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Proceeding: 2020-2021 Tree Trimming Balancing Account
Application: A.22-12-XXX
Exhibit: SDG&E-xx

SAN DIEGO GAS & ELECTRIC COMPANY
PREPARED DIRECT TESTIMONY OF
SHAUN GAHAGAN
ON BEHALF OF SAN DIEGO GAS & ELECTRIC COMPANY

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA



December 9, 2022

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1 **PREPARED DIRECT TESTIMONY OF SHAUN GAHAGAN**
2 **ON BEHALF OF SAN DIEGO GAS & ELECTRIC COMPANY**

3
4 **SUMMARY**

5 My name is Shaun Gahagan. I am the Wildfire Mitigation Program Manager at San
6 Diego Gas & Electric Company (SDG&E). My qualifications are attached to this testimony as
7 Section IV.

8 My testimony describes SDG&E’s Enhanced Vegetation Management Program—
9 including SDG&E trimming the highest risk trees to clearances exceeding 12 feet and going up
10 to 25 feet in the High Fire Threat District (HFTD)—as described in SDG&E’s approved Wildfire
11 Mitigation Plan (WMP) since 2019. Because the passage of Senate Bill 901 and Assembly Bill
12 1054 occurred after SDG&E filed its Test Year 2019 General Rate Case (GRC) Application, the
13 costs associated with Enhanced Vegetation Management were not incorporated into SDG&E’s
14 2019 GRC request. Thus, the impacts associated with the new WMP requirements and
15 California’s increased emphasis on the need for additional wildfire mitigation efforts were not
16 addressed in the decision approving SDG&E’s TY 2019 GRC, Decision (D).19-09-051. But, as
17 anticipated by D.19-09-051,¹ SDG&E’s wildfire mitigation efforts with respect to vegetation
18 management have resulted in additional spending to promote wildfire mitigation, increased
19 reliability, and public safety.

20 The Commission has previously approved SDG&E recovering costs incurred
21 implementing that Enhanced Vegetation Management Program in 2019,² finding that:

- 22 • SDG&E’s enhanced vegetation plan was authorized in SDG&E’s 2019 Wildfire
23 Mitigation Plan (WMP), permitting SDG&E to trim to a 25-foot clearance where
24 “necessary and feasible” as supported by data;

¹ D.19-09-051 at 267 (“Because of enhanced wildfire risk, SDG&E may find it necessary to conduct enhanced and additional risk mitigation activities which are difficult to predict at this time.”)

² D.22-03-009, Findings of Fact (FOF) 12-14 at 22.

- 1 • SDG&E relied upon historical data showing that the vegetation contact rate is
2 reduced for clearances of greater than 20 feet; and
3
- 4 • SDG&E strategically implemented the 25-foot clearance on a limited basis
5 because it targeted trees deemed to pose the highest risk to electrical
6 infrastructure.
7

8 Those findings remain equally applicable to costs associated with Enhanced Vegetation
9 Management for 2020-2021. SDG&E’s Enhanced Vegetation Management Program was
10 approved in SDG&E’s 2020 WMP and its 2021 WMP Update.³ In each of those WMPs, as well
11 as in SDG&E’s 2022 WMP Update, SDG&E provided additional data further buttressing the risk
12 reduction resulting from SDG&E’s targeted enhanced vegetation management strategy,
13 repeatedly demonstrating that the risk of vegetation contact with electrical infrastructure is
14 significantly reduced with clearances in excess of General Order 95 requirements. As found by
15 the Commission, SDG&E’s Enhanced Vegetation Management Program was “limited in scale
16 and used historical data to target high risk conditions.”⁴ That remained the case in both 2020 and
17 2021. Because, as in 2019, SDG&E’s Enhanced Vegetation Management Program continued to
18 “strategically implement” enhanced clearances “targeting situations which pose the highest
19 wildfire risk based on historical data,”⁵ SDG&E’s costs associated with the program are
20 reasonable and the Commission should allow cost recovery for this program.

³ Consistent with Public Utilities Code § 8386, SDG&E submitted a three-year WMP for 2020, and files the required annual WMP update for each interim year. For purposes of my testimony, I will refer to both the comprehensive three-year WMP and the annual updates as WMPs.

⁴ D.22-03-009 at 11.

⁵ *Id.* at 12.

1 **I. SDG&E’S ENHANCED VEGETATION MANAGEMENT PROGRAM**

2 **A. SDG&E’s Targeted Approach to Enhanced Vegetation Management Was**
3 **Designed to Promote the Highest Level of Risk Reduction**

4 There can be no question that contacts between vegetation and electrical infrastructure
5 poses a significant ignition risk that could lead to catastrophic wildfires. Many of the state’s
6 largest and most devastating fires—including the Rice Fire in San Diego in 2007—were the
7 result of tree-line contacts. And there has been a growing recognition that expanding the
8 clearance between trees and electrical infrastructure is both a reasonable and necessary way to
9 reduce wildfire risk. SDG&E’s initial efforts to trim trees to larger clearances began in 1999,
10 when SDG&E began to implement a 10-12 foot standard clearance throughout its system.
11 Additional refinements to SDG&E’s vegetation management efforts, including slightly increased
12 clearances for fast-growing species such as eucalyptus and palm, resulted in a reduction in
13 average vegetation-line contacts from 80 per year (1999-2010) to about 40 per year (2011-2019).
14 In 2017, the Commission also recognized the potential need for expanded clearances to reduce
15 the risk of wildfire when it revised General Order 95, Rule 35 to increase post-trim clearance
16 recommendations for trees in the HFTD.⁶

17 Following the devastating California fires in 2017 and 2018, and to implement its first
18 WMP, SDG&E began to consider ways to further improve its existing vegetation management
19 program by increasing its post-trim clearances on trees that posed the highest risk to the
20 electrical system. SDG&E’s Enhanced Vegetation Management Program, which was first
21 included in SDG&E’s 2019 WMP, increased post-trim clearances for high-risk trees in the

⁶ See, General Order 95, Rule 35, and Appendix E (increasing post-trim clearance recommendations for trees adjacent to distribution lines in the HFTD from 6 feet to 12 feet).

1 HFTD to 25-feet in certain locations, where necessary and possible.⁷ SDG&E finalized the
2 scope of the 25-foot program in March 2019 and began performing the work in April 2019.
3 Specifically, SDG&E’s goal was to further reduce vegetation contacts—and thus ignition risk—
4 by increasing post-trim clearances, with a specific focus on five of the highest risk tree species in
5 the HFTD. The Commission initially approved SDG&E’s Enhanced Vegetation Management
6 Program in D.19-05-039.⁸ In approving the 2019 WMP, the Commission found that SDG&E
7 “may implement a 25-foot post-trim clearance where necessary and feasible if such a practice is
8 supported by scientific evidence or other data showing that such clearance will reduce risk under
9 wildfire conditions.”⁹

10 In 2020 and 2021, SDG&E continued to implement EVM through a targeted and data
11 driven approach to reducing wildfire risk. First, SDG&E continued to limit the scope of the
12 Enhanced Vegetation Management Program, and specifically the 25-foot clearance, to instances
13 where it would have the biggest impact on reducing risk.¹⁰ These limitations reduced the scope
14 of the enhanced clearance from the over 400,000 trees within SDG&E’s entire tree inventory, to
15 approximately 80,000 trees, or 20%, within the HFTD.¹¹ Second, SDG&E selected a clearance
16 level using existing data in 2019, based on historical successes with a larger clearance for
17 transmission infrastructure. SDG&E had experienced a historical outstanding performance
18 record (less than one contact per year on average over five years) when clearances were

⁷ See R.18-10-007, SDG&E’s Wildfire Mitigation Plan (February 6, 2019) (2019 WMP) at 43, available at <https://www.sdge.com/rates-and-regulations/proceedings/wildfire-mitigation-plan-oir>

⁸ The purpose of Wildfire Mitigation Plan submissions is not to address cost recovery and the reasonableness of such costs. That is the purpose of this Application.

⁹ D.19-05-039, Ordering Paragraph (OP) 5 at 29-30.

¹⁰ 2020 WMP at 39-40.

¹¹ *Id.*

1 maintained at 20-30 feet. Third, SDG&E approached the Enhanced Vegetation Management
2 Program to achieve the highest level of risk reduction by limiting the scope of the program to
3 trees that posed the most risk to infrastructure. This risk assessment was made both using the
4 expertise of SDG&E’s team of qualified foresters and arborists who have years of experience
5 with the climate and ecology of SDG&E’s service territory, and it was buttressed by the data and
6 studies performed by SDG&E to support its 2019, 2020, 2021 and 2022 WMPs.

7 As demonstrated below, as SDG&E has continued to refine, hone, and analyze its data on
8 vegetation clearances; the results of those analyses continue to conclusively demonstrate that as
9 tree clearances increase, the likelihood of vegetation-line contacts decreases.

10 It is also important to note that SDG&E’s EVM program is not a blanket approach to
11 tree-trimming. SDG&E’s vegetation management team does not approach an “at risk” tree with a
12 “one size fits all” trim and, without any other analysis, trim it to 25 feet of clearance. Rather,
13 SDG&E has identified the 80,000 inventory trees of “at risk” species and targeted those trees for
14 Enhanced Vegetation Management Program inspections to better identify if they require
15 enhanced clearances and/or removal. The ultimate clearance at time of trim is determined by the
16 arborist and based on several tree characteristics, including but not limited to, species, location,
17 tree health, and other issues identified by the inspector.¹²

18 As discussed below, the Commission, the Office of Energy Infrastructure Safety (as
19 successor to the Commission’s Wildfire Safety Division (WSD)) approved SDG&E’s 2020
20 WMP, including the continuation of the Enhanced Vegetation Management Program, with the
21 condition that SDG&E continue to study the effectiveness of post-trim clearances and provide
22 additional detail about its selection of five species—oak, pine, sycamore, eucalyptus, and palm—

¹² *Id.* at 113.

1 as “at risk.”¹³ At no point did WSD-005 indicate that SDG&E cease its Enhanced Vegetation
2 Management Program or limit its scope. Rather, the Commission continued to encourage a
3 process of learning and innovation to reduce wildfire risk by directing the continued study of the
4 Program to assess its value and benefits. Notably, WSD-005 actually implied that SDG&E
5 continue the EVM Program and share its findings with Pacific Gas & Electric Company (PG&E)
6 and Southern California Edison Company (SCE) “to develop a consensus methodology for how
7 to measure post-trim vegetation clearance distance impacts on the probability of vegetation
8 caused ignitions and outages.”¹⁴ Without the benefit of the data provided by continuation of the
9 program, meeting such a requirement would be impossible. SDG&E has since complied with all
10 of the conditions imposed by WSD-005, and the continued analysis has conclusively
11 demonstrated the effectiveness of enhanced clearances.

12 **i) Effectiveness of Enhanced Clearances**

13 While the Commission initially found in WSD-005 that it was “difficult to determine the
14 effectiveness” of the enhanced clearances,¹⁵ SDG&E has subsequently proven the incremental
15 benefits of a strategic implementation of larger clearances. SDG&E’s Third Quarterly Report
16 addressing its 2020 WMP clearly identified the impacts of increased clearances by calculating
17 the average reduction in vegetation contacts per year by the end of the program utilizing the

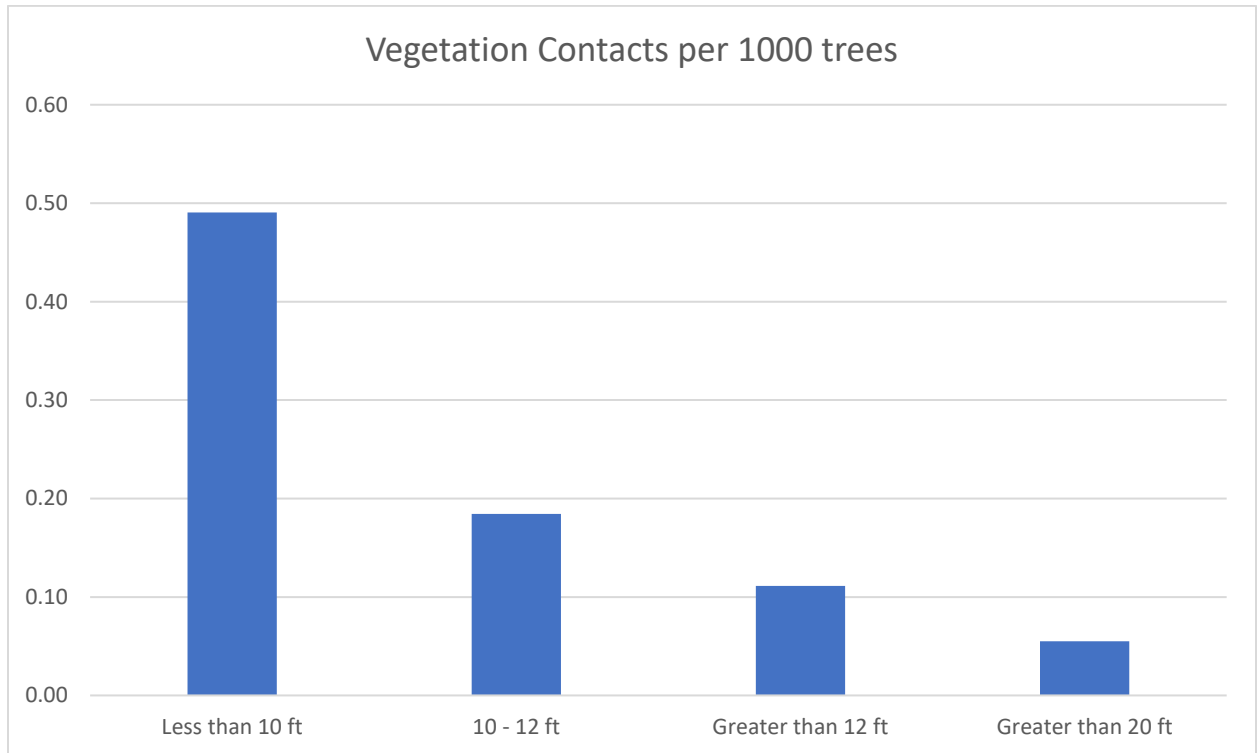
¹³ Resolution WSD-005 (June 11, 2020) (WSD-005) at 38-39. The Commission found that SDG&E had “satisfied the requirement” of an approved WMP for purposes of Public Utilities Code § 8389(e)(1) with this conditional approval. *Wildfire Safety Division Approval or San Diego Gas & Electric Company’s 2020 Safety Certification Request*, CPUC (September 14, 2020) at 3.

¹⁴ WSD-005 at 38. In approving SDG&E’s 2021 WMP Update, Energy Safety in fact directed SDG&E and the other large utilities to “participate in a multi-year vegetation clearance study” aimed at both the effectiveness of advanced clearances and identification of high-risk species. Energy Safety concluded that SDG&E (and the other large IOUs) had “jointly made progress” toward this objective. *See Final Decision on San Diego Gas & Electric Company’s WMP 2022 Update*, Office of Energy Infrastructure Safety (July 5, 2022) at 64-65, 71.

¹⁵ WSD-005 at 38.

1 measured difference in vegetation contact rates at the different post-trim clearance levels.¹⁶ As
2 summarized in the table below, by expanding clearances from SDG&E's standard of 10-12 feet
3 to the enhanced clearance levels for identified species, annual contacts rates move from 0.18 per
4 thousand trees to 0.05 per thousand trees, a significant reduction.

5 **Table 1 - Vegetation Contacts per 1000 Trees (2002-2020)**



6
7 SDG&E encourages the Commission to review SDG&E's data and analysis on post-trim
8 vegetation clearance provided in the 2020 WMP Q3 Report in assessing the merits and risk
9 reduction of the Enhanced Vegetation Management Program. Based on this study alone, SDG&E
10 has proven the reasonableness of this important investment in the safety and resiliency of its
11 system.

¹⁶ SDG&E's Quarterly Report on 2020 WMP for Q3 2020 (September 9, 2020) (2020 WMP Q3 Report), Section III.L at 125-129, and Appendix B.

1 Based on additional requirements from both the Commission and, subsequently, the
2 Office of Energy Infrastructure Safety (Energy Safety), SDG&E has continued to study the
3 effectiveness of enhanced clearances, the optimal level of clearance, and the species/genus of
4 high-risk trees. Further, SDG&E has endeavored to collaborate with its peer utilities in
5 California to understand best practices and vegetation management efforts statewide.

6 To further support the effectiveness of the Enhanced Vegetation Management Program in
7 its 2022 WMP Update, SDG&E commissioned an additional study performed by a third-party
8 data science company that verifies SDG&E's argument that enhanced clearances reduce the risk
9 of vegetation contact.¹⁷ The study analyzed line clearance distance from vegetation in three
10 different ways to understand its effect on outage rates. First a two-proportion z-test was used to
11 statistically prove the difference between outage rates in different periods of time. Second, the
12 machine-learning model was applied to identify and confirm SDG&E's list of targeted trees, and
13 finally a sensitivity analysis was performed to understand how different line clearance distances
14 could have impacted outages historically.

15 The two-proportion z-test demonstrated that enhanced clearing years, 2017-2020, had a
16 lower outage rate than pre-enhanced clearing years, 2006-2016—showing a clear advantage in
17 years that followed enhanced line clearance protocols, with a reduction in outage rate of
18 approximately thirty-eight percent. The outage rate from 2006-2016 is thus greater than outage
19 rate from 2017-2020 at a statistically significant level (p-value = .0000002472).

¹⁷ SDG&E 2020-2022 WMP Update (February 11, 2022) (2022 WMP Update), Attachment E, available at <https://www.sdge.com/2022-wildfire-mitigation-plan>.

1

Table 2 – Outage Rate 2006-2016

Pre - Enhanced Clearance Efforts			
Year	TreeCount	Outages	Outage Rate
2006	393,455	60	1.52E-04
2007	380,613	55	1.45E-04
2008	376,928	83	2.20E-04
2009	383,893	62	1.62E-04
2010	402,006	111	2.76E-04
2011	424,450	24	5.65E-05
2012	446,128	22	4.93E-05
2013	453,867	18	3.97E-05
2014	470,931	41	8.71E-05
2015	469,637	22	4.68E-05
2016	465,167	56	1.20E-04
Total	4,667,075	554	1.19E-04

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3

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Table 3 – Outage Rate 2017-2020

Post Enhanced Clearance Efforts			
Year	TreeCount	Outages	Outage Rate
2017	462,479	61	1.32E-04
2018	466,870	23	4.93E-05
2019	465,449	22	4.73E-05
2020	468,860	31	6.61E-05
Total	1,863,658	137	7.35E-05

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9

For the sensitivity analysis, line clearance distances were lengthened to understand the potential impact to historical outage rates from 2017-2020. Line clearance distances were lengthened to 7, 9, 11, 13.5, 17.5, and 25 feet. Values were only changed if actual line clearance distance was lower than the threshold being tested.

10

11

12

13

After making changes to line clearance distance, the model was run on the data to update the risk probability score per Tree ID and see how many risk trees were identified. The true positive and false negative percentage ratios from the actual data were then used to calculate potential outage effects. Table 4 shows the results when changing line clearance distances.

1 When tree line clearances are brought to above 12 feet (13.5+ feet), there is a significant
 2 impact to potential outage reduction. If all trees were trimmed to at least 13.5 feet, the total
 3 number of vegetation-related outages on the system would be reduced by 11 across the 4-year
 4 timeframe. If all trees were trimmed to at least 25 feet, the number of vegetation related outages
 5 across the 4-year timeframe would be reduced by half from 78 to 39 outages. The model and
 6 analysis show a clear correlation between trim clearance and a reduction in vegetation related
 7 outages.

8 **Table 4 - Sensitivity Analysis Results**

Sensitivity Analysis	% of records changed	Risk trees identified by model	Assumed true positive outage rate	Expected outage (T)	Non-risk trees identified by model	Assumed false negative outage rate	Expected outage (F)	Total Outages	Difference
Actual	0	338,373	1.92E-4	65	1,173,298	1.11E-5	13	78	Baseline
If <7, 7	15%	335,660	1.92E-4	64	1,175,998	1.11E-5	13	78	(0)
If <9, 9	35%	330,234	1.92E-4	63	1,181,424	1.11E-5	13	76	(2)
If <11, 11	73%	319,595	1.92E-4	61	1,192,063	1.11E-5	13	74	(4)
If <13.5, 13.5	86%	288,906	1.92E-4	53	1,222,752	1.11E-5	14	67	(11)
If <17.5, 17.5	92%	235,561	1.92E-4	41	1,276,097	1.11E-5	14	55	(23)
If <25, 25	98%	153,119	1.92E-4	24	1,358,539	1.11E-5	15	39	(39)

9
 10 Based on the overall results, the study concluded that there is an appreciable impact on
 11 outages when line clearances increase. When trees are trimmed to non-enhanced levels (7-11
 12 feet) there is a smaller impact on outage reduction. But when tree-line clearance exceeded 12
 13 feet, there is a “large impact” on possible outage reduction. And when clearances went up to 25
 14 feet, outages were reduced by nearly 50%. “As a result, it can be conclusively determined based

1 on using the sensitivity analysis that better line clearance methods can greatly minimize
2 outages.”¹⁸

3 **ii) Identification of At-Risk Trees**

4 To verify the high-risk species that SDG&E has targeted in its enhanced clearance
5 initiative, a machine-learning model was used to assign weights to variables which drive the
6 outage probability score. The dataset included 93 species. The weights for each species were
7 analyzed to understand what the model identified as potentially higher risk related to species.

8 Using the test dataset (2019-2020), a probability score threshold of 0.15 was utilized to
9 classify if a tree was a risk-tree. Of the 753,847 tree activities in the test set, the model identified
10 169,698 risk trees, which accounted for 32 of the 39 outages during that timeframe. The 169,698
11 risk trees were then summarized by species to obtain an understanding of higher-risk species.

12 Table 5 shows the top 10 risk species based on a risk metric (defined as Count of Risk
13 Trees multiplied by Avg Risk Probability) and included if that group experienced an outage.
14 These top 10 species accounted for 90 percent of risk trees returned by the model and 29 of 32
15 outages in the test dataset. These results quantitatively confirm the species that are believed to be
16 the highest risk and validate the methodology used by SDG&E in identifying Eucalyptus, Palm,
17 Pine, Oak, and Sycamore as the targeted at-risk tree genus/species, subject to enhanced clearing.

¹⁸ 2022 WMP Update, Attachment E at 14-15.

Table 5 – Identified Risk Trees by Species

Species	Count	Pct of Total	Actual Outage	Avg Risk Probability	Risk Metric
<i>Eucalyptus</i>	59,184	34.6%	10	2.82 E-4	16.70
<i>Palm-Fan</i>	26,894	15.7%	11	3.66 E-4	9.84
<i>Pine</i>	28,189	16.5%	4	2.47 E-4	6.96
<i>Oak</i>	13,175	7.7%	1	1.24 E-4	1.63
<i>Sycamore</i>	5,999	3.5%	0	2.51 E-4	1.50
<i>Palm-Feather</i>	8,299	4.8%	1	1.50 E-4	1.25
Pepper (California)	6,045	3.5%	0	1.34 E-4	0.81
Tamarisk/Salt Cedar	2,617	1.5%	0	2.62 E-4	0.69
Cypress	1,617	0.9%	1	1.62 E-4	0.26
Pecan	1,750	1.0%	1	1.92 E-4	0.34

The data thus demonstrates that enhanced vegetation clearances, when applied strategically and targeted to at risk species, serve to reduce the likelihood of vegetation powerline contact, which has all too frequently been the source of catastrophic wildfires in California in the past few years, as California faces “increased wildfire risks in the state.”¹⁹ SDG&E estimates that its Enhanced Vegetation Management Program will reduce vegetation-caused ignitions by 28.8 percent by January 1, 2023.²⁰

B. SDG&E’s EVM Program is Supported by Commission Decisions Approving SDG&E’s WMP Initiatives and Cost Recovery of Prior TTBA Undercollections

SDG&E’s Application for recovery of its 2019 TTBA undercollected balance included a substantial analysis of SDG&E’s 2019 costs associated with Enhanced Vegetation Management, the details of the program, and SDG&E’s risk-based, targeted approach of implementing enhanced clearances where necessary and feasible. Based on that record, the Commission

¹⁹ D.22-03-009 at 20.

²⁰ Final Decision on San Diego Gas & Electric’s WMP 2022 Update, Office of Energy Infrastructure Safety, at 64-65.

1 authorized recovery of costs associated with SDG&E’s Enhanced Vegetation Management
2 Program²¹—including for implementing clearances up to 25-feet for high-risk tree species in
3 HFTD.²² As the Commission found in approving the recovery of those costs:

- 4 • “The increased hazard tree activities (*e.g.*, tree audits, inspections, trims, and
5 removals) SDG&E performed were necessary to meet the objectives set forth in
6 its WMP and to ensure safe operations of its facilities;”²³
7
- 8 • “D.19-05-039 permitted SDG&E to implement the 25-foot clearance where
9 necessary and feasible if such a practice is supported by scientific evidence or
10 other data showing that such clearance will reduce risk under wildfire
11 conditions;”
12
- 13 • “SDG&E used historical data to strategically implement the 25-foot clearance on
14 a limited basis in 2019, targeting situations which data has shown pose the highest
15 wildfire risk, specifically for HFTDs and for specific tree species that have
16 historically been prone to failure (*e.g.*, cause ignitions);” and
17
- 18 • “SDG&E’s data shows that the rate of vegetation contacts reduces with increased
19 clearances, with the greatest rate reduction for clearances of greater than 20
20 feet.”²⁴

21 The Commission further held that “[s]afety considerations of SDG&E’s vegetation
22 management practices are appropriately addressed in SDG&E’s WMP filings.”²⁵ Based on these
23 findings, the Commission authorized recovery of 2019 enhanced vegetation management costs.

24 D.22-03-009 specifically notes that its finding that 2019 costs related to enhanced
25 clearances were reasonable was limited to the 2019 costs, and directed SDG&E to provide a
26 comparison of how recorded costs compare to authorized levels, an explanation of why the costs
27 were reasonable and appropriate, and how SDG&E effectively managed the costs in subsequent

²¹ D.22-03-009, Conclusions of Law (COL) 2-4 at 21.

²² *Id.*, FOF 11-14 at 22.

²³ *Id.*, FOF 10 at 22.

²⁴ *Id.*, FOF 11-13 at 22.

²⁵ *Id.*, COL 12 at 25.

1 applications for recovery of TTBA undercollections.²⁶ My testimony addresses the explanation
2 of why SDG&E’s Enhanced Vegetation Management Program for 2020 and 2021 was
3 reasonable and appropriate; the other requirements of D.22-03-009 are addressed in the prepared
4 direct testimony of Don Akau and Jason Kupfersmid.

5 As noted above, SDG&E’s EVM Program is reasonable because of its demonstrated
6 effectiveness at reducing vegetation related outages in the HFTD—and thus reducing the
7 likelihood of ignition and catastrophic wildfire. To find now—after the program has been
8 effectively and reasonably implemented for over three years--that SDG&E's EVM efforts are
9 unreasonable would amount to the Commission indicating a lack of support for vegetation
10 management activities specifically and scientifically proven to reduce the risk of utility-related
11 catastrophic wildfires.

12 SDG&E does not simply rely on the assertion that EVM was a component of its approved
13 WMPs for 2020 and 2021 to support recovery of costs associated with the EVM Program.
14 SDG&E acknowledges that the Commission initially expressed interest and concern regarding
15 EVM’s effectiveness at reducing wildfire risk. As noted in D.22-03-009, the Commission
16 initially found that SDG&E’s 2020 WMP was deficient in providing detailed guidance for when
17 the increased clearance was feasible and necessary, or scientific evidence or data showing that
18 the increased clearance will reduce wildfire risk.²⁷ Yet although the Commission initially found
19 in response to SDG&E’s 2020 WMP that SDG&E had not yet provided sufficient evidence that
20 increasing clearances from their current standard of 10-12 feet to enhanced clearances where
21 necessary and feasible actually reduced vegetation contacts, making it “difficult to determine the

²⁶ *Id.*, OP 2 at 25.

²⁷ D.22-03-009 at 10.

1 effectiveness of this measure,”²⁸ SDG&E remedied this issue in its 2020 WMP Q3 Report and
2 subsequent WMP Updates.²⁹ Not only does the 2020 WMP Q3 Report clearly identify the
3 impacts of enhanced clearances, it calculates the average reduction in vegetation contacts per
4 year by the end of the program utilizing the measured difference in vegetation contact rates at the
5 different post-trim clearance levels.

6 Further, the Commission Resolution approving SDG&E’s 2020 WMP did not find that
7 the Enhanced Vegetation Management Program was “deficient.” Rather, WSD-005 *approved*
8 SDG&E’s WMP, including enhanced clearances.³⁰ It also held SDG&E to meeting its Enhanced
9 Vegetation Program initiative targets for 2020, which included the inspection of 17,000 high-risk
10 trees to determine if they required enhanced clearances. The Commission’s conditions with
11 respect to enhanced clearances instead pointed to the need for additional data, collaboration, and
12 study to support the risk reduction related to increased clearances, and additional detail regarding
13 the assessment of where enhanced clearances might be applied.³¹ It was the data—and not the
14 Program itself—that was identified as the deficiency. At no point did the Commission instruct
15 SDG&E to stop pursuing enhanced clearances for high-risk trees in the HFTD. And by asking
16 for additional data to “understand or even observe the incremental benefit of this increased
17 clearance,” the Commission implied a directive that SDG&E continue to gather data by
18 continuing the Enhanced Vegetation Management Program.

²⁸ WSD-005 at 38.

²⁹ See D.22-03-009 at 11 (“SDG&E asserts that data it later provided to the Commission in response to the 2020 deficiencies further supported its enhanced clearance efforts.”). See *e.g., supra*. n.16.

³⁰ WSD-005 at 38.

³¹ WSD-005 noted that SDG&E had provided additional data regarding its “tree by tree analysis with particular concern for ‘at risk species’ to determine if a 25-foot clearance is beneficial,” implying that, to a certain extent, the Commission was satisfied with SDG&E’s ENHANCED VEGETATION MANAGEMENT Program guidelines. *Id.* at 38.

1 Consistent with its approved WMP, SDG&E continued the same risk-based approach to
2 enhanced vegetation management that it used in 2019. Energy Safety also approved SDG&E’s
3 2021 WMP and associated enhanced vegetation initiatives, directing the ongoing collection of
4 data and a multi-year vegetation clearance study to, among other things, “assess the effectiveness
5 of enhanced clearances.”³² Energy Safety acknowledged the “complexity of this issue; any study
6 performed assessing the effectiveness of enhanced clearances will take years of data collection
7 and rigorous analysis.”³³ But while again requiring additional data and peer collaboration, the
8 essential underpinning of the Enhanced Vegetation Management Program was approved and
9 SDG&E’s Enhanced Vegetation Management related targets became measures by which Energy
10 Safety measured SDG&E’s WMP compliance for 2021.

11 And SDG&E continued to comply with both Commission and Energy Safety
12 requirements seeking additional data on the effectiveness of expanded clearances. Energy Safety,
13 which emphasizes a data-driven approach to wildfire mitigation, noted that with the submission
14 of SDG&E’s detailed study addressing the effectiveness of its approach to enhanced clearances,
15 in addition to the joint submission resulting from collaborative efforts of SDG&E, SCE, PG&E
16 and other electrical corporations, SDG&E had “sufficiently addressed the required remedy thus
17 far.”³⁴ In approving SDG&E’s 2022 WMP, Energy Safety directed SDG&E to continue the
18 collection of vegetation management data and would “continue to monitor progress.” But over
19 the evolution of the WMP process, SDG&E has continued to demonstrate the strength of its

³² Energy Safety, Action Statement on 2021 SDG&E’s Wildfire Mitigation Plan Update (July 20, 2021) at 53, available at <https://energysafety.ca.gov/what-we-do/electrical-infrastructure-safety/wildfire-mitigation-and-safety/wildfire-mitigation-plans/2021-wmp/>.

³³ *Id.*

³⁴ Energy Safety, Final Decision on San Diego Gas & Electric Company’s WMP 2022 Update (July 5, 2022) at A-2, available at <https://energysafety.ca.gov/what-we-do/electrical-infrastructure-safety/wildfire-mitigation-and-safety/wildfire-mitigation-plans/2022-wmp/>.

1 EVM Program, its targeted approach to risk reduction, and the limited scope to best address
2 wildfire risk. Thus, both the Program and its implementation are reasonable.

3 SDG&E’s targeted and reasonable approach to achieving enhanced clearances is further
4 supported by the reduction in the overall amount of enhanced trims performed year over year. As
5 noted above, SDG&E did not implement a blanket clearance policy. Instead, SDG&E targeted
6 17,000 trees annually for inspections to determine if an enhanced trim was warranted.³⁵ Not
7 every tree inspected ultimately necessitated an enhanced clearance, or achieving the clearance
8 was not feasible. For that reason, in 2022, SDG&E revised its EVM initiative goal in the WMP
9 to a reduced target of 12,500 trees trimmed to enhanced clearances. The revised methodology for
10 setting SDG&E’s 2022 targets included trees that were either (1) trimmed at least five of the last
11 ten years, or (2) trees which had no previous enhanced trim within the last 10 years, and with a
12 current line clearance of less than eight feet. And SDG&E also expanded its definition of
13 enhanced clearance to trims exceeding 12 feet, allowing additional flexibility to assess the need
14 for tree trimming on a case-by-case approach to promote a reasonable and risk-based approach.
15 While these changes largely apply to SDG&E’s 2022 EVM Program, they demonstrate
16 SDG&E’s willingness and desire to continually evaluate wildfire mitigation initiatives and seek
17 continual innovation in the interests of the safety of its community and providing the best value
18 to customers. This approach is consistent with the conclusion underlying the establishment of
19 SDG&E’s two-way balancing for the TTBA, and the Commission’s understanding that “SDG&E

³⁵ The 17,000 annual target was derived from taking the total number of at risk trees (85,000) and dividing this by a five-year program span.

1 may find it necessary to conduct enhanced and additional risk mitigation activities which are
2 difficult to predict at this time.”³⁶

3 **II. CONCLUSION**

4 SDG&E has provided the Commission and Energy Safety with empirical, quantitative
5 analysis demonstrating the wildfire risk reduction benefits of enhanced clearances, as required by
6 D.19-05-039. Further, SDG&E’s EVM Program, including its identification of high-risk trees
7 targeted for enhanced inspections, has been demonstrated to reduce ignition risk. SDG&E’s
8 targeted, limited, and data-supported approach to enhanced vegetation management is reasonable
9 and the costs incurred to implement the program were prudent. SDG&E should be authorized to
10 recover expenses incurred by this program, as wildfire risk reduction benefits are critical to the
11 safe and reliable operation of the SDG&E’s electric distribution system and the safety of
12 SDG&E’s customers in the communities served.

13 This concludes my prepared direct testimony.

³⁶ D.19-09-051 at 267 (“Because of enhanced wildfire risk, SDG&E may find it necessary to conduct enhanced and additional risk mitigation activities that are difficult to predict at this time.”).

1 **III. WITNESS QUALIFICATIONS**

2 My name is Shaun Gahagan. My business address is 8326 Century Park Court, San
3 Diego, California, 92123. I am employed by SDG&E as the Wildfire Mitigation Program
4 Manager. I have been employed by SDG&E since 2010 and have over 11 years of experience in
5 the utility industry. While with SDG&E, I have held various positions of increasing
6 responsibility in the functional areas of Wildfire Mitigation, Electric Regional Operations,
7 Substation Construction and Maintenance, Electric Distribution Planning, and Major Projects.

8 My current responsibilities include overseeing the development and implementation of
9 SDG&E's WMP and associated quarterly reports and filings. Prior to that, I was the Operations
10 and Engineering Manager of the Northeast District within Electric Regional Operations,
11 responsible for compliance inspections, reliability projects, and supervising the Electric
12 Troubleshooters. I have also worked as the Operations and Engineering Manager at SDG&E's
13 Substation Construction and Maintenance group where I was responsible for capital construction
14 and substation inspection and maintenance. Prior to that, I was the Team Lead at Electric
15 Distribution Planning responsible for the design of electric distribution projects required for
16 reliability and capacity.

17 I earned a Bachelor of Science degree in Chemical Engineering from Manhattan College
18 and a Master of Science degree in Chemical Engineering from the University of California San
19 Diego. I am a registered Professional Electrical Engineer (PE) in California.

20 I have not previously testified before the California Public Utilities Commission.

APPENDIX A

General Order 95

Appendix E

Clearance of Poles, Towers and Structures from Railroad Tracks

The following are guidelines to [Rule 35](#) .

The radial clearances shown below are recommended minimum clearances that should be established, at time of trimming, between the vegetation and the energized conductors and associated live parts where practicable. Reasonable vegetation management practices may make it advantageous for the purposes of public safety or service reliability to obtain greater clearances than those listed below to ensure compliance until the next scheduled maintenance. Each utility may determine and apply additional appropriate clearances beyond clearances listed below, which take into consideration various factors, including: line operating voltage, length of span, line sag, planned maintenance cycles, location of vegetation within the span, species type, experience with particular species, vegetation growth rate and characteristics, vegetation management standards and best practices, local climate, elevation, fire risk, and vegetation trimming requirements that are applicable to State Responsibility Area lands pursuant to Public Resource Code Sections 4102 and 4293.

Voltage of Lines	Case 13 of Table 1	Case 14 of Table 1
Radial clearances for any conductor of a line operating at 2,400 or more volts, but less than 72,000 volt	4 feet	12 feet
Radial clearances for any conductor of a line operating at 72,000 or more volts, but less than 110,000 volts	6 feet	20 feet
Radial clearances for any conductor of a line operating at 110,000 or more volts but less than 300,000 volts	10 feet	30 feet
Radial clearance for any conductor of a line operating at 300,000 or more volts	15 feet	30 feet

Appendix B

**Excerpt from San Diego Gas & Electric Company's
Quarterly Report on 2020 Wildfire Mitigation Plan for Q3 2020**

L. Update on Condition SDGE-13: Lack of Risk Reduction or Other Supporting Data for Increased Time-or-Trim Clearances

As described in its 2020 WMP Remedial Compliance Plan, SDG&E’s plan to measure the performance of enhanced clearances involved trimming trees to the enhanced clearance level, and then measuring the reliability performance of the electric system near those trees before and after the trimming. And while that will measure the effectiveness of this program on a going forward basis, SDG&E does have trees in the system that are trimmed to 20 – 30’ clearance and was able to develop a study to measure the impacts of post trim clearance on vegetation contacts and ultimately ignitions.

To begin the study, SDG&E queried the vegetation database for outages caused by individual trees that had a post trim clearance associated with the tree at the time of the outage. At the outset, SDG&E’s original goal was to utilize 20 years of data (2000 through 2019), but the data set was incomplete for years 2000 and 2001. While SDG&E has recorded vegetation contacts since 1995, SDG&E started recording outages for specific trees in its vegetation management database starting in the year 2000. There were some process issues in recording the data in the early years, however as this table demonstrates. Accordingly, SDG&E truncated the data set to 2002 – 2019.

**SDGE-13 Table 21
Vegetation Contacts**

	Contacts with post trim clearance	All Outages	% Trees with a trim
2000	4	42	9.5%
2001	21	64	32.8%
2002	46	102	45.1%
2003	58	113	51.3%
2004	37	72	51.4%
2005	32	70	45.7%
2006	62	79	78.5%
2007	43	71	60.6%
2008	52	107	48.6%
2009	40	78	51.3%
2010	55	130	42.3%
2011	18	29	62.1%
2012	25	39	64.1%
2013	21	29	72.4%
2014	36	48	75.0%
2015	21	28	75.0%
2016	39	65	60.0%
2017	38	70	54.3%
2018	30	36	83.3%
2019	21	31	67.7%
Total	699	1303	53.6%

The study concept involved measuring the amount of historical contacts from trees that had been in SDG&E’s tree inventory and trimmed to a certain measured line clearance by SDG&E certified arborists. As this study is focused on the impact that trimming trees to a certain clearance has on vegetation contacts, contacts from trees that were not in inventory (had never been trimmed) or contacts from fall in trees were excluded from this data set. Below is a table containing the vegetation contact data.

SDGE-13 Table 22
Outages by Post Trim Clearance

Outages by Post Trim Clearance											
Year	2.1 to 4.0 ft	4.1 to 5.9 ft	6.0 to 7.9 ft	8.0 to 9.9 ft	10.0 to 11.9 ft	12.0 to 14.9 ft	15.0 to 19.9 ft	20.0 to 30.0 ft	30.1 to 40.0 ft	40.1 to 50.0 ft	50.1 - 60.0 ft
2002	2	8	1	15	15						
2003	0	6	4	20	26						
2004	0	1	3	6	26						
2005	0	1	3	4	24						
2006	0	0	3	4	54	0	0	0			
2007	1	0	3	1	37	1	0	0			
2008	1	1	2	3	41	2	0	1			
2009	0	3	1	0	32	2	1	1			
2010	0	1	2	2	45	0	3	2			
2011	0	0	0	0	17	0	1	0			
2012	0	0	0	0	22	3	0	0			
2013	1	0	0	0	15	2	0	1			
2014	0	2	0	2	26	3	1	1			
2015	2	1	0	0	18	0	0	0	0	0	0
2016	0	0	0	1	32	3	3	1	0	0	0
2017	0	1	1	1	33	2	1	0	0	0	0
2018	0	0	1	0	26	1	2	0	0	0	0
2019	0	0	2	0	17	2	0	0	0	0	0
Average contacts per year	0.4	1.4	1.4	3.5	28.1	1.5	0.9	0.5	0.0	0.0	0.0

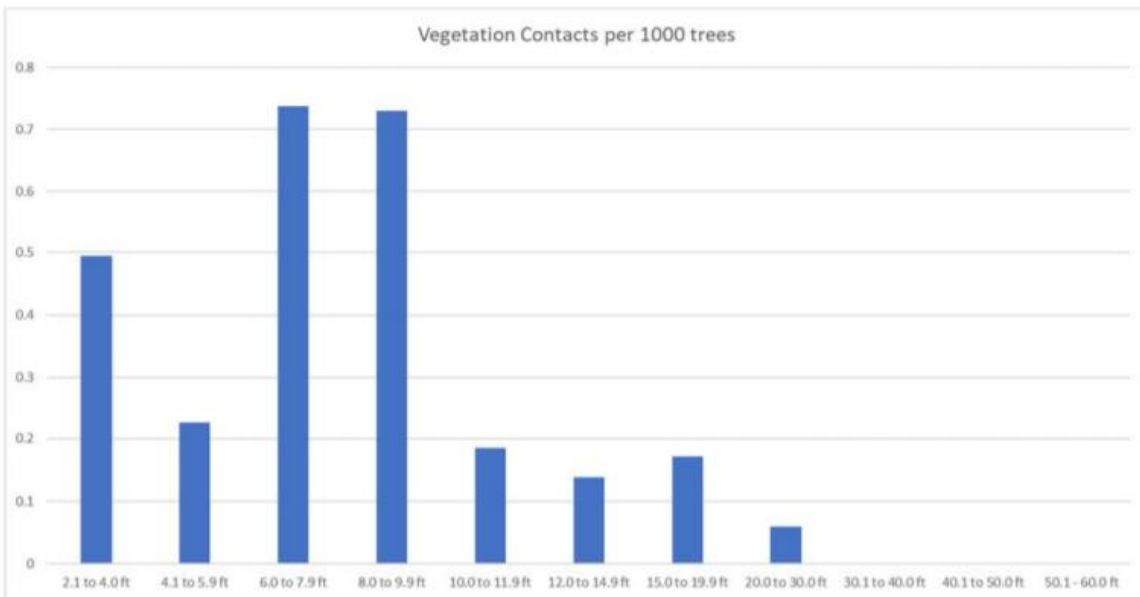
The next part of the study involved understanding the total tree exposure at these same post trim clearance levels so that a vegetation contact rate could be calculated. Ideally, SDG&E would have the entire tree inventory at the end of each year as a snapshot, by post trim clearance, but SDG&E did not record the data in that way. The best available data is the number of trees trimmed in a particular year to a post trim clearance level, which is the best proxy for inventory in this way because even though SDG&E does not trim every tree in the inventory every year, the number of trims are proportional to the inventory levels. Below is a chart showing the number of trims to post trim clearance levels by year.

**SDGE-13 Table 23
Trees Trimmed to Clearance Levels**

Trees Trimmed to Clearance Levels											
Year	2.1 to 4.0 ft	4.1 to 5.9 ft	6.0 to 7.9 ft	8.0 to 9.9 ft	10.0 to 11.9 ft	12.0 to 14.9 ft	15.0 to 19.9 ft	20.0 to 30.0 ft	30.1 to 40.0 ft	40.1 to 50.0	50.1 - 60.0
2002	910	4898	7787	27024	146090						
2003	768	5643	5254	16409	124730						
2004	359	9170	2787	3012	208161						
2005	329	5288	1922	2010	129322						
2006	430	5197	2052	2338	134801	6651	2222	2242			
2007	398	4708	1258	1627	121896	5545	1916	3203			
2008	403	5452	938	870	119608	2653	2952	6236			
2009	411	6630	872	820	140447	4902	3743	8183			
2010	173	6141	675	708	136307	5325	2747	8181			
2011	149	5779	714	664	144950	13106	2838	7489			
2012	175	5716	531	581	154370	9629	3177	6671			
2013	183	5568	414	398	148557	7716	3385	6099			
2014	1005	7368	1144	3697	203175	14008	6690	8025	2575	201	135
2015	1843	6285	1336	5031	193353	12925	7095	10457	2235	152	42
2016	1327	7313	1542	5080	191139	18308	9008	13770	3621	316	89
2017	1264	6135	1496	3459	145121	14955	7401	9856	2058	238	144
2018	1809	7148	1839	5488	164436	15922	7238	13359	2251	615	174
2019	2229	6484	2701	7067	136322	20096	9808	15154	2664	486	155
Average	787	6162	1959	4794	152376	10899	5016	8495	2567	335	123

SDG&E then divided average vegetation contacts per year at a clearance level by the trees trimmed at clearance level to determine the contact rate. As these numbers are small, SDG&E normalized the data by reporting the contact rate per 1,000 trees. Below is the resulting chart.

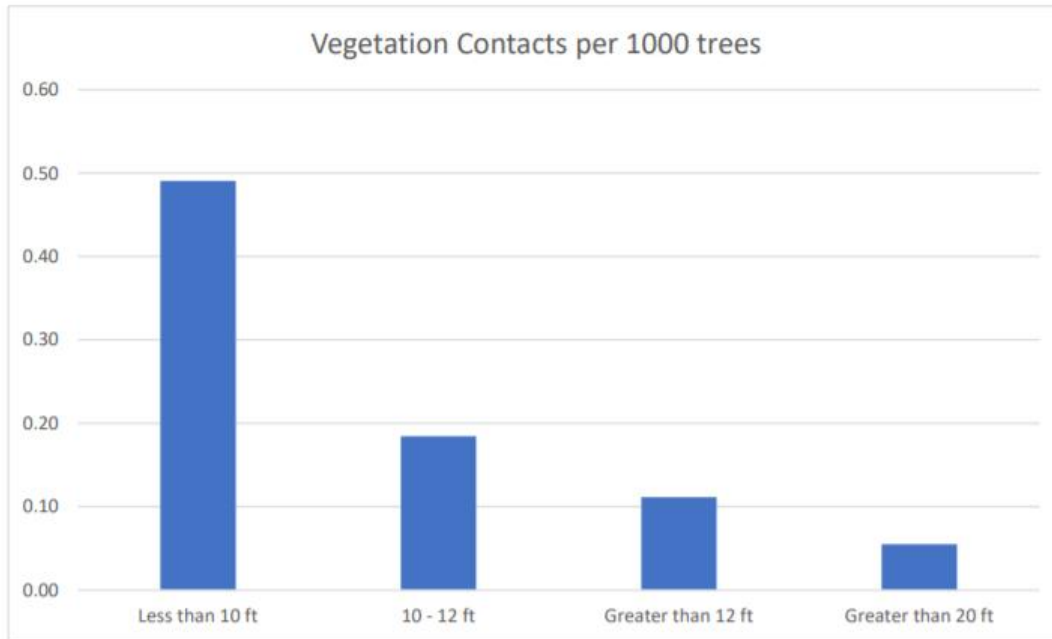
**SDGE-13 Figure 16
Vegetation Contacts per 1,000 Trees**



As shown by the chart, there is a relationship between post trim clearance and contact rates. As post trim clearance increases, the contact rates go down. To further illustrate this conclusion, SDG&E grouped the data into four categories. These groupings follow the same methodology described above. Set forth below are the results of the grouped data. SDG&E

maintained the 10 – 12’ trim level as an individual category because the majority of trees in SDG&E’s inventory are trimmed to this level.

SDGE-13 Figure 17
Vegetation Contacts per 1,000 Trees – By Group



This data demonstrates that increased post trim clearances decreases vegetation contacts are valid. It also demonstrates that stakeholder concerns regarding diminishing returns are valid too. Going from less than 10’ to 10’ - 12’ represents a .31 vegetation contact per 1000 trees reduction, while going from 12’ to greater than 20’ represents a .13 vegetation contact reduction per 1000 tree reduction. In fact, SDG&E would estimate that going from less than 10’ to 10 -12’ has an even greater impact than this data demonstrates, as SDG&E has already completed most of the trims to get its inventory to this level prior to 2002. The trees that remain at less than 10’ remain so because SDG&E’s arborist inspections determined that these specific trees were safe at these levels.

Nevertheless, even with diminishing returns, trimming to 20’ represents a 58% reduction in contact rate. For practical purposes, SDG&E’s program has targeted 80,000 trees within the HFTD for this greater level of clearance. $80,000 * .13 / 1000 = 10.4$ vegetation contacts reduced annually. Given that SDG&E currently averages 40 vegetation contacts per year, this would represent a 25% reduction in both vegetation contacts and ignition risk. While this risk

reduction is less than what SDG&E had originally estimated, based on SDG&E's current average cost per trim, this program remains risk spend efficient.

In addition to the information presented on the study, SDG&E would like to clarify the scope of the enhanced vegetation management program. The enhanced vegetation management program is targeting greater clearances on specific high-risk species (described in SDG&E-14 below), that are located in the HFTD. When SDG&E discusses achieving enhanced clearances up to 25' where feasible, it is talking about the high-risk tree species that have tree canopies located above the adjacent power lines, a radial clearance from 0-180 degrees versus 0 – 360 degrees. SDG&E is not trying to achieve a 25' radial clearance from all vegetation including native plants, grasses, shrubs, or trees that are located below the power lines. SDG&E maintains compliant clearances on trees that grow under power lines to ensure a grow in does not occur, but there is no need to increase clearances on these trees, because they are not at risk of shedding branches in wind events that could blow into the power lines. SDG&E agrees that native plants and vegetation can actually help slow the spread of fires and has no intention of clear cutting native vegetation below its power lines, its only objective is to trim back or remove trees with canopies located above the power lines that have the potential shed branches that could contact the power lines and result in a potential ignition.