

Aliso Canyon Methane Leak Climate Impacts Mitigation Program

**Air Resources Board
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I. Summary

This document sets forth the California Air Resources Board's (ARB or Board) recommended approach to achieve full mitigation of the climate impacts of the Aliso Canyon natural gas leak. This leak at a Southern California Gas Company (SoCalGas) natural gas storage facility in Los Angeles County emitted almost 100,000 tons¹ of methane, a potent greenhouse gas, into the atmosphere from October 2015 to February 2016. ARB estimates that the leak added approximately 20 percent to statewide methane emissions over its duration.

In addition to the leak's many effects on local residents, the emissions from Aliso Canyon will contribute to global warming and its detrimental consequences for the environment, problems that the State has recognized and rallied to address. A decade ago, the State enacted the California Global Warming Solutions Act of 2006 (AB 32), which targeted a return to 1990 statewide greenhouse gas emission levels by 2020. The emission-reduction strategies ARB has adopted and implemented under the authority of AB 32, combined with valuable contributions by other State agencies, local authorities, and businesses, organizations, and individuals across the State, have resulted in significant progress toward this goal. The methane emissions from the Aliso Canyon leak, equivalent to millions of tons of carbon dioxide, set the opposite example, exacerbating rather than alleviating climate change.

This mitigation program addresses the Aliso Canyon methane leak's contribution to global warming. By letter sent to Governor Brown in December 2015, SoCalGas pledged to mitigate the environmental impacts of the leak. Governor Brown subsequently issued a proclamation² (Proclamation) that directed ARB to prepare a program, to be funded by SoCalGas, that will "fully mitigate the methane emissions from the leak" and prioritize reductions of short-lived climate pollutants (SLCP). This program, with its focus on the leak's climate impacts, represents one facet of a comprehensive response by State and local agencies, as well as the affected communities themselves, to the leak and its short- and long-term effects upon the environment and public health and safety.

¹ ARB has issued a preliminary estimate that the natural gas leak emitted approximately 94,500 tons of methane, the primary component of natural gas, into the atmosphere. ARB, Aliso Canyon Natural Gas Leak, Preliminary Estimate of Greenhouse Gas Emissions (As of February 21, 2016), http://www.arb.ca.gov/research/aliso_canyon/aliso_canyon_natural_gas_leak_updates-sa_flights_thru_feb_21_2016_updated.pdf. As discussed in the ensuing text, additional data will contribute to a final emission estimate, expected by Summer 2016.

² Governor's Proclamation of a State of Emergency (Jan. 6, 2016), <https://www.gov.ca.gov/news.php?id=19263>.

With its mitigation program, ARB recommends a principle-driven approach to mitigation that will accomplish the Proclamation's objectives. ARB projects that with a sufficient and reasonable financial commitment by SoCalGas, the program related in this document will generate reductions in greenhouse gas emissions in this State over a defined time frame that are at least equivalent to the emissions from the leak, effectively counteract the damage to the atmosphere caused by the leak, and set the stage for substantial additional emission reductions in ensuing years.

Many mechanisms exist for reducing emissions of methane and other greenhouse gases, not all of which are well-situated for inclusion within a mitigation program with a definite target and a focus on SLCPs. ARB has considered numerous mitigation opportunities for potential inclusion within its program. Following this review, ARB proposes that the Aliso Canyon mitigation program incorporate a portfolio of emission-reduction projects that will:

- Generate significant and quantifiable reductions in methane emissions within the agriculture and waste sectors;
- Promote a more sustainable energy infrastructure by promoting energy efficiency and decreasing reliance on fossil fuels; and
- Address emissions from methane "hot spots" not presently targeted under federal, State, or local laws.

ARB recommends that the mitigation program focus primarily on reducing methane emissions from the agriculture (including dairy) and waste (landfill and wastewater) sectors for several reasons: methane is the State's most prevalent SLCP, these sectors generate a substantial majority of the State's methane emissions, and ARB has identified significant mitigation opportunities within these spheres. Properly targeted investments within the agriculture and waste sectors will generate emission reductions commensurate with the emissions from Aliso Canyon, catalyze additional emission reductions, and generate significant economic and environmental co-benefits. Meanwhile, the two secondary areas of program emphasis recommended by ARB will serve valuable complementary roles by producing near-term emission reductions, yielding co-benefits of their own, especially in communities most directly affected by the Aliso Canyon leak and disadvantaged communities, and ensuring the realization of other programmatic objectives, as described below.

The mitigation program proposed here represents the product of a process that incorporated two periods of public comment, the second of which followed the posting of a draft version of this program on ARB's website. Altogether, more than 60 comments

on the mitigation program were received from stakeholders and reviewed by ARB staff.³ ARB thanks all commenters for their time and their engagement with the development of the mitigation program. These comments make it clear that the people of this State and their public officials refuse to allow the Aliso Canyon leak to compromise the State's campaign to address climate change.

These comments contained many helpful suggestions for the mitigation program. Some commenters supported the program as described in Aliso Canyon Methane Leak Climate Impacts Mitigation Program Draft (Draft) posted by ARB on March 14, 2016.⁴ Other comments recommended changes to the Draft. ARB has modified certain aspects of its proposed program in response to feedback it has received. In other respects, comments will inform the mitigation program going forward, even when no corresponding changes were made to the Draft. The comments, as a whole, reflected a range of views regarding how best to respond to the climate-change dimension of the Aliso Canyon leak. These differences underscore the diversity in perspectives that will continue to ensure a robust response to the incident. ARB's recommendations that follow are mindful and respectful of the input the agency has received, even where ARB recommends a different approach than that advanced by a commenter.

Substantively, these comments addressed various aspects of the program proposed in the Draft.⁵ Some comments addressed topics relevant to the basic nature of the necessary mitigation, such as the global warming potential (GWP) figures most appropriate to this specific context. The discussion of full mitigation in this document incorporates ARB's responses to these comments. Many comments suggested geographic or substantive areas of emphasis for the mitigation program. Upon consideration of these comments, ARB believes that while the primary and secondary emphases of the mitigation should remain as described in the Draft, such that reductions in methane emissions from the agriculture and waste sectors remain the principal mitigation target, the selection process for projects should specifically account for the interest in situating mitigation projects in nearby communities harmed by the

³ On ARB's website, comments received on the February 18, 2016 presentation to the Board by ARB staff appear at <http://www.arb.ca.gov/lispub/comm2/bccommlog.php?listname=aliso-canyon-mp-ws>. Comments received on the draft version of this program appear at <http://www.arb.ca.gov/lispub/comm2/bccommlog.php?listname=alisonpmdraft-ws>.

⁴ The Draft can be found on ARB's website at http://www.arb.ca.gov/research/aliso_canyon/draft_aliso_canyon_mitigation_program_03142016.pdf.

⁵ Some comments received by ARB suggested responses to the leak, such as a methane tax, that lie outside of ARB's mandate under the Proclamation. While these suggestions have not been incorporated within ARB's mitigation program, they provide insights into how others would respond to the Aliso Canyon incident and address methane emissions within the State.

Aliso Canyon leak, other communities directly affected by methane emissions, disadvantaged communities, and communities within the Aliso Canyon service area. ARB therefore recommends a scoring system for emission-reduction projects that takes this consideration into account, giving qualified prioritization to projects in these areas ahead of otherwise similar projects elsewhere.

Comments also addressed other aspects of the program proposed in the Draft. Numerous comments received by ARB endorsed specific mitigation projects for inclusion in the program. Although ARB is not presently prepared to recommend specific projects for incorporation into the program, ARB anticipates that proposals that advance projects described in these comments will be submitted and reviewed during the program's implementation process. ARB also received several comments concerning the process of program implementation, and has revised the Draft to provide additional details on some of the matters raised in these comments. Finally, stakeholder comments included helpful observations about other matters for ARB to consider going forward in the implementation process.

Ultimately, the mitigation program ARB recommends here represents the agency's view of a mitigation framework that is fair, effective, and appropriate to its context. The program presented in this document responds to the circumstances of this particular incident (as currently known), SoCalGas's voluntary outreach to the Governor, and the terms of the Governor's Proclamation. Different circumstances could produce different mitigation recommendations from ARB. The program presumes that SoCalGas will continue to embrace its earlier pledge to work with the State to mitigate the environmental impacts of the leak.

The text that follows elaborates on the program's background, its framing principles and objectives, ARB's recommended areas of programmatic emphasis, and a process for implementing the program.

II. Background

In October 2015, SoCalGas reported a natural gas leak at well SS-25 at its Aliso Canyon natural gas storage facility in Los Angeles County. Over the next four months, emissions from this leak drove thousands of local residents from their homes, impaired public health, and added almost 100,000 metric tons of methane, a powerful greenhouse gas, to the atmosphere.

SoCalGas stopped the leak and sealed well SS-25 in February 2016. Even though the leak has stopped, State, regional, and local agencies continue the work they began while the leak was ongoing to identify and address its many impacts on public health and the environment. Among these efforts, throughout the duration of the leak ARB

teamed with partners including the South Coast Air Quality Management District to monitor and track leaked emissions. These efforts continue, with a final estimate of the leak's methane emissions expected by Summer 2016. Investigations also are underway to pinpoint the reasons for the leak, and rulemakings have been launched to prevent similar calamities from occurring in the future.

This climate impacts mitigation program represents one facet of the comprehensive multi-agency response to the Aliso Canyon leak. While ARB's proposed mitigation program addresses only the global warming consequences of the leak, ARB understands that the leak has had other significant harmful impacts that require careful review and full redress. State, regional, and local authorities have already taken and will continue to take steps to moderate and respond to these impacts and the leak's other effects on the environment and public health and safety. The mitigation program that ARB recommends will complement the actions of these entities through mitigation of the leak's climate impacts.

The mitigation program draws from ARB's experience in measuring greenhouse gas emissions and devising and executing strategies to reduce these emissions. Since the enactment of AB 32 in 2006, ARB has designed and implemented a suite of emission-reduction programs to achieve the statute's target of returning to 1990 statewide greenhouse gas emission levels by 2020, as well as continuing further reductions thereafter. ARB also is developing a complementary plan pursuant to SB 605 (Lara, Chapter 523, Statutes 2014) to reduce the State's emissions of SLCPs, including methane. SLCPs represent a class of climate pollutants that also includes black carbon and fluorinated gases. SLCPs do not persist in the atmosphere for as long as carbon dioxide—the most common climate pollutant—but on a ton-for-ton basis, SLCPs have a more significant climate impact than carbon dioxide. Overall, it is estimated that SLCPs are responsible for approximately 40 percent of current net climate forcing, a fact that highlights the need for prompt action to address these pollutants. ARB released its draft SLCP reduction strategy in September 2015, and a final plan is forthcoming.

On December 18, 2015, with the leak still ongoing, SoCalGas CEO Dennis Arriola wrote Governor Brown a letter promising that SoCalGas would “mitigate the environmental impact of the actual natural gas released from the leak” and “[w]ork[] with you and your staff to develop a framework that will help us achieve this goal.” Consistent with SoCalGas's pledge, Governor Brown charged ARB with developing a program to mitigate the climate impacts of the methane released from the leak. In a Proclamation issued on January 6, 2016, Governor Brown directed ARB to prepare a mitigation program, to be funded by SoCalGas, designed to fully mitigate the leak's emissions of methane. The Proclamation also directed that this program be developed in consultation with appropriate State agencies, be limited to projects in this State, and

prioritize projects that reduce SLCPs. Finally, the Proclamation directed ARB to develop the program by March 31, 2016.

This document relates a mitigation program that meets the Governor's goal of realizing full mitigation through a portfolio of in-State projects that prioritizes reductions of SLCPs. The document reflects a process of program development that has included outreach to appropriate State agencies, a presentation by ARB staff to the Board at its February 2016 meeting⁶ and an ensuing public-comment period, the posting of the Draft of this program on ARB's website on March 14, 2016, and a second period of public comment afterward.

III. Quantifying Full Mitigation

The directive to fully mitigate the Aliso Canyon leak's emissions of methane requires, at the outset, that ARB define "full mitigation" of climate impacts in this context.

Since November 2015, ARB has measured emissions from the Aliso Canyon leak using several different methods. These measurements allow for the estimation of the leak's cumulative emission totals. ARB presently estimates that, in all, the leak released approximately 100,000 metric tons of methane into the atmosphere. This is a preliminary estimate. Additional data will inform a final emission estimate, expected by Summer 2016. Drawing from numerous data sources and research by leading experts, employing a comprehensive array of measurement techniques, the ARB-approved final estimate will provide the reference point for the total emissions to be mitigated.

ARB believes a mitigation program that will achieve "full mitigation" of climate impacts must generate reductions in emissions of SLCPs and other greenhouse gases at least equivalent to the total quantity of Aliso Canyon methane emissions ultimately estimated. The preliminary nature of the current emission estimate means that the mitigation program that ARB proposes in this document is, by necessity, scalable and designed to account for possible adjustments in the overall emission total at a later date.

ARB envisions that the mitigation program will concentrate principally on projects that will reduce methane emissions, allowing for ton-for-ton comparisons between leaked emissions and emission reductions from mitigation projects. The text below discusses the drawing of comparisons across greenhouse gases, however, in the event that some

⁶ The presentation on Aliso Canyon given by ARB staff to the Board on February 18, 2016, which included a discussion of the climate impacts mitigation program under development, can be found on ARB's website at <http://www.arb.ca.gov/board/books/2016/021816/16-2-1pres.pdf>.

other gases may be targeted either directly or as an ancillary effect of programs designed to achieve methane reductions.

The concept of a GWP recognizes the fact that some climate pollutants have a more powerful influence upon the climate on a per-ton basis than others. A climate pollutant's GWP represents a measure of its climate impact integrated over a period of time from the emission of a unit mass relative to carbon dioxide, which has the baseline GWP of 1. The fact that different climate pollutants have different GWPs means that the emission reductions needed to fully mitigate approximately 100,000 tons of methane will depend on the specific climate pollutant involved in the mitigation. Should mitigation projects target carbon dioxide or SLCPs other than methane, some conversion will have to occur to account for the fact that, on a ton-for-ton basis, methane is a far more potent climate pollutant than carbon dioxide, and less potent than fluorinated gases or black carbon.

A GWP can be characterized in 20-year and 100-year terms. This distinction accommodates the fact that some gases, such as methane, have an especially potent effect over a short time horizon, which then decays as the gas undergoes chemical reactions that transform it into gases that are not climate pollutants. The GWPs assigned to different greenhouse gases have evolved with advances in climate-change research. Current science, as related by the Fifth Assessment Report of the United Nations Intergovernmental Panel on Climate Change (AR 5), assigns to methane a 20-year GWP of 84 and a 100-year GWP of 28.⁷ In other words, one ton of methane has the global warming potential of 84 tons of carbon dioxide over a 20-year time frame, and the potential of 28 tons of carbon dioxide over a 100-year span. These reconciliations often are expressed in terms of methane's carbon dioxide equivalent, or CO₂e.

With this mitigation program, ARB uses the 20-year GWPs for SLCPs assigned by AR 5. These figures properly incorporate current scientific knowledge, underscore the influence of SLCPs as immediate climate-forcing agents, and emphasize the need for immediate action on climate change.⁸ The anticipated consequences of climate change by 2050 and 2100 are sufficiently dramatic and irreversible to make it inappropriate to

⁷ Myhre, et al. (2013), Chapter 8, Anthropogenic and Natural Radiative Forcing, in Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, http://www.ipcc.ch/pdf/assessment-report/ar5/wg1/WG1AR5_Chapter08_FINAL.pdf.

⁸ "The use of [global warming potentials] with a time horizon of 20 years better captures the importance of the [short-lived climate pollutants] and gives a better perspective on the speed at which [short-lived climate pollutant] emission controls will impact the atmosphere relative to CO₂ emission controls." ARB (2015), Draft Short-Lived Climate Pollutant Reduction Strategy, <http://www.arb.ca.gov/cc/shortlived/2015draft.pdf>.

tether mitigation here to methane's impacts over an even longer time horizon. Using the AR 5 20-year GWP of 84, the approximately 100,000 tons of methane emitted in the Aliso Canyon leak amount to about 8,000,000 metric tons of carbon dioxide equivalent (8 MMTCO_{2e}).

Some stakeholder comments in response to the Draft recommended the use of different GWP figures within the mitigation program. Multiple comments favored a 100-year GWP; others recommended that ARB consider climate-carbon feedbacks that, per the AR 5 report, increase methane's 20-year GWP to 86. For purposes of this mitigation program, ARB continues to believe a 20-year GWP of 84 is appropriate. The principal argument advanced by commenters for using a 100-year GWP is that this metric is more commonly used in other contexts. In those settings, such as some greenhouse gas inventories, the interest in maintaining consistency across emission measurements can provide a reason to employ a uniform metric. This singular, forward-looking mitigation program, focused on SLCP reductions, presents distinct issues and considerations that make a 20-year GWP more appropriate. Meanwhile, although there may be merit to using a GWP figure that accounts for climate-carbon feedbacks, ARB is not prepared to endorse such an approach here without giving additional consideration to its advisability. For this reason, ARB continues to use a 20-year GWP for methane of 84.

The full mitigation contemplated by this program does not involve the purchase and surrender of compliance instruments (allowances and offset credits) associated with the State's Cap-and-Trade Program for greenhouse gas emissions. Use of these instruments for mitigation would be inappropriate for several reasons. Among them, the Cap-and-Trade Program, with its carefully calibrated annual emission caps, is not designed to capture fugitive emissions from sources such as Aliso Canyon. SoCalGas's purchase of compliance instruments commensurate with Aliso Canyon emissions could tighten the markets for Cap-and-Trade allowances and offsets and potentially impact the cost and ability of regulated entities to comply with the Cap-and-Trade Program. Surrender of compliance instruments to supposedly mitigate Aliso Canyon emissions thus could hinder rather than facilitate the State's progress toward meeting its 2020 target for greenhouse gas emissions. The contrary views expressed by SoCalGas in its comment regarding this element of the mitigation program reflect both a misunderstanding of the Cap-and-Trade Program and a misapprehension of what full mitigation entails.⁹

⁹ SoCalGas's comment letter also makes the overbroad and inaccurate assertion that "ARB explicitly decided not to regulate fugitive emissions." On the contrary, ARB does regulate these emissions, such as in its ongoing rulemaking regarding fugitive gas emissions within the oil and gas sector.

ARB recommends that the emission reductions associated with this mitigation program occur within a defined time frame, ideally five and not more than 10 years from the beginning of the Aliso Canyon leak. This window for achieving the necessary emission reductions recognizes that some mitigation projects that may be included within the program may take a few years to start generating substantial emission reductions due to coordination, planning, permitting, and construction prerequisites. At the same time, a time limit will ensure prompt action is taken to implement the mitigation program, facilitate the monitoring of program progress, lessen the administrative costs associated with program implementation, and avoid the contingencies that may complicate or frustrate distant emission reductions.

On the matter of timing, one commenter on the Draft recommended a somewhat shorter period for mitigation, “at most within five years and preferably by 2020.” The comment received from SoCalGas, conversely, stated that all emission reductions from the “lifecycle of a project” should count toward mitigation. ARB agrees that a five-year window for emission reductions is optimal, but also believes that strict insistence on such a constraint could unduly disadvantage potentially transformative projects that may take a few years to begin yielding significant emission reductions. A “project lifecycle” approach, on the other hand, would treat emission reductions in the distant future as precisely the same (on a ton-for-ton basis) for mitigation purposes as emissions from the Aliso Canyon leak, which is not the case as a matter of science, consequence, or logic. ARB therefore maintains its earlier recommendation regarding the timing of emission reductions.

The issue of a time frame for full mitigation is related to the question of discounting future emission reductions. One comment urged ARB to discount future greenhouse gas reductions to account for their delayed benefits. ARB has considered whether these reductions require discounting, and if so, what the proper discount factor would be. ARB appreciates that arguments may exist in favor of some discounting of future mitigation. However, ARB declines to recommend the discounting of emission reductions obtained in connection with the Aliso Canyon mitigation program that it prescribes at this time. The time frame for the necessary emission reductions in ARB’s recommended program lessens, if not eliminates, the importance of discounting. The more delayed the emission reductions are, though, the stronger the case becomes for incorporating a discounting mechanism into the formula required for tallying future emission reductions and measuring them against a full-mitigation benchmark.

IV. Mitigation Objectives and Principles

There exist many possible routes toward full mitigation of the climate impacts of the methane emissions from the Aliso Canyon leak. ARB has identified a series of core principles and objectives that provide necessary direction for mitigation efforts.

A. Program Objectives

Consistent with the language of the Governor's Proclamation, the mitigation program envisioned by ARB involves a complementary suite of emission-reduction projects. ARB has identified the following as the key objectives for the overall mitigation program it proposes:

- Achieving reductions in emissions of SLCPs and other greenhouse gases with an aggregate CO₂e (20-year GWP) at least equal to the CO₂e of the methane emitted from the leak;
- Catalyzing substantial additional reductions in emissions of SLCPs and other greenhouse gases over the near- and longer terms;
- Generating significant environmental, economic, and public health co-benefits, including those associated with reduced reliance on fossil fuels;
- Conferring co-benefits upon disadvantaged communities and communities directly impacted by the leak, and incorporating avenues for engagement by these communities in the program development and implementation process;
- Facilitating participation by other stakeholders, with the public being given the opportunity to provide meaningful input toward the program's composition, and receiving timely updates regarding the program's ongoing progress; and
- Allowing for ongoing monitoring and verification of program implementation and progress.

The first of these objectives follows from the definition of "full mitigation" related in Section III of this document, and represents the paramount goal of this mitigation program. The next three objectives recognize that some mitigation projects that could serve to achieve this goal also may provide momentum for additional emission reductions, involve co-benefits such as reductions in criteria pollutants, and provide benefits to disadvantaged communities and areas most affected by the Aliso Canyon methane leak; their inclusion as objectives underscores that these beneficial attributes also should inform project selection and program composition. The final two objectives pertain to process, with an inclusive program-development process being followed by a well-supervised and transparent implementation phase.

B. Mandatory Project Criteria

In addition to these overall program objectives, ARB has defined several core principles that individual projects must satisfy to be eligible for inclusion within the mitigation program. At a minimum, each project within the program must:

- Occur within the State;
- Complement the existing and anticipated efforts of federal, State, and local governments to combat global warming, reduce air pollution, and protect public health, safety, and the environment;
- Address the global warming impacts of the Aliso Canyon methane leak;
- Involve specific actions (whether in the nature of funding or otherwise) to be taken by SoCalGas, and allow for ready verification of these actions;
- Yield real, verifiable, and permanent greenhouse gas emission reductions that are additional to those that would be achieved under a conservative “business as usual” scenario, including actions that SoCalGas already is taking, will otherwise be legally obligated to undertake, or voluntarily agreed to prior to the natural gas leak at Aliso Canyon.

ARB has considered and rejected the position that projects that could have any economic value to SoCalGas should be excluded from the mitigation program on that basis. As described above, eligible projects must be additional to those that SoCalGas already is taking, will be legally obligated to undertake, or voluntarily agreed to prior to the Aliso Canyon leak. These criteria will be carefully applied to projects under review for inclusion within the mitigation program, and will avoid the prospect of a windfall in lieu of true mitigation. To ensure this outcome, SoCalGas may be required to forfeit some benefits associated with mitigation projects, or contribute these benefits toward additional mitigation efforts, until such time as full mitigation is achieved.

C. Other Considerations for Projects

In addition to the necessary criteria related above, ARB recommends that other considerations inform the selection of projects for the program. Specifically, the program should prioritize emission-reduction projects that:

- Involve substantial direct and indirect reductions in emissions of SLCPs, especially methane;
- Involve communities directly impacted by the Aliso Canyon methane leak, other communities directly affected by methane leaks, or disadvantaged communities;
- Enhance the sustainability and resiliency of the State’s energy infrastructure, with a particular focus on projects in communities served by the Aliso Canyon natural gas storage facility; or

- Provide other significant and demonstrable environmental, economic, or public health co-benefits.

Comments on the Draft received from Porter Ranch residents, their elected representatives, and other public officials urged ARB to prioritize emission-reduction projects that would confer co-benefits upon nearby communities that felt the effects of the Aliso Canyon leak most keenly. ARB also received similar input from stakeholders who supported the prioritization of projects that would serve other specified communities, areas, or needs. Upon consideration of these comments, ARB agrees that the mitigation program should prioritize emission-reduction projects in a systematic manner sensitive to the circumstances surrounding this incident.

Therefore, in the review process for mitigation-project proposals, the scoring system used in connection with project selection will assign weights to the above-listed factors, as well as other project criteria, so that all else being substantially equal,¹⁰ emission-reduction projects involving communities directly affected by emissions from the Aliso Canyon leak will be prioritized over emission-reduction projects situated elsewhere. Meanwhile, emission-reduction projects that either enhance energy efficiency or promote reliance on renewable energy in other communities served by the Aliso Canyon natural gas storage facility, address methane emissions in areas directly affected by other methane leaks across the State, or involve disadvantaged communities also would receive an incremental advantage in the project scoring process over other projects with similar cost, emission-reduction, and co-benefit profiles, although to a lesser extent than projects within the first of these prioritized categories.

As combined with this program's areas of primary and secondary emphasis, this approach will produce an efficient, effective, and fair mitigation program. The irreducible goal of this program is to achieve full mitigation of the climate impacts of the Aliso Canyon leak. As described elsewhere in this document, ARB believes that projects to reduce methane emissions from the agriculture and waste sectors represent the optimal vehicles for obtaining the majority of emission reductions and do so in a reasonable time frame and at reasonable cost. The geographic adjustments incorporated within the scoring process for projects therefore will remain subordinate to the primary emphasis that the mitigation program will place on projects addressing methane emissions from the agriculture and waste sectors.

¹⁰ The notion of "all else being substantially equal" connotes that projects with substantially different costs or emission-reduction forecasts or potential would not be considered similarly situated for purposes of this review. In addition, a project lacking substantial economic, environmental, or public health co-benefits would not be regarded as similar to a project that promised substantial co-benefits in one or more of these respects.

Ultimately, while good reason exists to give certain emission-reduction projects some priority in the project selection process based on their location, ARB believes that its mitigation program must consider and, as appropriate, incorporate emission-reduction opportunities as may exist across the State. An advance directive that the mitigation program be limited to projects in a particular community or region of the State could result in a program that would not result in full mitigation of climate impacts, do so only at excessive cost, or fail to achieve transformative results or other important program objectives. These concerns loom especially large insofar as the program must produce substantial reductions in emissions of SLCPs, especially methane, within a manageable time frame.

V. Mitigation Projects

The objectives and principles described above inform ARB's recommendations regarding the mitigation program's areas of emphasis. These recommendations also draw from insights generated through ARB's ongoing preparation of a Short-Lived Climate Pollutant Reduction Strategy,¹¹ stakeholder input regarding project selection, and the substantial efforts of other authorities at the federal, State, local, and international levels to reduce emissions of SLCPs and other greenhouse gases.

A. Areas of Concentration

In identifying the recommended areas of program emphasis, ARB has considered the extent to which potential project categories, both viewed independently and in tandem with other project types, would fulfill the principles and objectives discussed earlier in this document. ARB also has taken into account additional factors such as the State's pronounced interest in reducing methane emissions,¹² the cost-effectiveness of various emission-reduction measures, the quantity of emission reductions anticipated to result from different mitigation projects, and the need for both immediate and longer-term reductions in emissions of SLCPs and other greenhouse gases. From this assessment, ARB recommends that the Aliso Canyon mitigation program emphasize the following:

- **Reducing Methane Emissions from the Agriculture and Waste Sectors:** ARB recommends that, as its primary emphasis, the mitigation program support

¹¹ ARB (2015), Draft Short-Lived Climate Pollutant Reduction Strategy, <http://www.arb.ca.gov/cc/shortlived/2015draft.pdf>.

¹² Methane is neither a criteria pollutant subject to air quality standards under the Clean Air Act, 42 U.S.C. section 7208 et seq. and State law (e.g., California Health and Safety Code sections 39602.5, 39606(a)(2), 39608(a); California Code of Regulations title 17, section 70100 et seq.) nor a toxic air contaminant subject to control under California Health and Safety Code section 39650 et seq. and California Code of Regulations title 17, section 93000 et seq.

projects that will reduce methane emissions in the agriculture (including dairies) and waste (landfill and wastewater) sectors. Combined, these sectors produce approximately three-quarters of statewide methane emissions, making improvement central to the achievement of the State's climate goals. ARB anticipates that with sufficient funding, the mitigation program could generate reductions in methane emissions from these sectors at least commensurate with the emissions from the Aliso Canyon leak, although it may take several years to realize this mitigation. Mitigation opportunities within these sectors include the development of infrastructure and systems to convert methane captured by anaerobic digesters within the State into biogas that could be directed toward several beneficial uses, including renewable hydrogen production. This area of emphasis would not include projects adequately sponsored by other programs, e.g., the purchase of on-farm digester equipment where funding is already available from existing federal or State programs. Furthermore, the availability of mitigation funds should not provide a basis to delay any regulatory requirements for reductions of SLCPs from these sectors.

- **Promoting Sustainable Energy Infrastructure:** As a secondary area of emphasis, ARB recommends that the mitigation program reduce emissions of SLCPs and other greenhouse gases through projects that will enhance the State's energy infrastructure by decreasing reliance on fossil fuels and promoting energy efficiency and renewable energy resources. Examples of projects within this category include:
 - New or enhanced incentives or subsidies to replace appliances that consume fossil fuels (e.g., gas water heaters and furnaces) with devices or systems that rely on renewable energy;
 - Subsidization of purchases of low-emission or zero-emission vehicles to replace existing vehicle fleets, including diesel fleets (such as bus fleets) and fleets of light-duty vehicles;
 - Build-outs of infrastructure necessary to support sustainable transportation technologies; and
 - Sponsorship of other residential and commercial energy-efficiency programs additional to SoCalGas's existing and anticipated efforts.

- **Addressing "Orphan" and Newly Identified Methane Emission Sources:** Finally, ARB recommends that the mitigation program build upon ongoing efforts to identify and control previously unrecognized or unresolved sources of methane emissions through projects that will reduce emissions of methane that no person or entity presently has a legal responsibility to mitigate, or which lack a financially solvent responsible party. Projects here could include sponsorship of efforts to

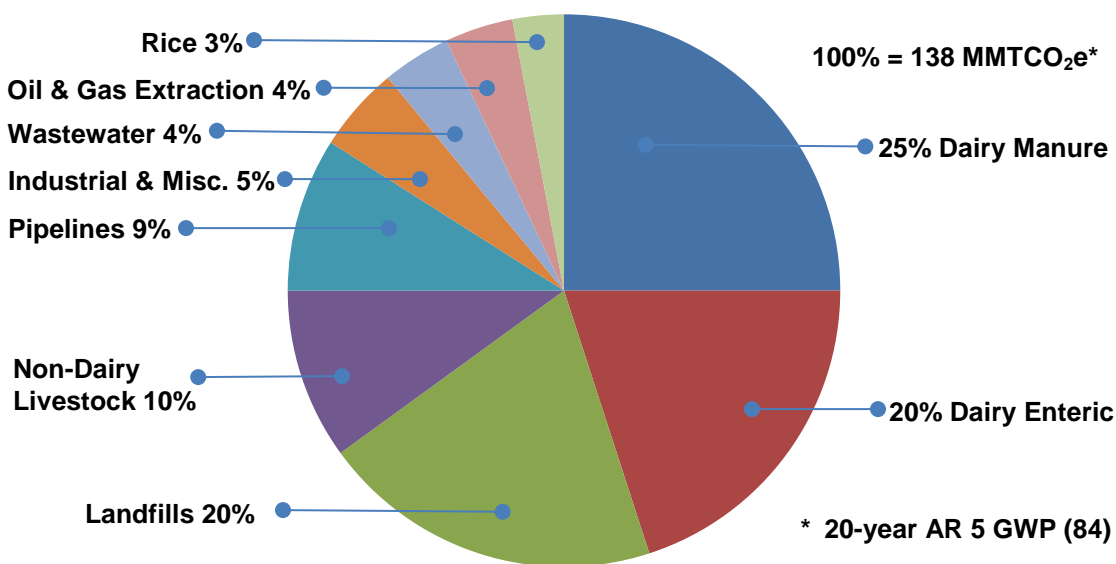
abate leaks at high-emission methane “hot spots” in the State, such as abandoned oil and gas wells.¹³

A robust mitigation program comprised of projects within these three categories could meaningfully advance the State’s efforts to reduce SLCP emissions. Such a program will address SLCP emissions on multiple dimensions by simultaneously targeting the predominant known sources of methane emissions in the State; assisting with the identification and abatement of additional methane emission sources; and moving the State toward a future in which an evolved, more resilient energy infrastructure will make SLCP emissions, from facilities such as Aliso Canyon or otherwise, less likely to occur. A more detailed explanation of ARB’s recommendations follows.

B. Program Concentration #1: Reducing Emissions in the Agriculture and Waste Sectors

ARB anticipates that within the mitigation program, projects within the agriculture and waste sectors will produce most of the emission reductions required for full mitigation of climate impacts. As ARB’s SLCP inventory demonstrates, approximately three-quarters of the State’s emissions of methane come from these sectors:

Figure 1: California 2013 Methane Emission Sources



¹³ ARB has been charged under AB 1496 (Thurmond, Chapter 604, Statutes 2015) with monitoring and measuring methane “hot spots” within the State. California Health & Safety Code section 39731(a). The mitigation projects envisioned within this category would build on, and be additional to, research efforts undertaken by ARB and others to identify and monitor emissions from these sites.

Methane emissions from agriculture are primarily associated with enteric fermentation and emissions from dairy manure lagoons. Emissions from landfills derive principally from the decay of organic waste deposited in these sites.

Since these sectors are responsible for the majority of the State's methane emissions, they represent logical starting points for prospective mitigation responsive to the Aliso Canyon leak. The State must seize mitigation opportunities in these sectors in order to achieve the Governor's goals of a 40 percent reduction in statewide emissions of greenhouse gases by 2030 and an 80 percent reduction in these emissions by 2050. ARB's Draft Short-Lived Climate Pollutant Reduction Strategy has identified reduced greenhouse emissions from manure management practices at dairies, in particular, as the source of almost half the reductions needed to achieve the State's 2030 emissions target for methane.

Past, present, and anticipated rulemakings, incentive programs, credits, and grants will put the State in a position to achieve these emission-reduction targets, but more must be done.¹⁴ The Aliso Canyon mitigation program provides a vehicle to stimulate substantial emission reductions through projects that will divert or capture methane from agricultural operations, landfills, and wastewater treatment sites.

For example, SoCalGas could leverage its existing capabilities and provide funding to facilitate the production of marketable biogas from methane emissions that could be captured at anaerobic digesters situated at dairies, landfills, and wastewater treatment facilities. Properly targeted contributions will build upon existing programs and systems to maximize their impact. Within the agricultural sector, financing as part of a mitigation program could help support biogas upgrading and pipeline interconnection and injection infrastructure, which could advance other, parallel efforts to promote digester construction at individual dairy facilities. Within the waste sector, a promising avenue for emission reductions involves the financing of projects to divert organic waste away from landfills and toward existing digester capacity at wastewater treatment plants. In each of these examples, funding through the mitigation program could enhance existing and anticipated GHG-reduction efforts and contribute to significant emission reductions,

¹⁴ As observed in ARB's First Update to the Climate Change Scoping Plan, the voluntary installation of anaerobic digesters at California dairies has not increased as expected, due to factors including a lack of adequate financial incentives and insufficient utility contracts. The production of renewable biogas offers a way to make dairy, landfill, and wastewater-treatment digesters more economically attractive, but only if the necessary infrastructure exists to connect sources of biogas with pipelines and, eventually, consumers. ARB (2014), First Update to the Climate Change Scoping Plan, http://www.arb.ca.gov/cc/scopingplan/2013_update/first_update_climate_change_scoping_plan.pdf.

while also providing meaningful co-benefits such as reduced emissions from landfills and economic opportunities in disadvantaged communities.

Although ARB anticipates that projects within the agriculture and waste sectors ultimately will provide the majority of the methane emission reductions associated with the mitigation program, some of these efforts also may require significant planning, permitting, and coordination, and for this reason may not generate substantial emission reductions immediately. Timing, as well as the importance of generating a diversified project portfolio and achieving the full array of program objectives, counsel in favor of incorporating into the overall mitigation program additional measures that are capable of realizing prompt emission reductions.

As described above, ARB recommends that emission-reduction projects within these additional areas of emphasis also either enhance the sustainability of the State's energy infrastructure, or address "hot spot" sources of methane emissions that fall outside of the State's existing legal framework for greenhouse gas reductions or lack a financially responsible party. The timing, areas of impact, and co-benefits associated with projects within these categories will make them beneficial complements to mitigation efforts targeted at emissions in the agriculture and waste sectors. Furthermore, emission reductions through these projects will serve to ensure that the program as a whole realizes full mitigation of the Aliso Canyon leak.

C. Program Concentration #2: Promoting Sustainable and Resilient Energy Infrastructure

The first of these complementary project categories will emphasize projects that will achieve emission reductions while advancing the long-term sustainability and resiliency of the State's energy infrastructure. Projects in this sphere will sponsor or otherwise promote enhanced energy-efficiency measures and the targeted replacement of fossil fuels with renewable energy resources, especially in the transportation, commercial, and residential sectors. These projects could include incentive programs, sponsored infrastructure installations, equipment purchases, and other efforts to promote the adoption and utilization of less energy-intensive systems and devices, including those powered by renewable energy resources.

While ARB does not anticipate that these efforts will result in emission reductions equivalent to those projected to come from mitigation projects in the agriculture and waste sectors, it believes that these projects nevertheless will serve several useful complementary purposes. Consistent with the overall objectives of ARB's proposed mitigation program, projects in this sphere could serve disadvantaged communities and communities directly impacted by the Aliso Canyon leak. Properly targeted emission-reduction projects also could help avert potential electric and grid reliability issues by

reducing peak gas and electric demand in areas that have relied on gas stored in Aliso Canyon. These projects also could produce transformative benefits either by demonstrating new technologies and processes, or by placing emission-reducing innovations on more secure footing. In addition, while mitigation projects in the agriculture and waste sectors may take time to start generating emission reductions, projects designed to enhance energy efficiency could yield returns more quickly, thereby ensuring continuing momentum for the mitigation program. Combined, these factors provide a compelling case for the inclusion of these projects within the overall program portfolio, subject to the limitation that the mitigation program, as a whole, must prioritize SLCP reductions.

D. Program Concentration #3: Identifying and Addressing Additional Methane “Hot Spots”

The last of ARB’s recommended areas of programmatic focus will build upon ongoing efforts to identify and address high-emission methane “hot spots” across the State. It is now believed that previously unrecognized or underappreciated emission sources may contribute substantially to overall methane emission levels. In a measure passed last year, the Legislature recognized that there was “an urgent need to improve the monitoring and measurement of methane emissions from the major sources in California,”¹⁵ and directed ARB to “[u]ndertake, in consultation with districts that monitor methane, monitoring and measurements of high-emission methane hot spots in the state using the best available and cost-effective scientific and technical methods.”¹⁶

Some of the methane-emission sources detected by surveys undertaken by ARB and others may be difficult to abate without contributions such as those that the mitigation program could provide. There may be no existing legal obligation to mitigate some high-emission “hot spots.” Other sources of methane emissions (such as abandoned oil and gas wells) may lack a financially solvent responsible party, leading to “orphan” emissions that would go unaddressed unless outside action is taken.¹⁷ ARB therefore recommends that the mitigation program, as another point of secondary emphasis, capitalize upon ongoing and upcoming monitoring and measurement efforts by contributing to the abatement of emissions from sources such as these that would otherwise lack remedial attention.

¹⁵ AB 1496, ch. 604, section 1(c).

¹⁶ California Health & Safety Code section 39731(a).

¹⁷ Such efforts would build upon the work of the Department of Conservation’s Division of Oil, Gas, and Geothermal Resources (DOGGR), which from 1977 to 2010 plugged 1,307 orphan wells. DOGGR, Oil, Gas, and Geothermal – Idle Well Program, http://www.conservation.ca.gov/dog/idle_well.

E. Additional Considerations

Finally, ARB has considered whether to incorporate a minimum supplemental financial commitment within the mitigation program, as urged by a commenter on the Draft. Such a commitment from SoCalGas could serve to ensure full mitigation if the initial slate of projects supported by the company does not realize full mitigation, making further mitigation efforts necessary. Such a backstop may ultimately represent an important component of the mitigation program. But ARB continues to believe the need for and design of such a failsafe will depend on the slate of projects that are initially chosen for the program and SoCalGas's initial commitment. ARB therefore maintains the position that the existence and extent of a backstop represent matters properly reserved for future discussions with SoCalGas in connection with program implementation.

VI. Going Forward: Project Selection and Program Development

Implementation of the mitigation program described in this document will require the specification and completion of tasks that include:

- Soliciting or otherwise identifying eligible projects;
- Screening responses to requests for project proposals to evaluate the submitted projects' consistency with specified project criteria;
- Composing a portfolio of suitable projects that will realize full mitigation and other program objectives;
- Presenting the approved portfolio of projects to all necessary parties for their review and approval;
- Supervising and managing disbursements from any funding account established for program implementation;
- Overseeing project implementation, including receipt and review of periodic progress reports (including the evaluation of reported emission reduction totals) and undertaking project audits as appropriate;
- Issuing periodic reports to the public regarding the program's progress toward its mitigation goals; and
- Certifying project and program completion.

Put together, these tasks form a coherent process in which projects will be solicited through a public process, evaluated by ARB and potentially other parties, combined into an overall program portfolio, and funded, implemented, and monitored over time to ensure that emission-reduction targets are satisfied. ARB envisions that the process of soliciting, submitting, evaluating, and selecting projects could commence as soon as Spring 2016, and be completed by Fall 2016.

ARB anticipates that it will have a significant role in project selection, and recommends the appointment of a third-party administrator approved by ARB to oversee day-to-day program implementation. In other respects, the precise allocation of responsibilities as among ARB, a third-party administrator, and other parties if and as appropriate will depend on decisions relating to program design that will be finalized only in the future.

Regardless of where responsibilities are assigned, project proposals will be carefully vetted and reviewed prior to their inclusion within the mitigation program. The project selection process will begin with a public solicitation for project proposals that are consistent with detailed requirements for inclusion within the mitigation program. These proposals will have to be received by a firm deadline to be eligible for the program. Each project proposal will incorporate a discussion of project details, including, at a minimum:

- A description of the project, including its location, timeframe, interested parties, the manner in which it will achieve emission reductions and other beneficial impacts, its benefits to affected or disadvantaged communities, and other pertinent information;
- The extent of SoCalGas's financial investment or other commitment(s) that will be required for the project;
- The anticipated annual and cumulative emission reductions associated with the project, relative to a conservative business-as-usual baseline;
- The methodology used to quantify emission reductions associated with the project, along with an explanation of how these reductions are real, permanent, additional, and verifiable;
- An explanation of how emission reductions associated with the project are to be assigned or allocated to SoCalGas;¹⁸
- The identity of a qualified and independent verification authority that will certify any emission reductions associated with the project; and
- The project operator's agreement to comply with all obligations associated with inclusion within the program, including but not limited to the provision of periodic compliance reports to a mitigation program administrator.

Each project proposal will undergo an initial review to determine whether the project description is accurate and complete, and that the project comports with the criteria required for inclusion within the mitigation program. In the event that the project description is incomplete or insufficient for the reviewer to make a compliance determination, the person or entity submitting the project description will be required to

¹⁸ The allocation of emission reductions to SoCalGas for certain projects within a mitigation program, such as infrastructure development, may require especially careful consideration.

provide the necessary additional information. Project descriptions that contain misleading or inaccurate material information will be subject to rejection on that basis alone.

If a proposed project passes this initial review, the project will be evaluated pursuant to a scoring system that reflects the requirements, emphases, and prioritizations described in this document. High-scoring projects within the areas of primary and secondary emphasis will be combined into a portfolio that will achieve the program's overarching objectives. Once the reviewer has compiled a portfolio of projects that, in its opinion, will produce full mitigation and satisfy all other program objectives, it will endorse the portfolio of projects as a viable mitigation program and submit the program, as a whole, to any other necessary parties for their confirmation. In the event that ARB would not be responsible for initial project review, its approval of the project portfolio would be required at this stage. ARB and any other necessary parties would conduct their own reviews of the portfolio to ascertain whether the projects comply with required criteria, and whether the program as a whole meets the mitigation program's objectives. Upon this review, the program would either be approved for implementation, or rejected. In the event of rejection, a different array of projects could be compiled and circulated for approval. All necessary funding commitments by SoCalGas would be put in place shortly thereafter.

As discussed above, ARB recommends that an administrator that it approves be appointed to supervise the implementation of the mitigation program. The administrator's duties will include oversight of any funds that SoCalGas would deposit in an escrow account to fund the program, project oversight and (if and as necessary) auditing, and the preparation of periodic progress reports. With regard to the last of these tasks, at specified intervals during program implementation the administrator will submit compliance reports to ARB that will describe the program's progress toward meeting SoCalGas's mitigation commitments. These reports will include discussions of the progress, including emission reductions, made by specific projects undertaken to date. These reports will be made available to the public through their posting on ARB's website. The third-party administrator also will certify to ARB and, as appropriate, other entities responsible for additional oversight when SoCalGas has completely fulfilled its responsibilities under the mitigation program. This certification will be subject to confirmation by ARB and any other necessary parties.

VII. *People v. Southern California Gas Company*

The preceding discussion presumes a mitigation commitment that has been voluntarily assumed by SoCalGas, consistent with the firm's December 18, 2015 letter to Governor Brown. The mitigation program described in this document is designed to take

SoCalGas at its word. It is also a program that could be implemented promptly and with a high degree of assurance that the intended benefits would be achieved.

Earlier this year, ARB joined *People v. Southern California Gas Company*, a civil lawsuit brought in Los Angeles Superior Court against SoCalGas in connection with the Aliso Canyon methane leak. This lawsuit was originally filed by the Los Angeles City Attorney, and the Attorney General and the County of Los Angeles also appear with ARB as plaintiffs. The lawsuit includes claims that allege that the methane emissions from the leak have amounted to a nuisance and have impaired and polluted the environment, and seeks relief relating to the leak's climate impacts.

The mitigation program described in this document does not necessarily reflect the responsibilities that could be imposed on SoCalGas through judicial proceedings in the *People v. Southern California Gas Company* case, or agreed to by the parties in a settlement of this action. Additional mitigation responsibilities could be imposed on SoCalGas through judicial proceedings in this matter. ARB's co-plaintiffs and the court also may have views regarding mitigation that could differ from the framework presented here.

The *People v. Southern California Gas Company* action also could affect mitigation by serving as an enforcement and oversight vehicle for any mitigation program that may come into being. For example, if the pertinent claims in *People v. Southern California Gas Company* are resolved in the plaintiffs' favor and the court orders mitigation by SoCalGas, or if the case results in a settlement agreement between the plaintiffs and SoCalGas that is then entered as a consent decree by the court, these resolutions could provide an avenue for implementing the provisions of any agreed-upon or compelled mitigation program.

VIII. Conclusion

This mitigation program provides a framework for fully mitigating the climate-change consequences of the Aliso Canyon methane leak. Beyond that, the program itself, the process of its development, and the future process of its implementation have provided and will provide a forum for conversations about how to repair the damage caused by the Aliso Canyon leak, and perhaps will also provide a guide on how to mitigate the global-warming consequences of any similar future catastrophes. ARB looks forward to further engagement with stakeholders in these discussions.