM*

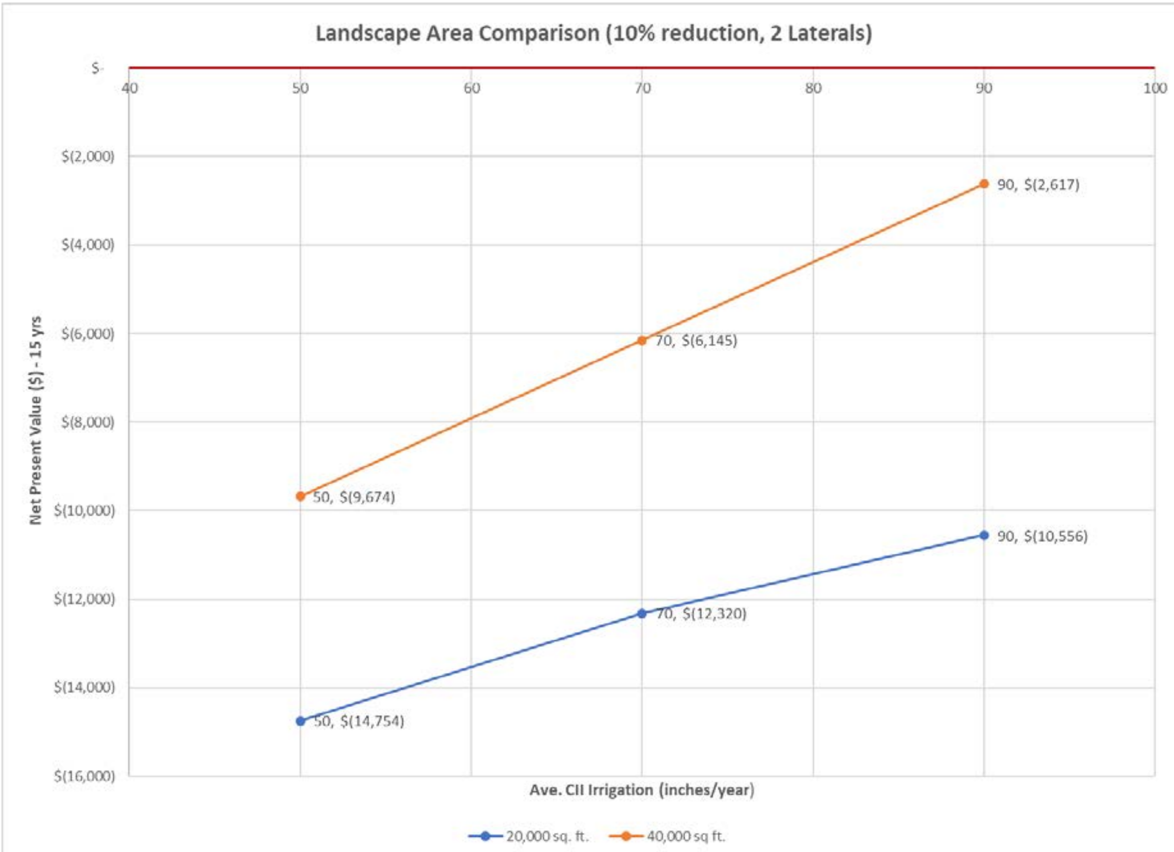


The following observations can be made from the data presented in Graph 2:

- For **40,000** square feet of CII landscape area, and an assumed 20% irrigation reduction post DIM installation, NPV's are **positive** for **ALL** scenarios of applied irrigation water.
- For **20,000** square feet of CII landscape area, and an assumed 20% irrigation reduction post DIM installation, NPV's are **negative** for **ALL** scenarios of applied irrigation water.
- For **20,000** square feet of CII landscape area, and an assumed 20% irrigation reduction post DIM installation, positive NPV's can be achieved for sites that apply more than **90 inches** of irrigation water.

Graphs 3 and 4 below compare the net present value in dollars over a **15-year** project life for two CII landscape areas of 20,000 and 40,000 square feet respectively and assuming an avoided cost of water of $700. However, unlike Graphs 1 and 2, Graphs 3 and 4 assume two lateral tie-ins to the DIM. As the data shows, NPV's decline further when two-tie ins are considered in the economic analysis.

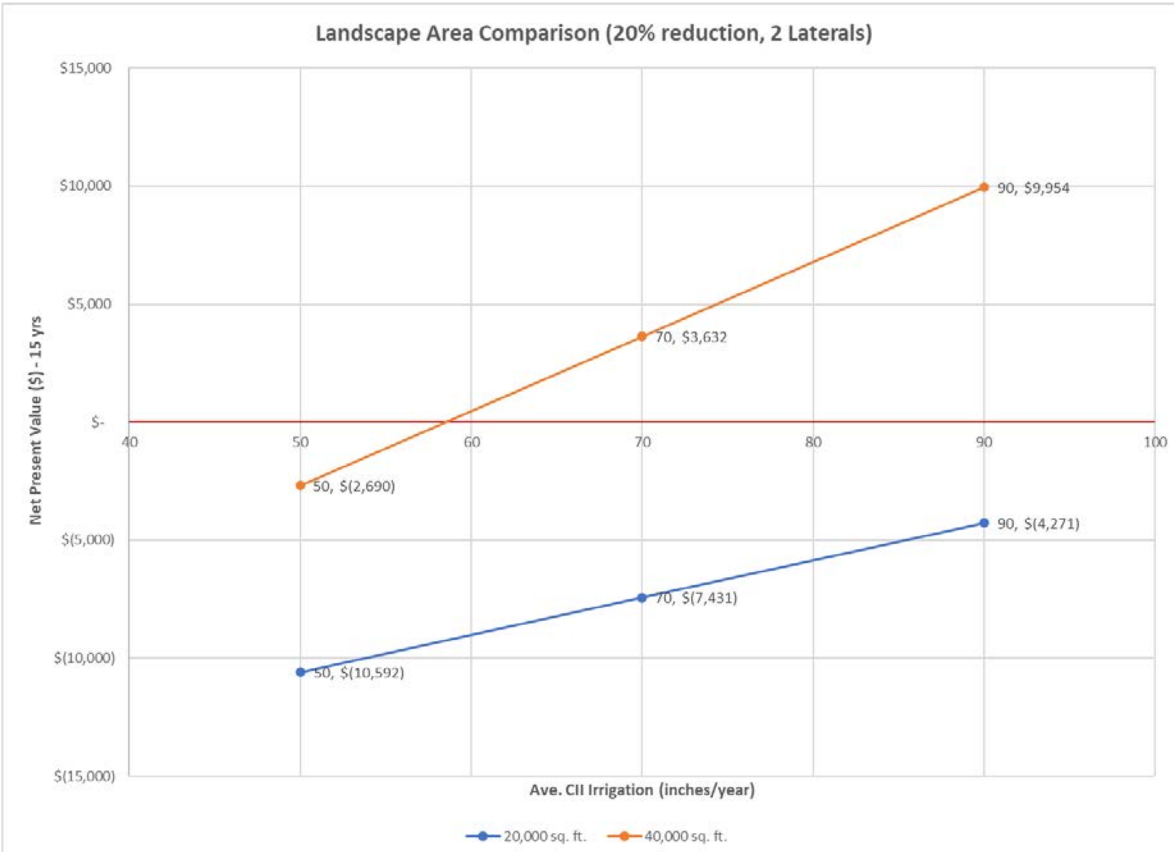
Graph 3: *NPV comparison of 40,000 and 20,000 CII landscape area with variable applied landscape irrigation representing a 10% reduction in water use and two tie-ins to the DIM*



The following observations can be made from the data presented in Graph 3:

- For **40,000** square feet of CII landscape area, and an assumed 10% irrigation reduction from DIM installation, NPV's are **negative** for **ALL** scenarios regardless of the amount of irrigation water applied.
- For **40,000** square feet of CII landscape area, and an assumed 10% irrigation reduction post DIM installation, positive NPV's can be achieved for sites that apply more than **100 inches** of irrigation water.
- For **20,000** square feet of CII landscape area, and an assumed 10% irrigation reduction from DIM installation, NPV's are **negative** for **ALL** scenarios regardless of the amount of irrigation water applied.

Graph 4: *NPV comparison of 40,000 and 20,000 CII landscape area with variable applied landscape irrigation representing a 20% reduction in water use and two tie-ins to the DIM*



The following observations can be made from the data presented in Graph 4:

- For **40,000** square feet of CII landscape area, and an assumed 20% irrigation reduction post DIM installation, NPV's are **positive** for scenarios approaching **60 inches** of applied irrigation water.
- For **20,000** square feet of CII landscape area, and an assumed 20% irrigation reduction post DIM installation, NPV's are **negative** for **ALL** scenarios of applied irrigation water.
- For **20,000** square feet of CII landscape area, and an assumed 20% irrigation reduction post DIM installation, positive NPV's can be achieved for sites that apply well above **100 inches** of irrigation water.

Additional Theoretical Findings

The following additional findings are for scenarios evaluated at a **15-year** project life:

- There was only one iteration under which the NPV was **positive** for 3 lateral tie-ins: 40,000 square feet, 90 inches of annual irrigation representing a 20% irrigation reduction.
- All scenarios for 10 lateral tie-ins had a **negative** NPV and ranged from approximately -$36,000 to -$47,000.

The following additional findings are for scenarios evaluated at a **20-year** project life:

- There was only one iteration under which the NPV was **positive** for a 20,000 square foot landscape: one lateral tie-in, 90 inches of annual irrigation representing a 20% irrigation reduction.
- Above 50 inches of applied irrigation water representing 20% irrigation reductions, NPVs were **positive** for 3 lateral tie-ins for 40,000 square feet of landscape area.

Supplier CII-DIM Feasibility Results

In total, forty-eight model iterations were completed for two 20,000 square foot and 40,000 square foot CII landscapes for three geographically distinct water suppliers in CA. Select findings are summarized and presented in Graphs 5 -10 below. See Table 5 for a breakdown of scenarios presented in each of the graphs (see Appendix B for additional graphs).

Table 5: Scenarios as presented in Graphs 5 - 8

Graph No.	Provider	10% Reduction	20% Reduction	1 Lateral	2 Lateral
5	Northern Coast	✓		✓	
6	East Bay	✓		✓	
7	Southern Coast	✓		✓	
8	Northern Coast		✓	✓	
9	East Bay		✓	✓	
10	Southern Coast		✓	✓	

A comparison of the approximate annual inches of irrigation applied *prior* to DIM installation to **20,000 square feet** of landscape area that would result in a positive NPV for splitting meters is presented in Table 6 below. The following conditions apply to these results:

- 15-year period
- One or two lateral tie-ins to the DIM
- **10 %** reduction in irrigation (since smaller sites tend to have less on-site water management).

Table 6: Comparison of annual applied MUM irrigation in inches on **20,000 square feet** of landscape area required to achieve a **positive NPV** for meter splitting with one or two lateral tie-ins to the DIM for different suppliers.

Agency	Landscape Area	1 Lateral	2 Laterals
Northern Coast	20,000 ft^2	>77 inches	>77 inches
East Bay	20,000 ft^2	>93 inches	>99 inches
Southern Coast	20,000 ft^2	*Never positive	*Never positive
Theoretical	20,000 ft^2	*Never positive	*Never positive

A comparison of the approximate annual inches of irrigation applied *prior* to DIM installation to **40,000 square feet** of landscape area that would result in a positive NPV for splitting meters is presented in Table 7 below. The following conditions apply to these results:

- 15-year period
- One or two lateral tie-ins to the DIM
- **20 %** reduction in irrigation (since larger sites are more likely to have on-site water management).

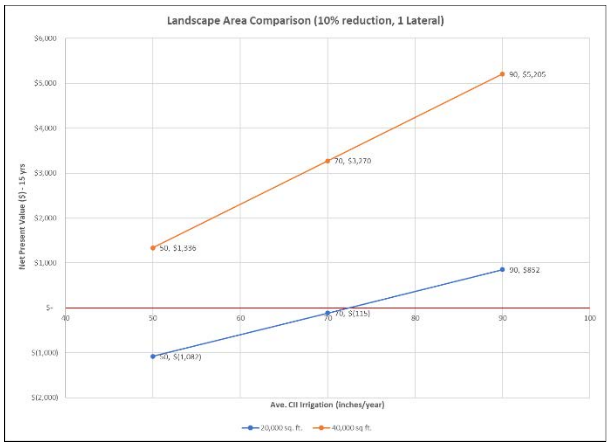
Table 7: Comparison of annual applied MUM irrigation in inches on **40,000 square feet** of landscape area required to achieve a **positive NPV** for meter splitting with one or two lateral tie-ins to the DIM for different suppliers.

Agency	Landscape Area	1 Lateral	2 Laterals
Northern Coast	40,000 ft^2	>48 inches	>48 inches
East Bay	40,000 ft^2	>72 inches	>84 inches
Southern Coast	40,000 ft^2	*Never positive	*Never positive
Theoretical	40,000 ft^2	>100	>144

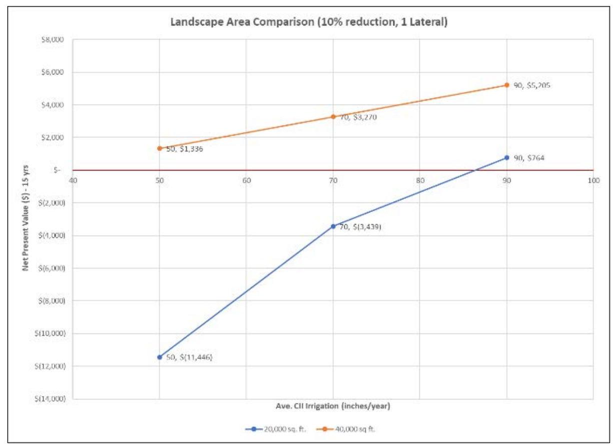
The differences in cost effectiveness between the three water suppliers analyzed is driven primarily by differences in their wastewater rates. In particular, the Northern Coast supplier has a relatively high variable wastewater charge, while the Southern Coast supplier has no variable wastewater charge, and the East Bay supplier falls in the middle. This translates into greater savings on customer water bills after meter splitting for suppliers with higher variable wastewater charges, and a correspondingly smaller incentive required from the supplier to meet the specified payback thresholds for the customer.

Secondary drivers for differences between the suppliers include the retail cost of water, the avoided cost of produced water, and the capital costs for meter splitting.

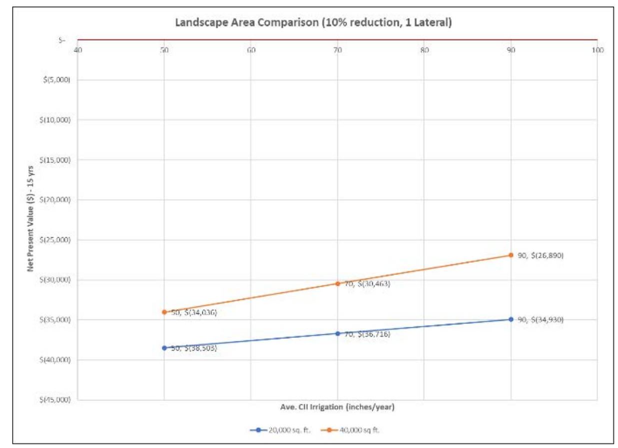
Graphs 5-7: *NPV comparison of 40,000 and 20,000 CII landscape area for three CA water suppliers with variable landscape irrigation applied representing a **10% reduction** in water use and **one tie-in** to the DIM. Note that graphs are staggered to align the red threshold of positive NPV.*



Graph 5: Northern Coast

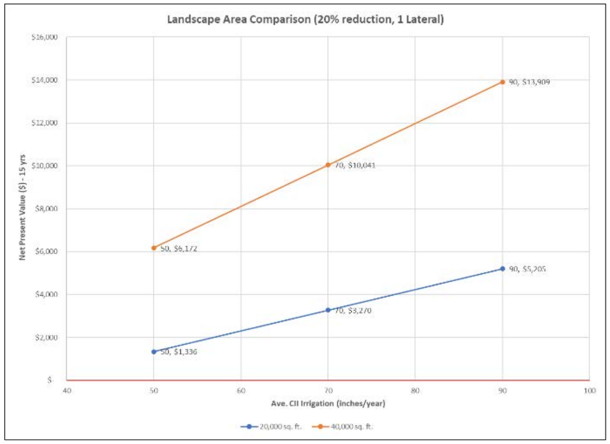


Graph 6: East Bay

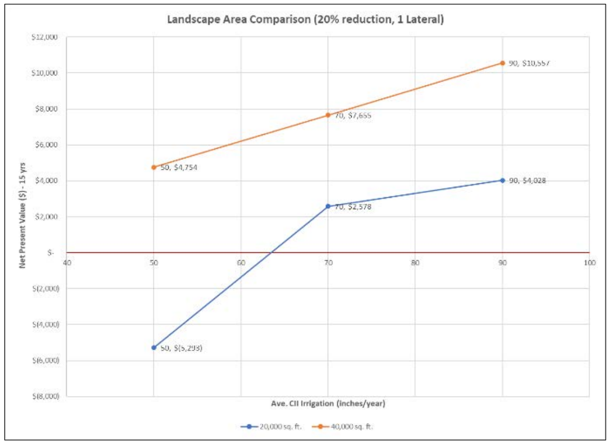


Graph 7: Southern Coast

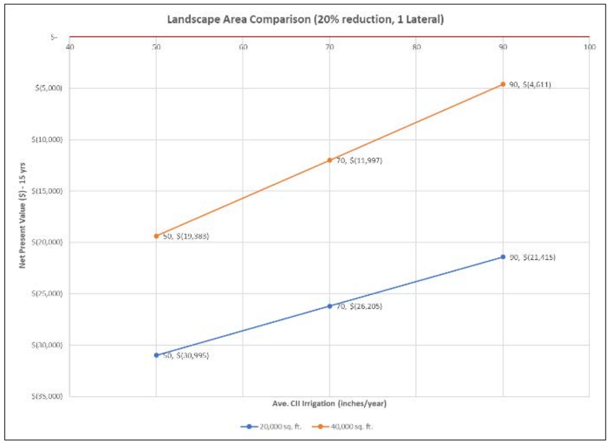
Graphs 8-10: *NPV comparison of 40,000 and 20,000 CII landscape area for three CA water suppliers with variable landscape irrigation applied representing a **20% reduction** in water use and **one tie-in** to the DIM. Note that graphs are staggered to align the red threshold of positive NPV.*



Graph 8: Northern Coast



Graph 9: East Bay



Graph 10: Southern Coast

Discussion and Additional Considerations

We find that, in most of the scenarios examined for CII landscapes of 20,000 square feet, meter splitting does not appear to be cost effective from a pure avoided water cost perspective. That said, determining feasibility is always site and agency specific, and there are many factors that ultimately determine whether a project makes sense, including an agency's avoided cost of water estimates. Under the assumptions considered in this analysis, it appears that sites that are large (40,000 square feet and above), where splitting requires minimal construction on the customer side, and where irrigation water is reduced, meter splitting may be a cost-effective approach.

One of the largest uncertainties in the analysis presented here is around the amount of water saved when splitting a meter. Two scenarios were examined here: 10 and 20 percent reductions in irrigation water use. Exactly how large water savings are likely to be is unknown, but the consensus among experts consulted is that a 20 percent reduction is very large, and is very unlikely to occur just because of a meter split and the additional information on water demand that split metering provides to account owners. Expert opinion was that 20 percent savings would only be achievable through substantial additional investment on top of the meter split, such as the application of water budget-based rates, water management plans, or other best management practices. Further, the data presented in Tables 6 and 7 seem to suggest that some candidate sites for cost-effective DIM installation would require additional water savings beyond 10 or 20 percent in order to be considered efficient, based on the 50 inches of average annual plant water required in California for cool season turf with a plant factor of 1.0.

One way to provide empirical evidence for the amount of water savings that could be expected purely from DIM installation would be to look at studies on the effect of switching from unmetered billing to metered billing. This is an analogous situation in which account owners gain additional feedback about their water use in terms of information and prices. One could assume that meter splitting would probably have a smaller effect than the initial move from unmetered to metered because account owners subject to a meter split already have some feedback about their water use and are gaining only a proportional increase in the amount of information they have. Two studies from the UK provide some measurements of the water saved when moving to metered billing, with one finding 22% savings[1] and another finding 12.5% savings[2]. If the assumption is correct that meter splitting (in the absence of additional BMPs) would result in lower savings than a switch to metered billing, then one can expect to see somewhat less than 12-22% savings, though exactly how much less is unknown. Note however, that this assumption is suppositional at best and additional data is necessary to confirm these assumptions.

[1] Ornaghi, C., & Tonin, M. (2021). The effects of the universal metering programme on water consumption, welfare and equity. *Oxford Economic Papers*, *73*(1), 399-422.
[2] Herrington, P. (2007). Waste not, want not, sustainable water tariffs. *World Wildlife Fund. Godalming. UK*.

Another area for further research would be into the value of additional benefits from having a DIM in place. The analysis here counts only two benefits: the value of avoided water costs, and the value of reduced runoff from overirrigation. There are several other benefits of DIMs not included because of the difficulty in quantifying their benefit. These include, but are not limited to:

- Compatibility with budget-based irrigation rates
- Easier enforcement of irrigation restrictions during a water shortage
- Compatibility with recycled water or other non-potable water products
- Increased standardization of CII customers for more accurate benchmarking and rate setting
- Increased accuracy and durability from the use of more appropriately sized meters.
- Other unforeseen benefits provided by better and more granular data

Finally, it is worth reiterating that the analysis here assumes that water suppliers will reimburse customers for one-time and recurring costs of DIM installation, up to the point where the conversion makes economic sense for the customer on a 5-year payback period. This is a largely untested assumption in reality, and it remains to be seen what sorts of mandates and incentives are likely to result in effective meter splitting programs.

APPENDIX A

Feasibility Tool Input Data for 3 California Water Agencies

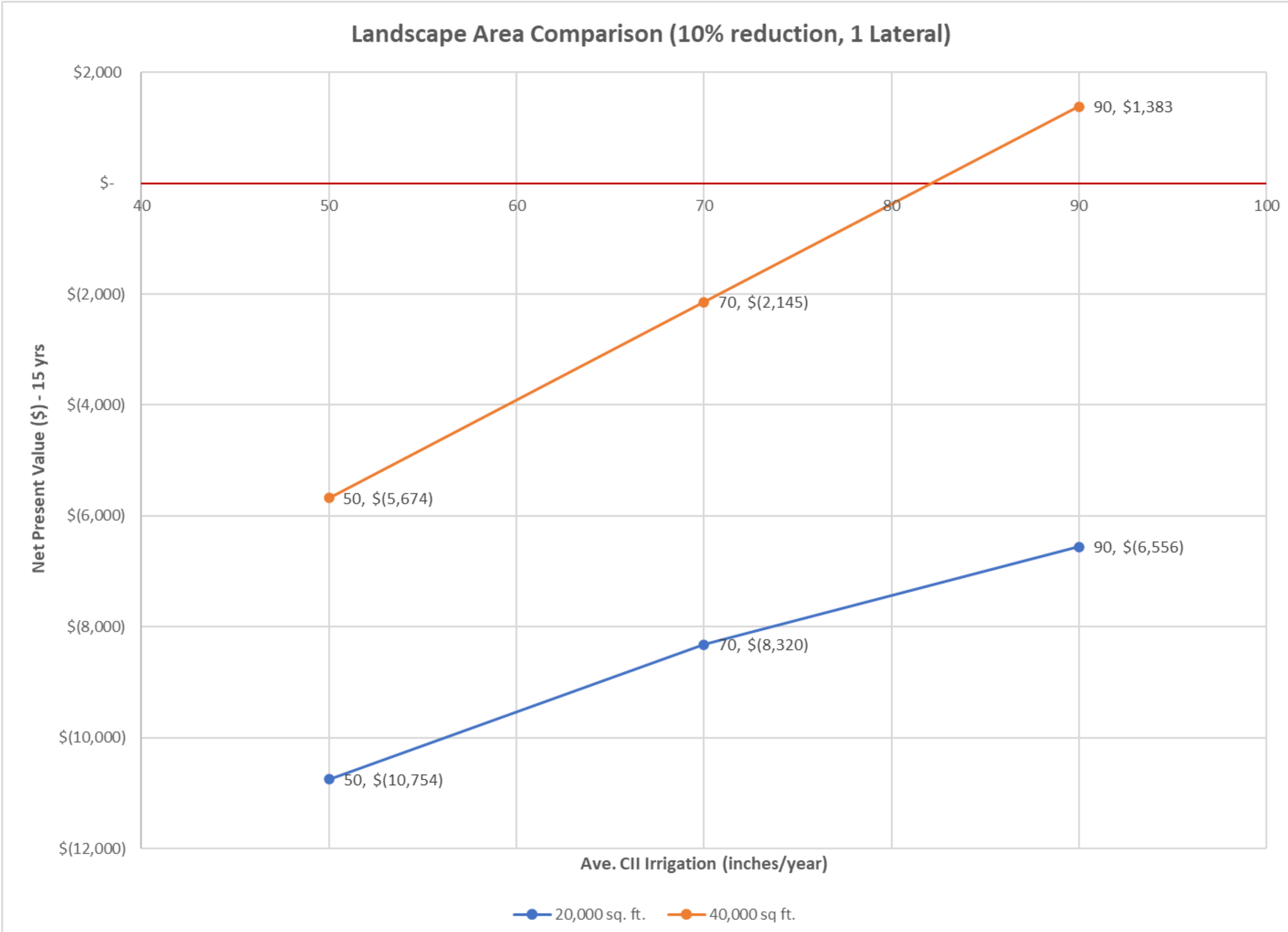
Supplier Feasibility Tool Inputs

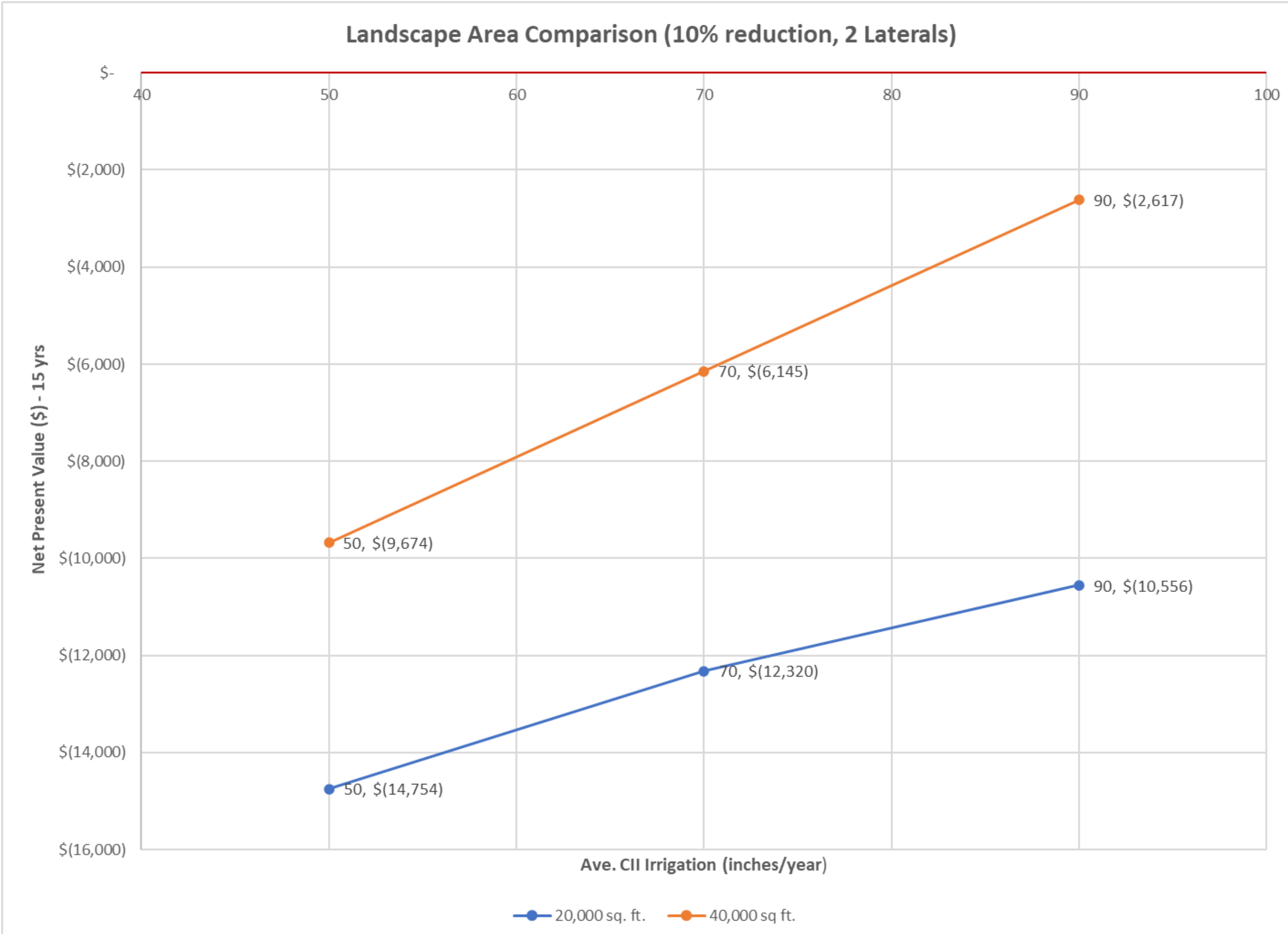
Tool Input	**Northern Coast**	**East Bay**	**Southern Coast**
Discount Rate	2.50%	2.50%	2.50%
Useful Life	15, 20	15, 20	15, 20
Water Rate (HCF)	$ 4.74	$ 5.37	$ 3.59
Irrigation Rate/ Water Rate	96%	100	100%
Volume Sewer (HCF)	$ 11.31	$ 6.87	$ -
% of Water Use	50%	50%	0%
DIM Volume Sewer (HCF)	$ -	$ -	$ -
DIM Rate/ Water Rate	$ -	$ -	$ -
Annual Sewer Reduction	$ -	$ -	$ -
CII Annual Water Use (inches)	50, 70, 90	50, 70, 90	50, 70, 90
Overwatering %	10, 20	10, 20	10, 20
Landscape Area (square feet)	20K, 40K	20K, 40K	20K, 40K
SW benefit/ AF	$0	$0	$20
Avoided Cost of Water	$ 1,000	$ 750	$1,143
Agency Program Costs	$ 2,000	$ 1,500	$ 1,500
Agency Account Mgmt. Costs	$ 1,500	$ 1,000	$ 1,000
DIM size (inches)	1.5	1.5	1.5
Ave. daily DIM service fee	$1.99	$ 4.03	$ 1.70
Annual backflow fee	$139.00	$121.95	$ 50.00
No. DIM installed	1	1	1
Bill reduction %	10%	10%	10%
Customer ROI %	20%	20%	20%
Meter installation fee	$ 2,475	$ 15,500	$ 1,095
Meter permits and inspection	$ 2,253	$ -	$ 800
Backflow installation	$ 1,000	$ -	$ 100
Discrete areas	1,2,3,10	1,2,3,10	1,2,3,10
Capital per discrete area tie-in	$ 5,000	5000	$ 10,000
Capital planning & mgmt.	$ 1,500	$ 500	$ 20,000

APPENDIX B

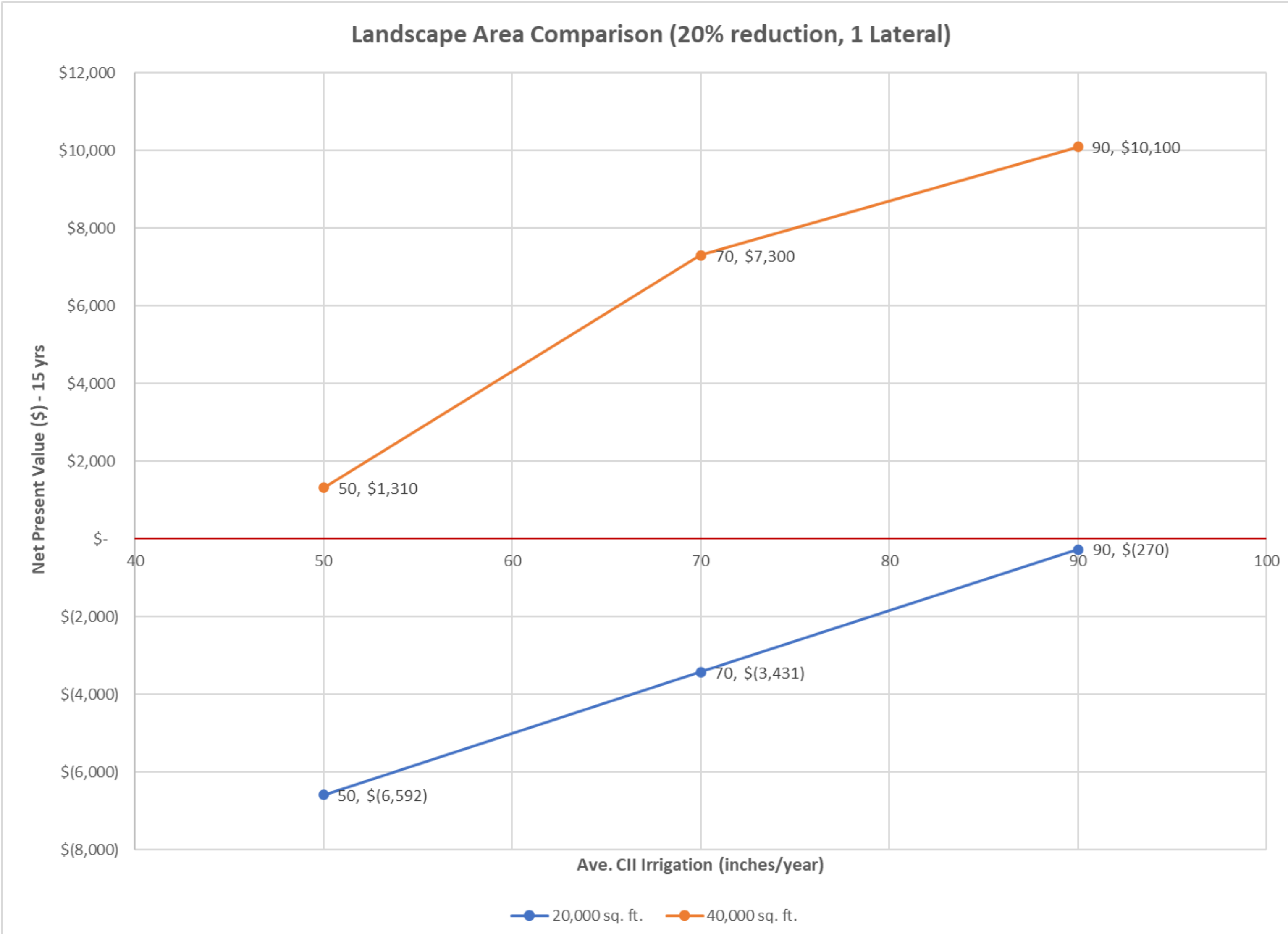
Model Results Presented in Graphs

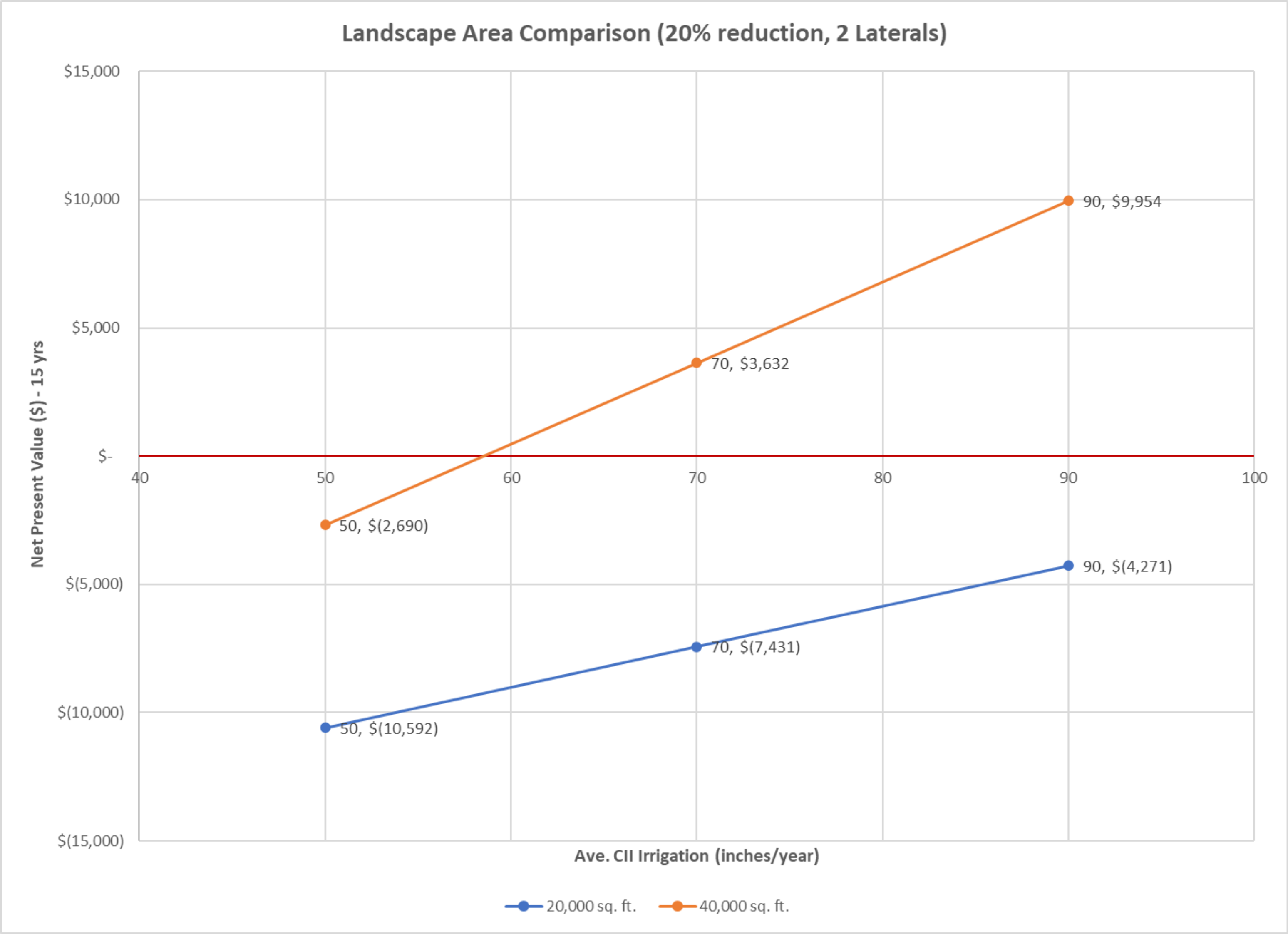
1.) Theoretical CII-DIM Feasibility Analysis



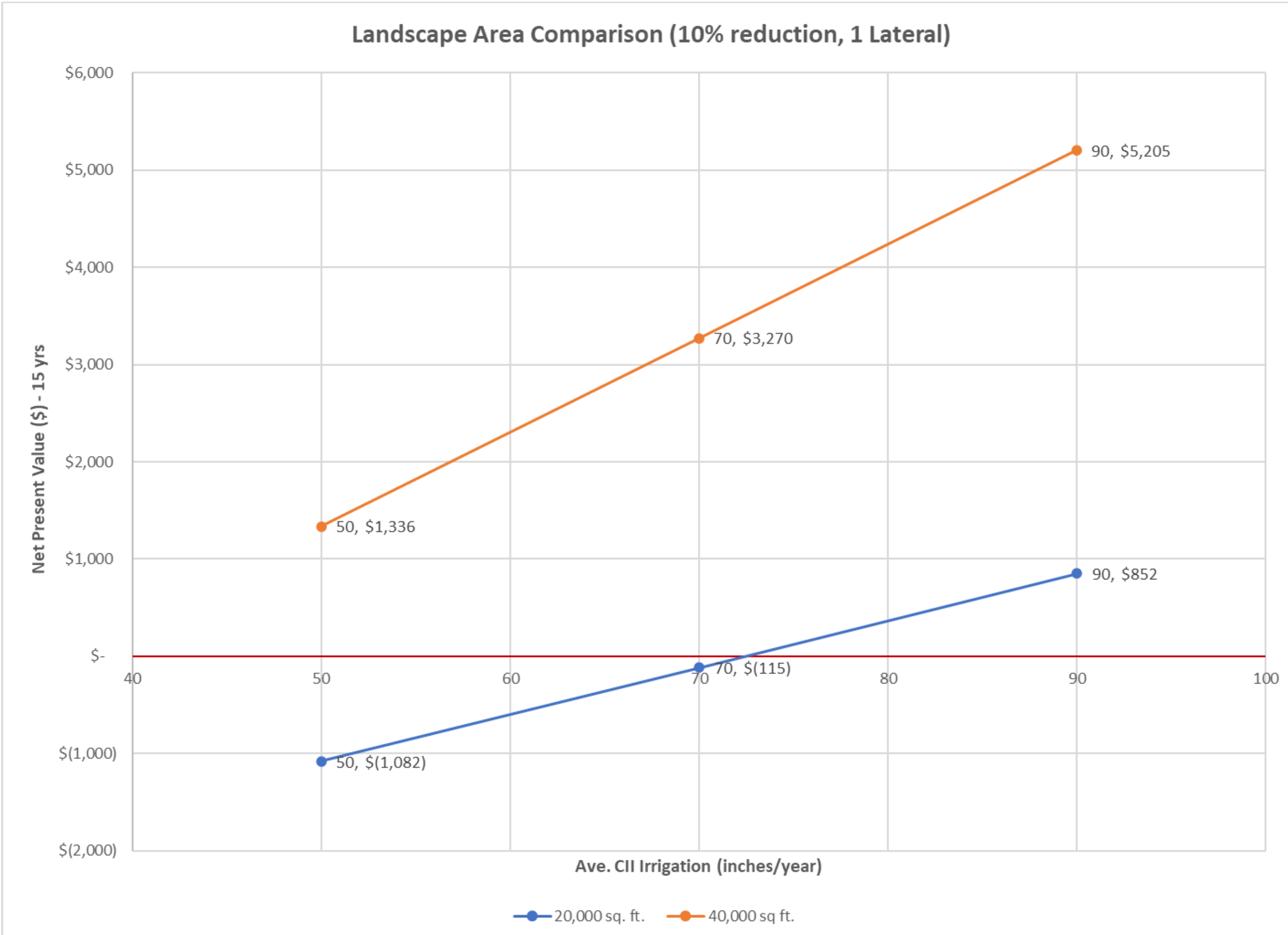


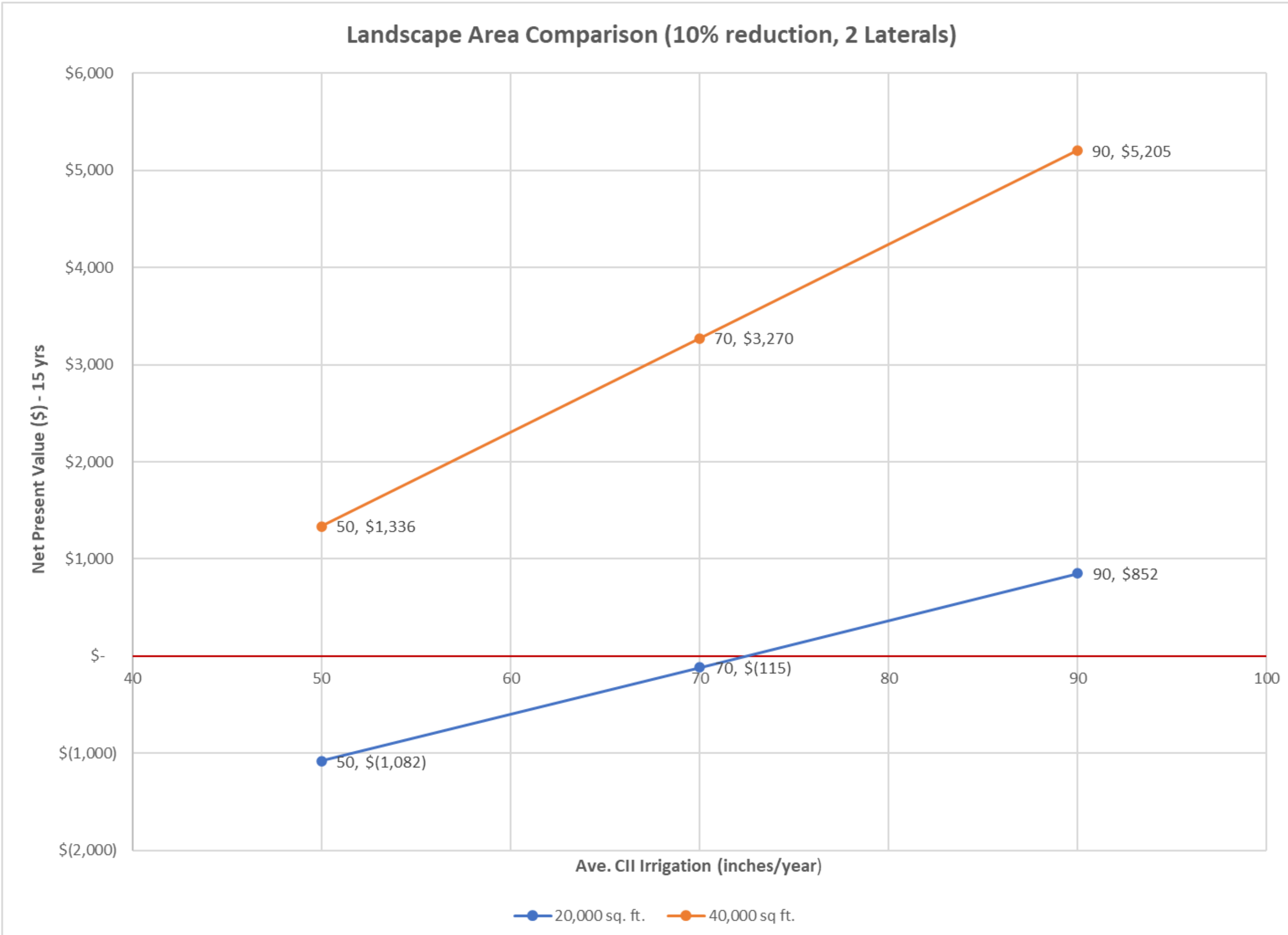
Landscape Area Comparison (10% reduction, 2 Laterals)
$-
$(2,000)
$(4,000)
$(6,000)
$(8,000)
$(10,000)
$(12,000)
$(14,000)
$(16,000)
Net Present Value ($) - 15 yrs
40
50
60
70
80
90
100
90, $(2,617)
70, $(6,145)
50, $(9,674)
90, $(10,556)
70, $(12,320)
50, $(14,754)
Ave. CII Irrigation (inches/year)
20,000 sq. ft.
40,000 sq ft.

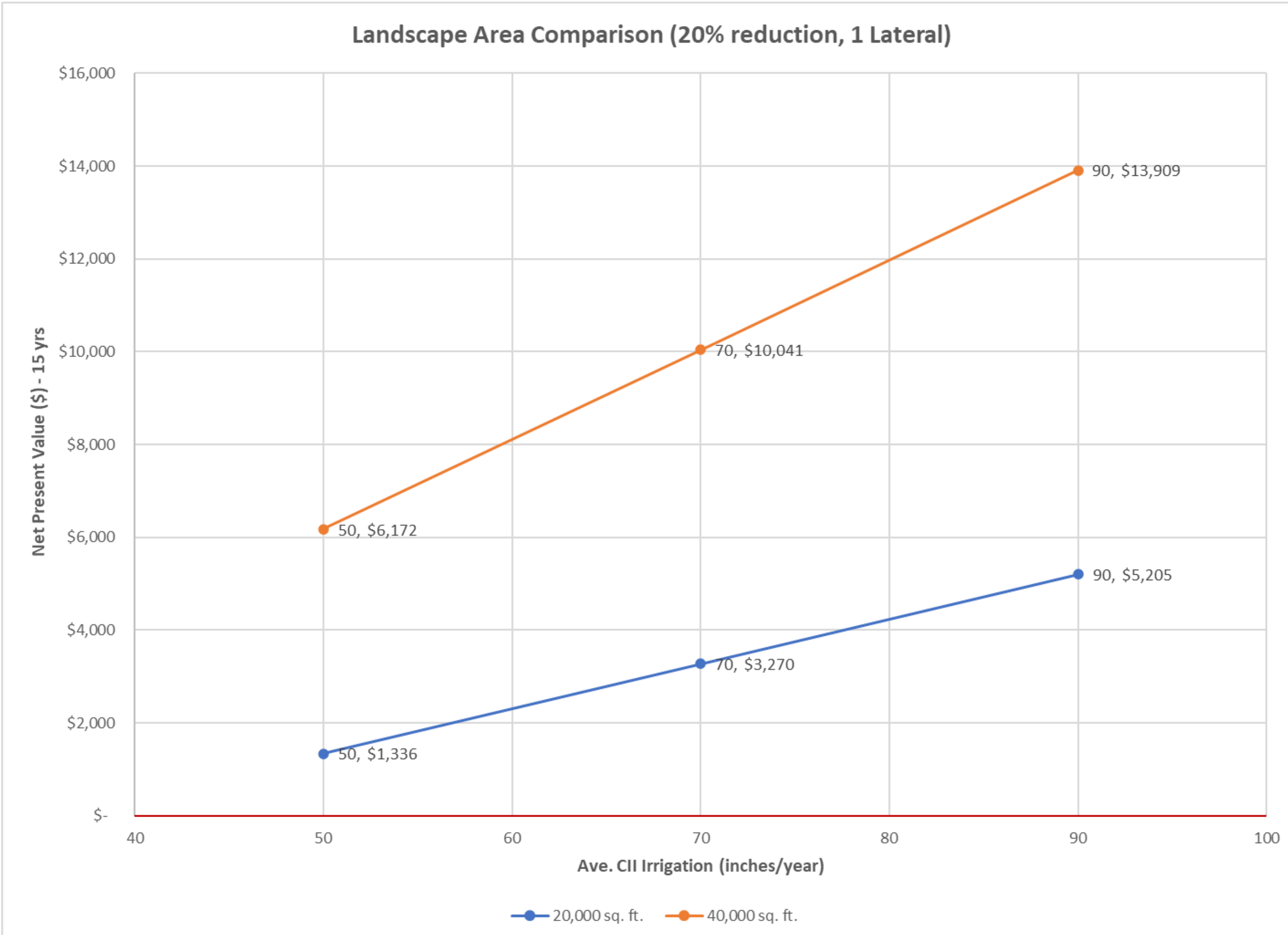

Landscape Area Comparison (20% reduction, 1 Lateral)
Net Present Value ($) - 15 yrs
$12,000
$10,000
$8,000
$6,000
$4,000
$2,000
$-
$(2,000)
$(4,000)
$(6,000)
$(8,000)
40
50
60
70
80
90
100
Ave. CII Irrigation (inches/year)
90, $10,100
70, $7,300
50, $1,310
90, $(270)
70, $(3,431)
50, $(6,592)
20,000 sq. ft.
40,000 sq. ft.

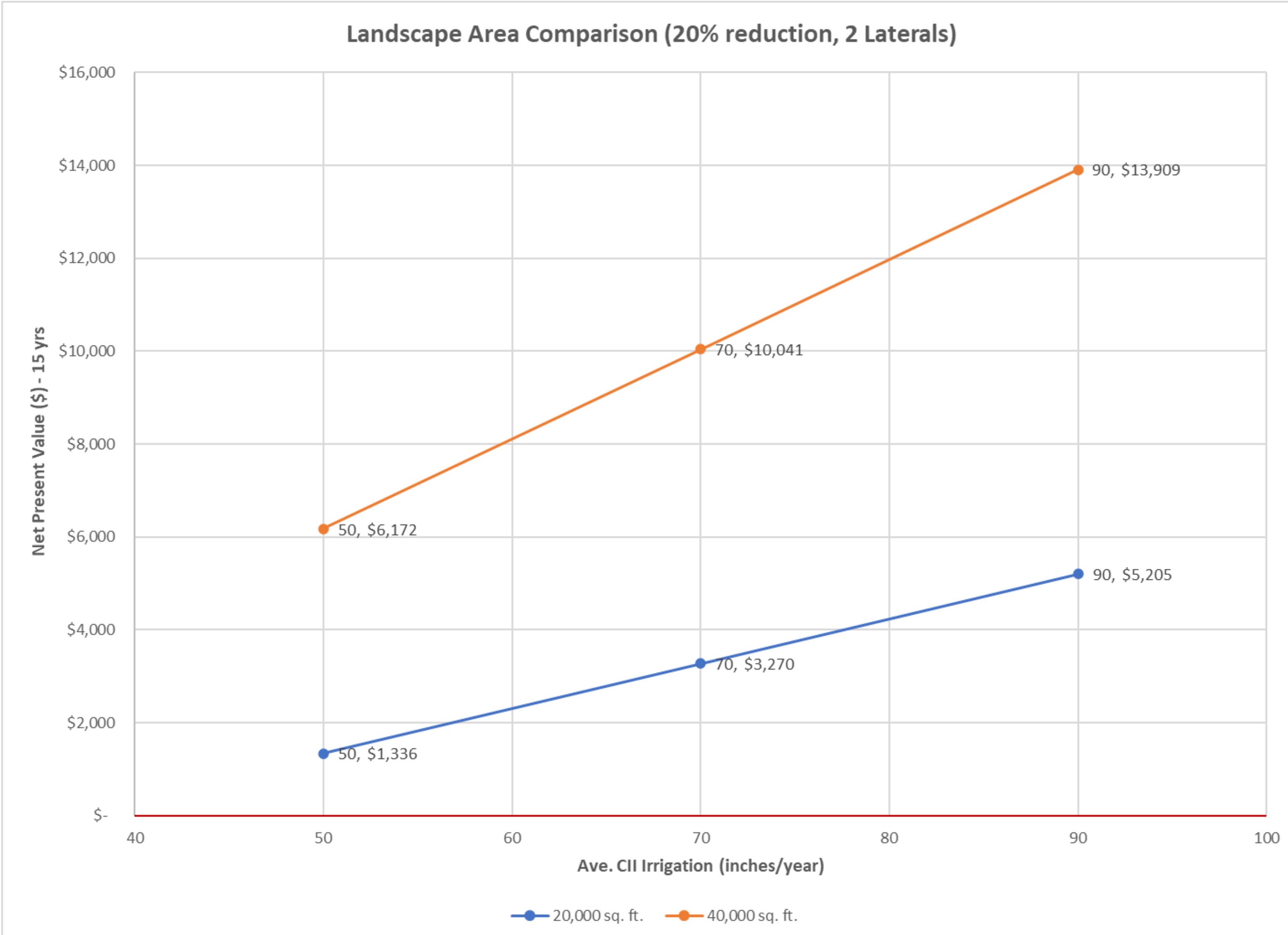

Landscape Area Comparison (20% reduction, 2 Laterals)
$15,000
$10,000
$5,000
$-
$(5,000)
$(10,000)
$(15,000)
Net Present Value ($) - 15 yrs
40
50
60
70
80
90
100
Ave. CII Irrigation (inches/year)
90, $9,954
70, $3,632
50, $(2,690)
90, $(4,271)
70, $(7,431)
50, $(10,592)
20,000 sq. ft.
40,000 sq. ft.

2.) Northern Coast CII-DIM Feasibility Analysis

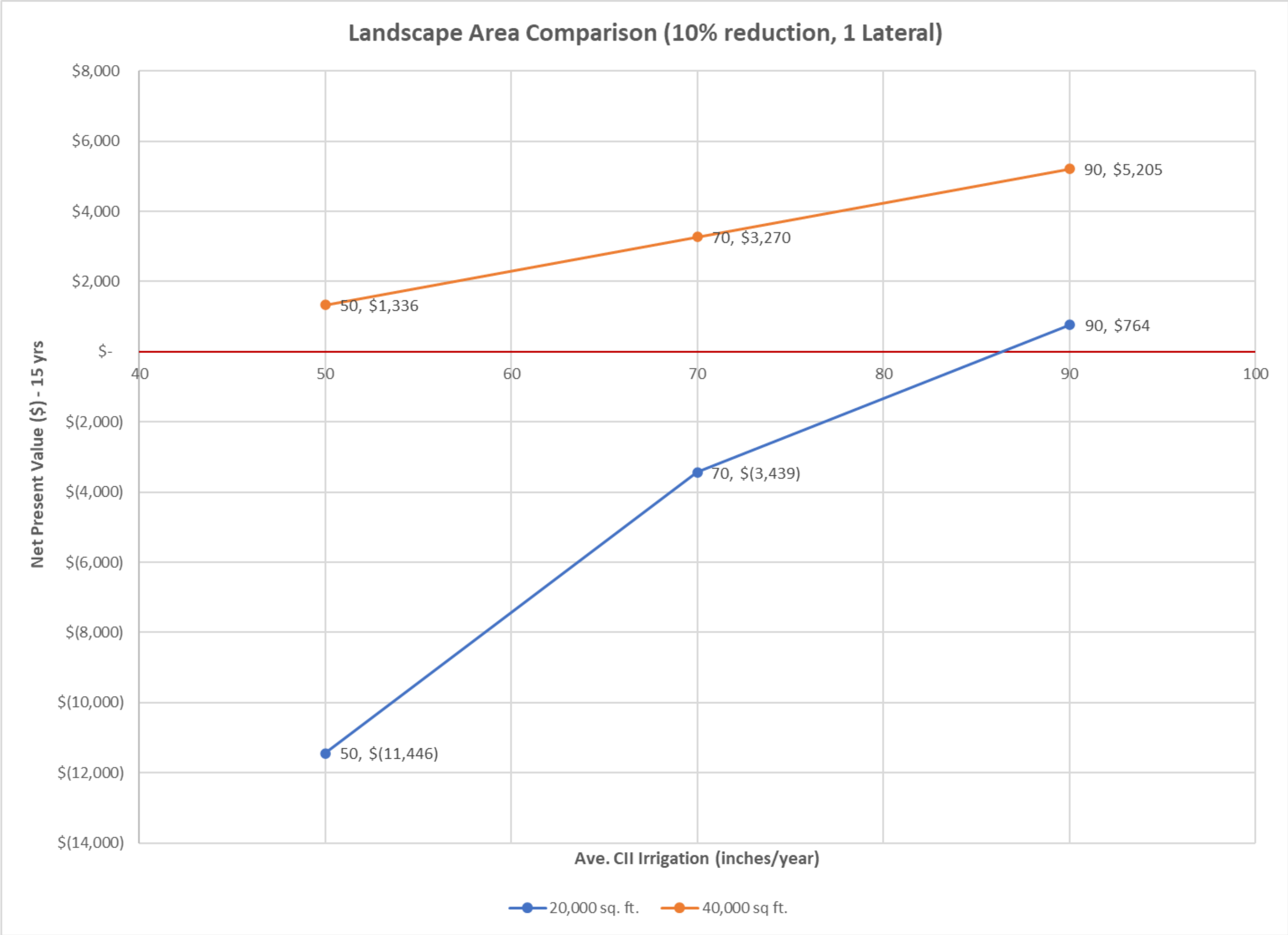


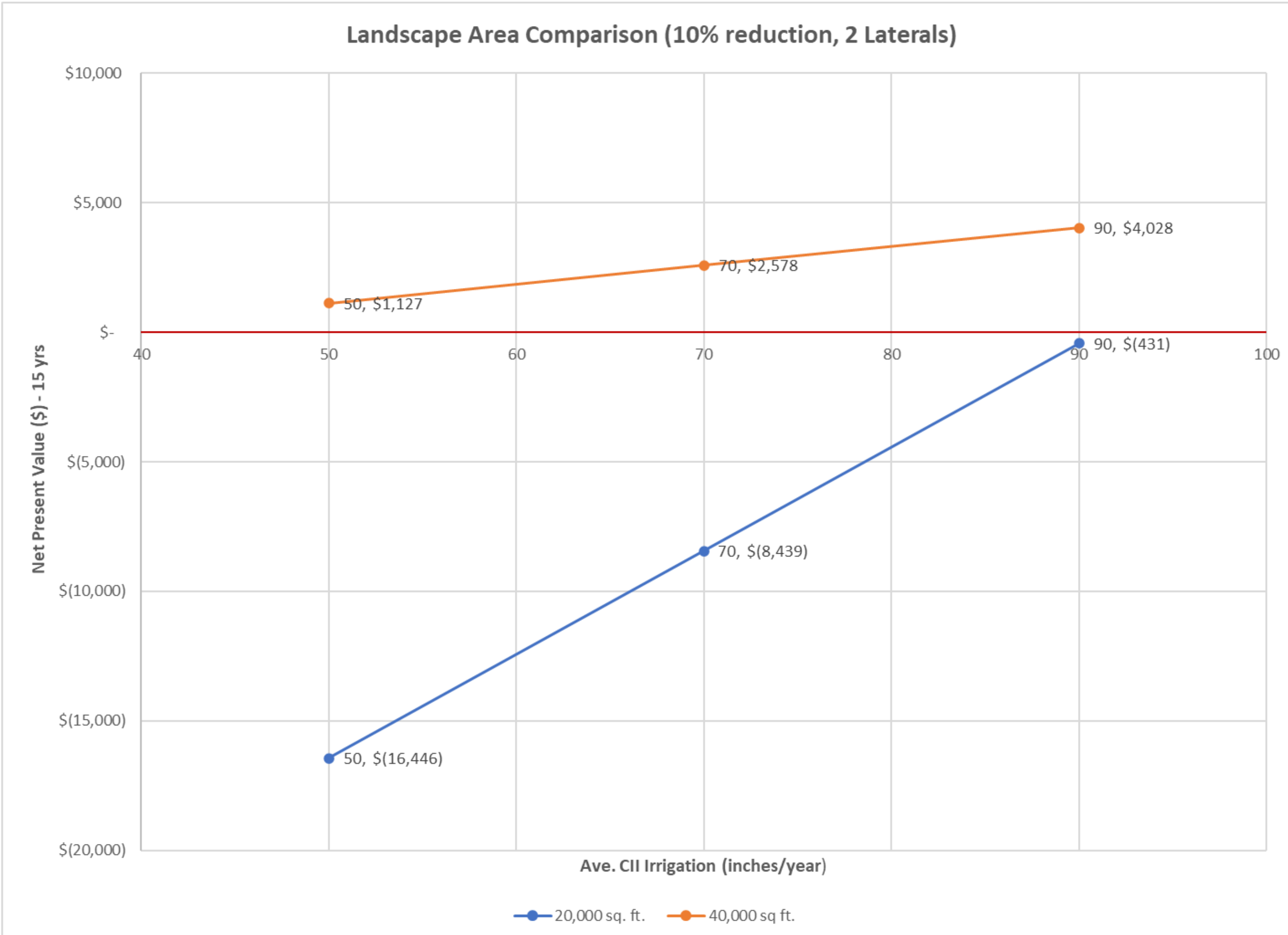

Landscape Area Comparison (10% reduction, 2 Laterals)
Net Present Value ($) - 15 yrs
$6,000
$5,000
$4,000
$3,000
$2,000
$1,000
$-
$(1,000)
$(2,000)
40
50
60
70
80
90
100
90, $5,205
70, $3,270
50, $1,336
90, $852
70, $(115)
50, $(1,082)
Ave. CII Irrigation (inches/year)
20,000 sq. ft.
40,000 sq ft.

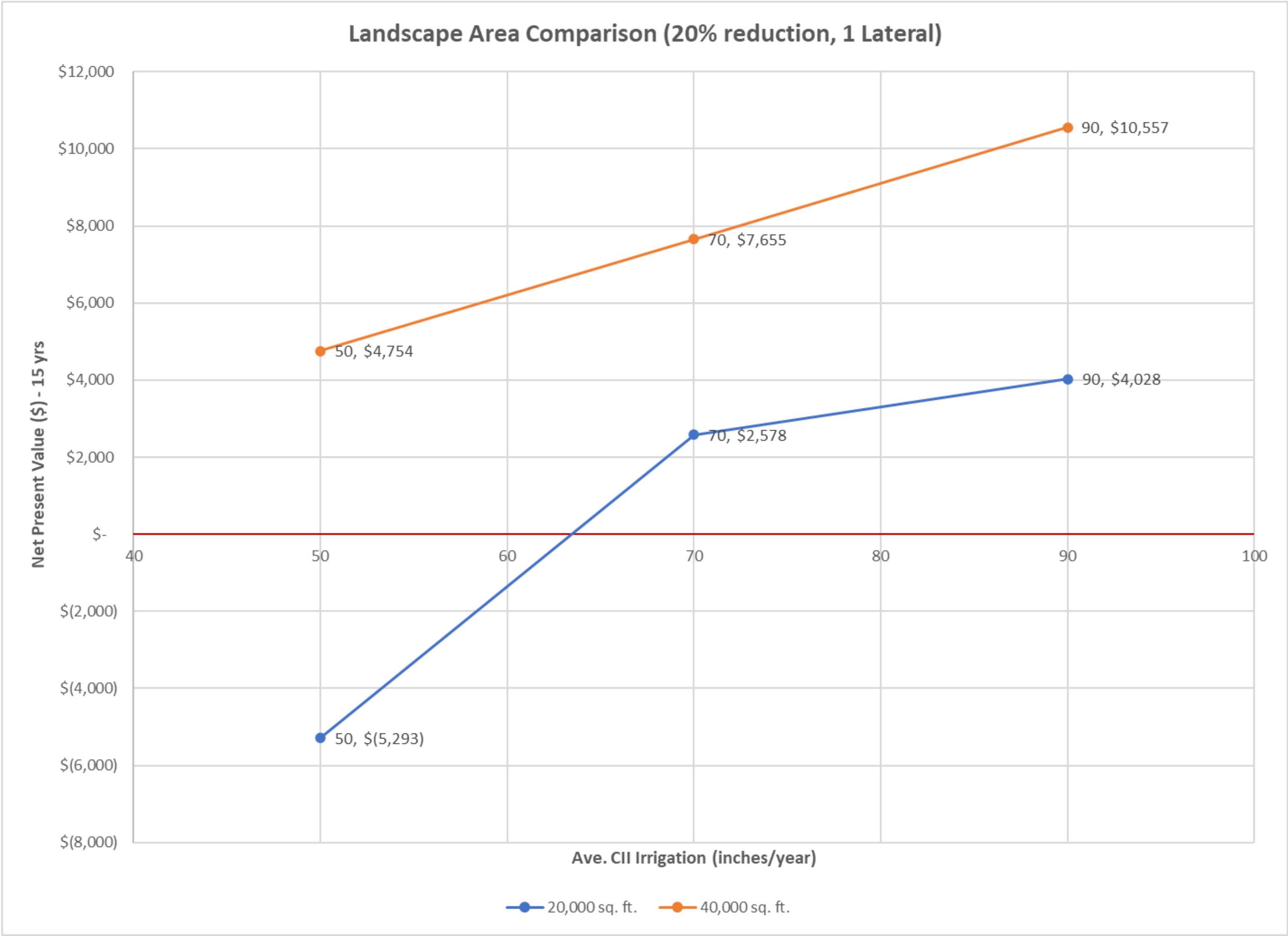

Landscape Area Comparison (20% reduction, 1 Lateral)
Net Present Value ($) - 15 yrs
$16,000
$14,000
$12,000
$10,000
$8,000
$6,000
$4,000
$2,000
$-
40
50
60
70
80
90
100
Ave. CII Irrigation (inches/year)
90, $13,909
70, $10,041
50, $6,172
90, $5,205
70, $3,270
50, $1,336
20,000 sq. ft.
40,000 sq. ft.

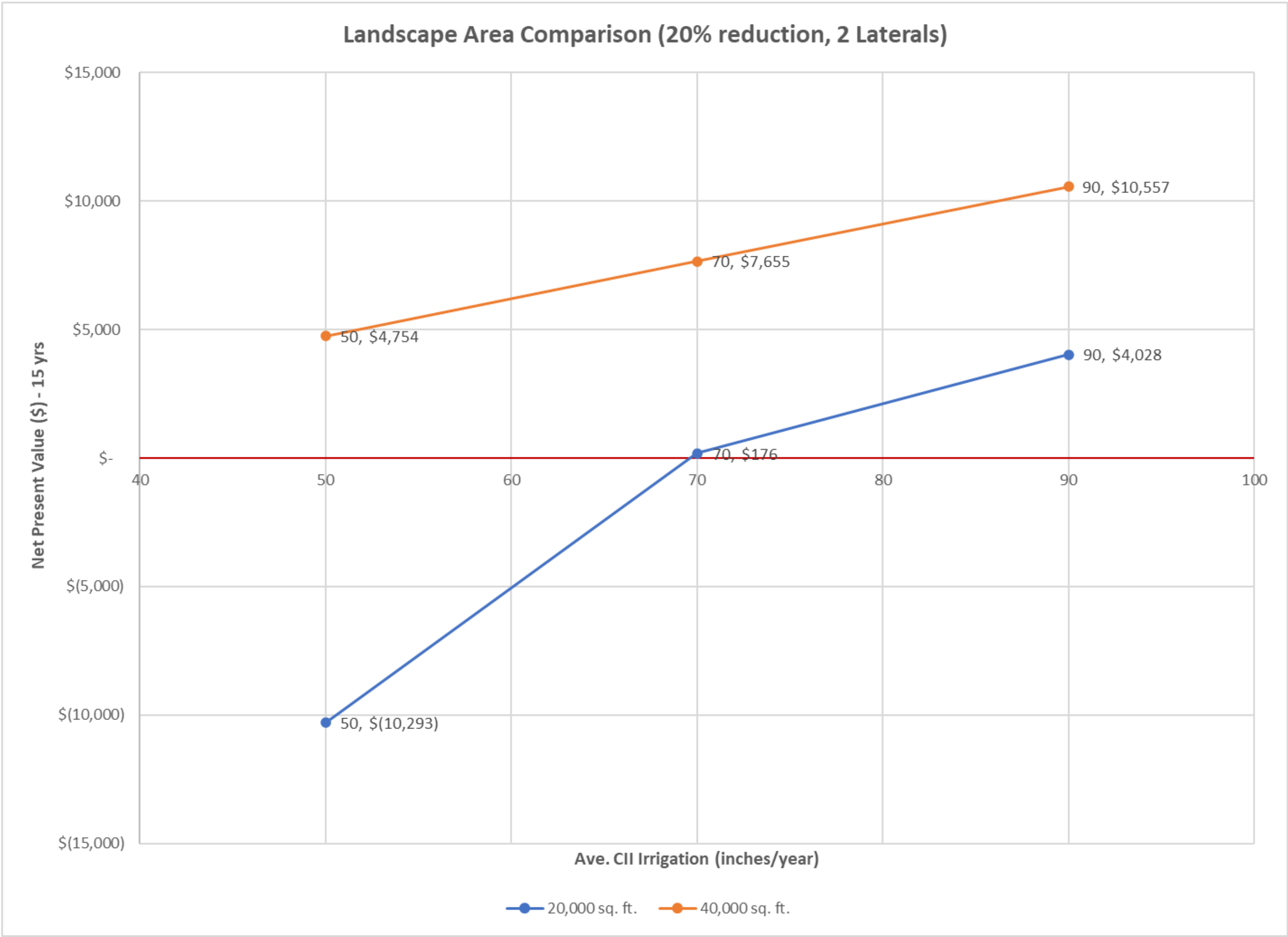

Landscape Area Comparison (20% reduction, 2 Laterals)
Net Present Value ($) - 15 yrs
$16,000
$14,000
$12,000
$10,000
$8,000
$6,000
$4,000
$2,000
$-
40
50
60
70
80
90
100
Ave. CII Irrigation (inches/year)
90, $13,909
70, $10,041
50, $6,172
90, $5,205
70, $3,270
50, $1,336
20,000 sq. ft.
40,000 sq. ft.

3.) East Bay CII-DIM Feasibility Analysis

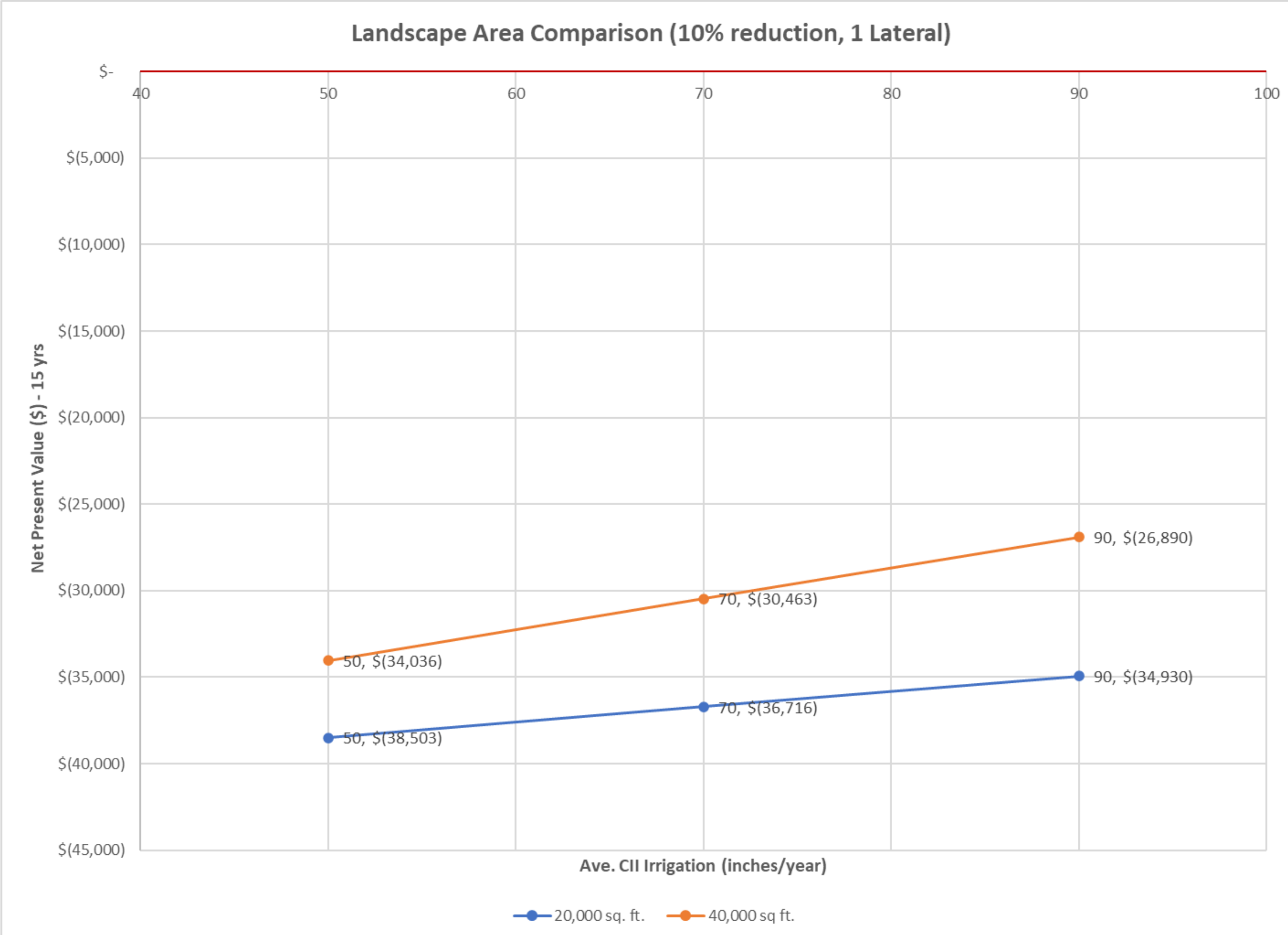


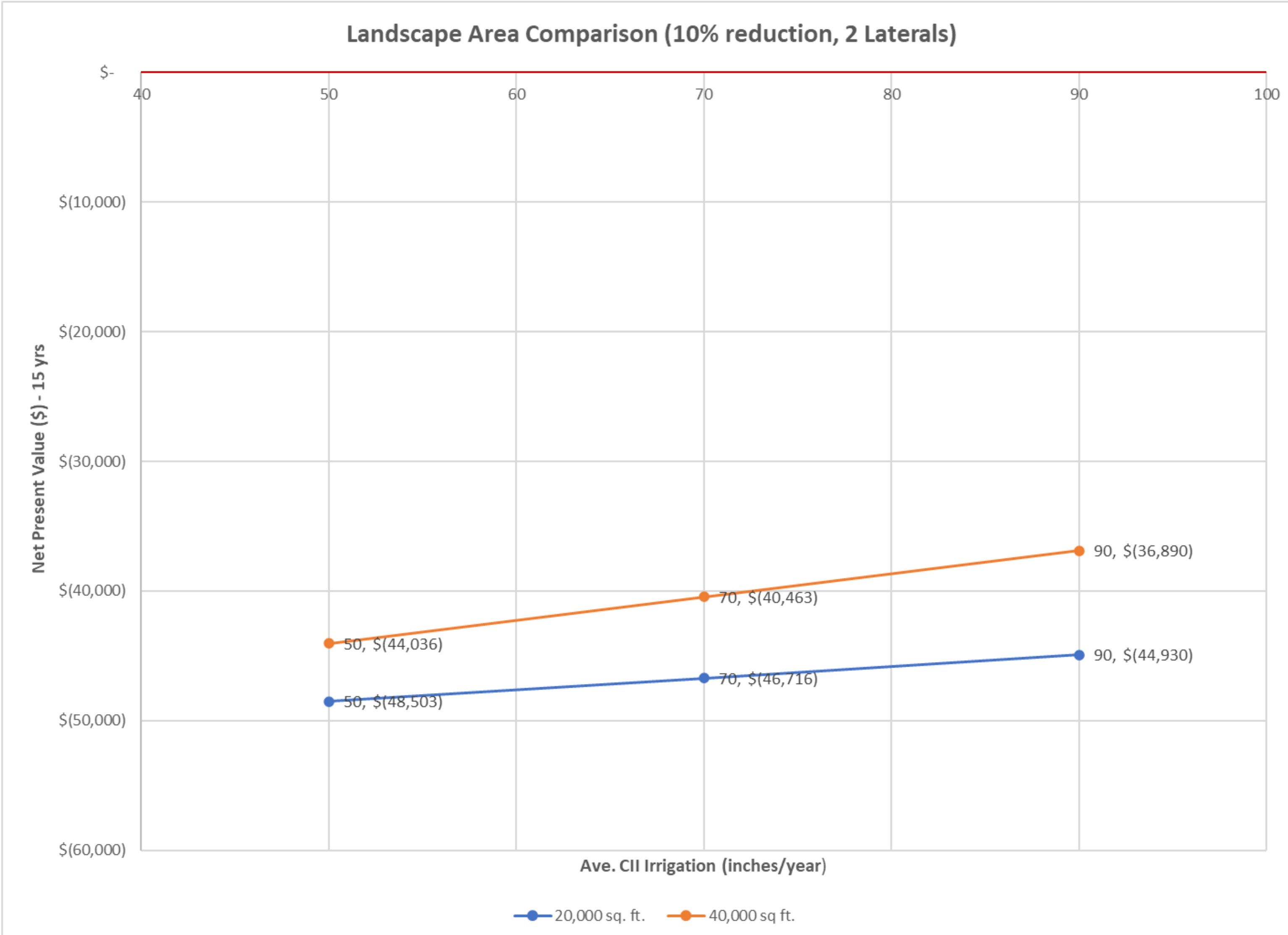

Landscape Area Comparison (10% reduction, 2 Laterals)
$10,000
$5,000
$-
$(5,000)
$(10,000)
$(15,000)
$(20,000)
Net Present Value ($) - 15 yrs
40
50
60
70
80
90
100
Ave. CII Irrigation (inches/year)
90, $4,028
70, $2,578
50, $1,127
90, $(431)
70, $(8,439)
50, $(16,446)
20,000 sq. ft.
40,000 sq ft.

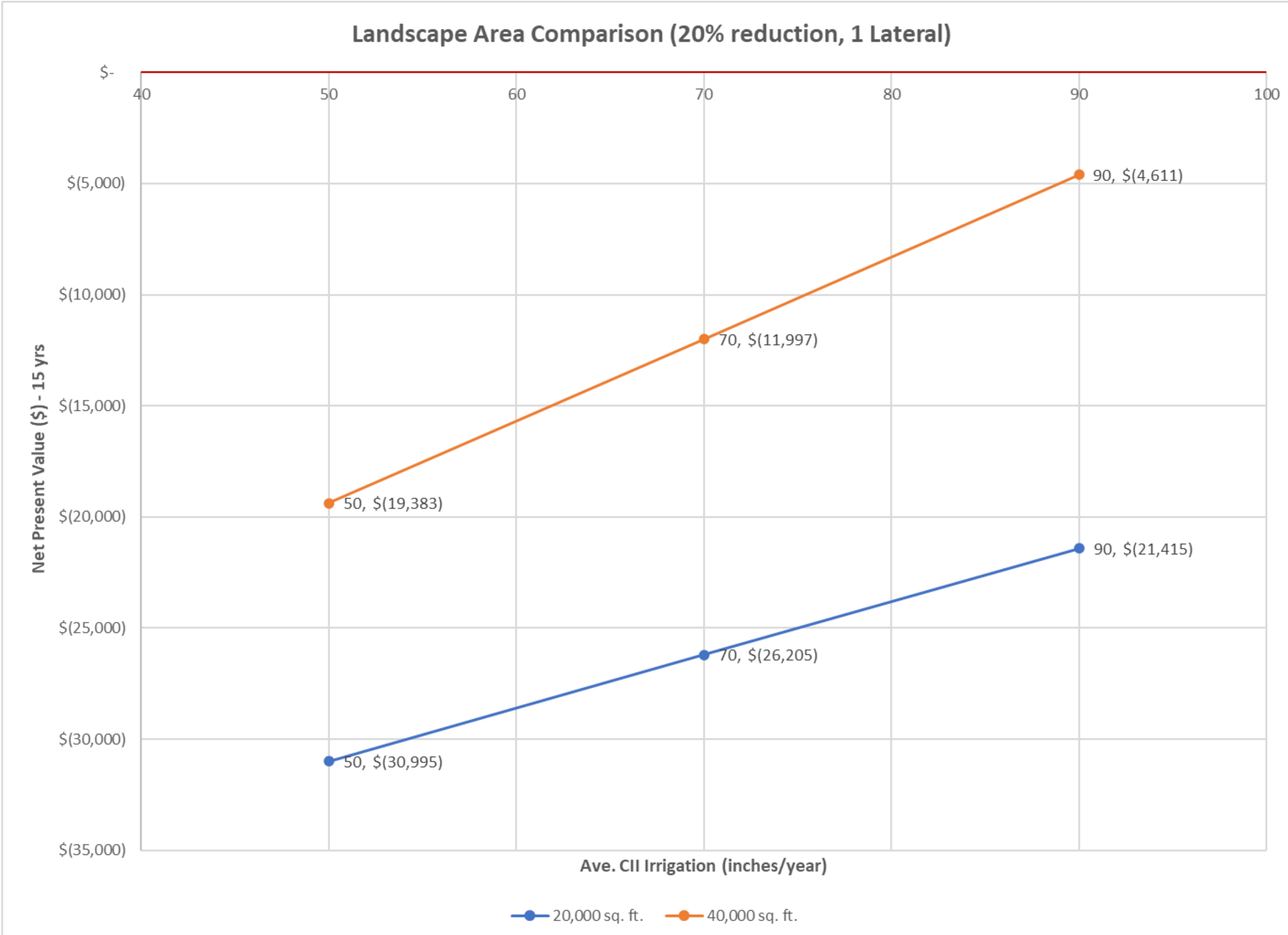

Landscape Area Comparison (20% reduction, 1 Lateral)
Net Present Value ($) - 15 yrs
$12,000
$10,000
$8,000
$6,000
$4,000
$2,000
$-
$(2,000)
$(4,000)
$(6,000)
$(8,000)
40
50
60
70
80
90
100
Ave. CII Irrigation (inches/year)
90, $10,557
70, $7,655
50, $4,754
90, $4,028
70, $2,578
50, $(5,293)
20,000 sq. ft.
40,000 sq. ft.

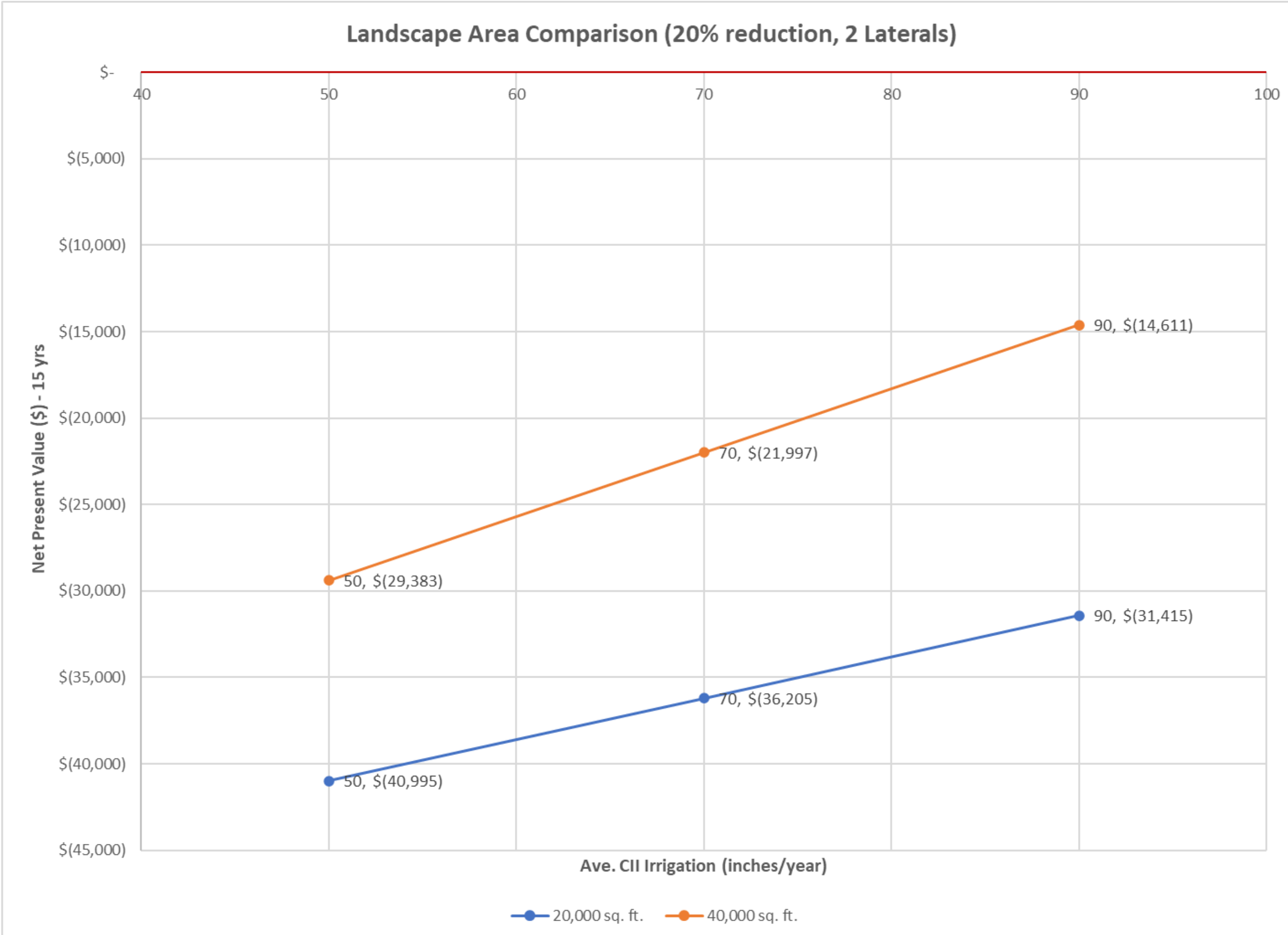

Landscape Area Comparison (20% reduction, 2 Laterals)
Net Present Value ($) - 15 yrs
$15,000
$10,000
$5,000
$-
$(5,000)
$(10,000)
$(15,000)
40
50
60
70
80
90
100
Ave. CII Irrigation (inches/year)
90, $10,557
70, $7,655
50, $4,754
90, $4,028
70, $176
50, $(10,293)
20,000 sq. ft.
40,000 sq. ft.

4.) Southern Coast CII-DIM Feasibility Analysis




Landscape Area Comparison (10% reduction, 2 Laterals)
$-
$(10,000)
$(20,000)
$(30,000)
$(40,000)
$(50,000)
$(60,000)
Net Present Value ($) - 15 yrs
40
50
60
70
80
90
100
90, $(36,890)
70, $(40,463)
50, $(44,036)
90, $(44,930)
70, $(46,716)
50, $(48,503)
Ave. CII Irrigation (inches/year)
20,000 sq. ft.
40,000 sq ft.


Landscape Area Comparison (20% reduction, 1 Lateral)
$-
$(5,000)
$(10,000)
$(15,000)
$(20,000)
$(25,000)
$(30,000)
$(35,000)
40
50
60
70
80
90
100
Net Present Value ($) - 15 yrs
Ave. CII Irrigation (inches/year)
90, $(4,611)
70, $(11,997)
50, $(19,383)
90, $(21,415)
70, $(26,205)
50, $(30,995)
20,000 sq. ft.
40,000 sq. ft.


Landscape Area Comparison (20% reduction, 2 Laterals)
Net Present Value ($) - 15 yrs
$-
$(5,000)
$(10,000)
$(15,000)
$(20,000)
$(25,000)
$(30,000)
$(35,000)
$(40,000)
$(45,000)
40
50
60
70
80
90
100
90, $(14,611)
70, $(21,997)
50, $(29,383)
90, $(31,415)
70, $(36,205)
50, $(40,995)
Ave. CII Irrigation (inches/year)
20,000 sq. ft.
40,000 sq. ft.