

Board Contract Summary

BC

For use with Expenditure Contracts submitted to the Board for approval. Complete information below, print, obtain signature of authorized departmental representative, and submit this form, along with attachments, to the appropriate departments for signature. See also: *Auditor-Controller Intranet Policies->Contracts*.

| | | |
|-----|-----------------------|-----------------|
| D1. | Fiscal Year | FY 17-18 |
| D2. | Department Name | PW/Water Agency |
| D3. | Contact Person | Fray Crease |
| D4. | Telephone | ext. 3542 |

| | | |
|------|------------------------------------------------------------------------------------------------------------------|------------------------------|
| K1. | Contract Type (check one): <input checked="" type="checkbox"/> Personal Service <input type="checkbox"/> Capital | |
| K2. | Brief Summary of Contract Description/Purpose | 2017-18 Cloudseeding Program |
| K3. | Department Project Number | WA8209 |
| K4. | Original Contract Amount | \$ 147,300 |
| K5. | Contract Begin Date | October 10, 2017 |
| K6. | Original Contract End Date | June 30, 2018 |
| K7. | Amendment? (Yes or No) | No |
| K8. | - New Contract End Date | N/A |
| K9. | - Total Number of Amendments | N/A |
| K10. | - This Amendment Amount | \$ N/A |
| K11. | - Total Previous Amendment Amounts | \$ N/A |
| K12. | - Revised Total Contract Amount | \$ N/A |

| | | |
|-----|-------------------------------------------------------------------|------------------|
| B1. | Intended Board Agenda Date | October 10, 2017 |
| B2. | Number of Workers Displaced (if any) | N/A |
| B3. | Number of Competitive Bids (if any) | N/A |
| B4. | Lowest Bid Amount (if bid) | N/A |
| B5. | If Board waived bids, show Agenda Date | N/A |
| | and Agenda Item Number | N/A |
| B6. | Boilerplate Contract Text Changed? (If Yes, cite Paragraph) | N/A |

| | | |
|-----|---------------------------------------|--------|
| F1. | Fund Number | 3050 |
| F2. | Department Number | 054 |
| F3. | Line Item Account Number | 7460 |
| F4. | Project Number (if applicable) | WA8209 |
| F5. | Program Number (if applicable) | 3009 |
| F6. | Org Unit Number (if applicable) | |
| F7. | Payment Terms | net 30 |

| | | |
|------|---------------------------------------------------------|------------------------------------|
| V1. | Auditor-Controller Vendor Number | 240538 |
| V2. | Payee/Contractor Name | North American Weather Consultants |
| V3. | Mailing Address | 8180 S. Highland Drive, Suite B-2 |
| V4. | City State (two-letter) Zip (include +4 if known) | Sandy, UT 84093 |
| V5. | Telephone Number | (801) 942-9005 |
| V6. | Vendor Contact Person | Don Griffith |
| V7. | Workers Comp Insurance Expiration Date | 11/16/17 |
| V8. | Liability Insurance Expiration Date | 8/31/18 |
| V9. | Professional License Number | |
| V10. | Verified by (print name of county staff) | CL |

V11 Company Type (Check one): ☐ Individual ☐ Sole Proprietorship ☐ Partnership ☒ Corporation

I certify information is complete and accurate; designated funds available; required concurrences evidenced on signature page.

Date: _____ Authorized Signature: 

AGREEMENT FOR SERVICES OF INDEPENDENT CONTRACTOR

THIS AGREEMENT (hereafter Agreement) is made by and between the **Santa Barbara County Water Agency**, a political subdivision of the State of California (hereafter COUNTY) and **North American Weather Consultants, Inc.** with an address at 8180 South Highland Drive, Suite B-2, Sandy, Utah, 84093 (hereafter CONTRACTOR) wherein CONTRACTOR agrees to provide and COUNTY agrees to accept the services specified herein.

WHEREAS, CONTRACTOR represents that it is specially trained, skilled, experienced, and competent to perform the special services required by COUNTY and COUNTY desires to retain the services of CONTRACTOR pursuant to the terms, covenants, and conditions herein set forth;

NOW, THEREFORE, in consideration of the mutual covenants and conditions contained herein, the parties agree as follows:

1. DESIGNATED REPRESENTATIVE

Matt Scrudato at phone number (805) 568-3582 is the representative of COUNTY and will administer this Agreement for and on behalf of COUNTY. Don Griffith at phone number (801) 942-9005 is the authorized representative for CONTRACTOR. Changes in designated representatives shall be made only after advance written notice to the other party.

2. NOTICES

Any notice or consent required or permitted to be given under this Agreement shall be given to the respective parties in writing, by personal delivery or facsimile, or with postage prepaid by first class mail, registered or certified mail, or express courier service, as follows:

| | |
|----------------|----------------------------------------------------------------------------------------------------------------|
| To COUNTY: | Ms. Fray Crease, Santa Barbara County Water Agency, 130 E. Victoria Street, Suite 200, Santa Barbara, CA 93101 |
| To CONTRACTOR: | Mr. Don Griffith, NAWC, 8180 South Highland Drive, STE B-2, Sandy, Utah 84093 |

or at such other address or to such other person that the parties may from time to time designate in accordance with this Notices section. If sent by first class mail, notices and consents under this section shall be deemed to be received five (5) days following their deposit in the U.S. mail. This Notices section shall not be construed as meaning that either party agrees to service of process except as required by applicable law.

3. SCOPE OF SERVICES

CONTRACTOR agrees to provide services to COUNTY in accordance with EXHIBIT A attached hereto and incorporated herein by reference.

4. TERM

CONTRACTOR shall commence performance on **October 10, 2017** and end performance upon completion, but no later than **June 30, 2018** unless otherwise directed by COUNTY or unless earlier terminated.

5. COMPENSATION OF CONTRACTOR

In full consideration for CONTRACTOR's services, CONTRACTOR shall be paid for performance under this Agreement in accordance with the terms of EXHIBIT B attached hereto and incorporated herein by reference. Billing shall be made by invoice, which shall include the contract number assigned by COUNTY and which is delivered to the

address given in Section 2 NOTICES above following completion of the increments identified on EXHIBIT B. Unless otherwise specified on EXHIBIT B, payment shall be net thirty (30) days from presentation of invoice.

6. INDEPENDENT CONTRACTOR

It is mutually understood and agreed that CONTRACTOR (including any and all of its officers, agents, and employees), shall perform all of its services under this Agreement as an independent contractor as to COUNTY and not as an officer, agent, servant, employee, joint venturer, partner, or associate of COUNTY. Furthermore, COUNTY shall have no right to control, supervise, or direct the manner or method by which CONTRACTOR shall perform its work and function. However, COUNTY shall retain the right to administer this Agreement so as to verify that CONTRACTOR is performing its obligations in accordance with the terms and conditions hereof. CONTRACTOR understands and acknowledges that it shall not be entitled to any of the benefits of a COUNTY employee, including but not limited to vacation, sick leave, administrative leave, health insurance, disability insurance, retirement, unemployment insurance, workers' compensation and protection of tenure. CONTRACTOR shall be solely liable and responsible for providing to, or on behalf of, its employees all legally-required employee benefits. In addition, CONTRACTOR shall be solely responsible and save COUNTY harmless from all matters relating to payment of CONTRACTOR's employees, including compliance with Social Security withholding and all other regulations governing such matters. It is acknowledged that during the term of this Agreement, CONTRACTOR may be providing services to others unrelated to the COUNTY or to this Agreement.

7. STANDARD OF PERFORMANCE

CONTRACTOR represents that it has the skills, expertise, and licenses/permits necessary to perform the services required under this Agreement. Accordingly, CONTRACTOR shall perform all such services in the manner and according to the standards observed by a competent practitioner of the same profession in which CONTRACTOR is engaged. All products of whatsoever nature, which CONTRACTOR delivers to COUNTY pursuant to this Agreement, shall be prepared in a first class and workmanlike manner and shall conform to the standards of quality normally observed by a person practicing in CONTRACTOR's profession. CONTRACTOR shall correct or revise any errors or omissions, at COUNTY'S request without additional compensation. Permits and/or licenses shall be obtained and maintained by CONTRACTOR without additional compensation.

8. DEBARMENT AND SUSPENSION

CONTRACTOR certifies to COUNTY that it and its employees and principals are not debarred, suspended, or otherwise excluded from or ineligible for, participation in federal, state, or county government contracts. CONTRACTOR certifies that it shall not contract with a subcontractor that is so debarred or suspended.

9. TAXES

CONTRACTOR shall pay all taxes, levies, duties, and assessments of every nature due in connection with any work under this Agreement and shall make any and all payroll deductions required by law. COUNTY shall not be responsible for paying any taxes on CONTRACTOR's behalf, and should COUNTY be required to do so by state, federal, or local taxing agencies, CONTRACTOR agrees to promptly reimburse COUNTY for the full value of such paid taxes plus interest and penalty, if any. These taxes shall include, but not be limited to, the following: FICA (Social Security), unemployment insurance contributions, income tax, disability insurance, and workers' compensation insurance.

10. CONFLICT OF INTEREST

CONTRACTOR covenants that CONTRACTOR presently has no employment or interest and shall not acquire any employment or interest, direct or indirect, including any interest in any business, property, or source of income, which would conflict in any manner or degree with the performance of services required to be performed under this Agreement. CONTRACTOR further covenants that in the performance of this Agreement, no person having any such

interest shall be employed by CONTRACTOR. COUNTY retains the right to waive a conflict of interest disclosed by CONTRACTOR if COUNTY determines it to be immaterial, and such waiver is only effective if provided by COUNTY to CONTRACTOR in writing.

11. OWNERSHIP OF DOCUMENTS AND INTELLECTUAL PROPERTY

COUNTY shall be the owner of the following items incidental to this Agreement upon production, whether or not completed: all data collected, all documents of any type whatsoever, all photos, designs, sound or audiovisual recordings, software code, inventions, technologies, and other materials, and any material necessary for the practical use of such items, from the time of collection and/or production whether or not performance under this Agreement is completed or terminated prior to completion. CONTRACTOR shall not release any of such items to other parties except after prior written approval of COUNTY.

Unless otherwise specified in Exhibit A, CONTRACTOR hereby assigns to COUNTY all copyright, patent, and other intellectual property and proprietary rights to all data, documents, reports, photos, designs, sound or audiovisual recordings, software code, inventions, technologies, and other materials prepared or provided by CONTRACTOR pursuant to this Agreement (collectively referred to as "Copyrightable Works and Inventions"). COUNTY shall have the unrestricted authority to copy, adapt, perform, display, publish, disclose, distribute, create derivative works from, and otherwise use in whole or in part, any Copyrightable Works and Inventions. CONTRACTOR agrees to take such actions and execute and deliver such documents as may be needed to validate, protect and confirm the rights and assignments provided hereunder. CONTRACTOR warrants that any Copyrightable Works and Inventions and other items provided under this Agreement will not infringe upon any intellectual property or proprietary rights of any third party. CONTRACTOR at its own expense shall defend, indemnify, and hold harmless COUNTY against any claim that any Copyrightable Works or Inventions or other items provided by CONTRACTOR hereunder infringe upon intellectual or other proprietary rights of a third party, and CONTRACTOR shall pay any damages, costs, settlement amounts, and fees (including attorneys' fees) that may be incurred by COUNTY in connection with any such claims. This Ownership of Documents and Intellectual Property provision shall survive expiration or termination of this Agreement.

12. NO PUBLICITY OR ENDORSEMENT

CONTRACTOR shall not use COUNTY's name or logo or any variation of such name or logo in any publicity, advertising or promotional materials. CONTRACTOR shall not use COUNTY's name or logo in any manner that would give the appearance that the COUNTY is endorsing CONTRACTOR. CONTRACTOR shall not in any way contract on behalf of or in the name of COUNTY. CONTRACTOR shall not release any informational pamphlets, notices, press releases, research reports, or similar public notices concerning the COUNTY or its projects, without obtaining the prior written approval of COUNTY.

13. COUNTY PROPERTY AND INFORMATION

All of COUNTY's property, documents, and information provided for CONTRACTOR's use in connection with the services shall remain COUNTY's property, and CONTRACTOR shall return any such items whenever requested by COUNTY and whenever required according to the Termination section of this Agreement. CONTRACTOR may use such items only in connection with providing the services. CONTRACTOR shall not disseminate any COUNTY property, documents, or information without COUNTY's prior written consent.

14. RECORDS, AUDIT, AND REVIEW

CONTRACTOR shall keep such business records pursuant to this Agreement as would be kept by a reasonably prudent practitioner of CONTRACTOR's profession and shall maintain such records for at least four (4) years following the termination of this Agreement. All accounting records shall be kept in accordance with generally accepted accounting principles. COUNTY shall have the right to audit and review all such documents and records at

any time during CONTRACTOR's regular business hours or upon reasonable notice. In addition, if this Agreement exceeds ten thousand dollars (\$10,000.00), CONTRACTOR shall be subject to the examination and audit of the California State Auditor, at the request of the COUNTY or as part of any audit of the COUNTY, for a period of three (3) years after final payment under the Agreement (Cal. Govt. Code Section 8546.7). CONTRACTOR shall participate in any audits and reviews, whether by COUNTY or the State, at no charge to COUNTY.

If federal, state or COUNTY audit exceptions are made relating to this Agreement, CONTRACTOR shall reimburse all costs incurred by federal, state, and/or COUNTY governments associated with defending against the audit exceptions or performing any audits or follow-up audits, including but not limited to: audit fees, court costs, attorneys' fees based upon a reasonable hourly amount for attorneys in the community, travel costs, penalty assessments and all other costs of whatever nature. Immediately upon notification from COUNTY, CONTRACTOR shall reimburse the amount of the audit exceptions and any other related costs directly to COUNTY as specified by COUNTY in the notification.

15. INDEMNIFICATION AND INSURANCE

CONTRACTOR agrees to the indemnification and insurance provisions as set forth in EXHIBIT C attached hereto and incorporated herein by reference.

16. NONDISCRIMINATION

COUNTY hereby notifies CONTRACTOR that COUNTY's Unlawful Discrimination Ordinance (Article XIII of Chapter 2 of the Santa Barbara County Code) applies to this Agreement and is incorporated herein by this reference with the same force and effect as if the ordinance were specifically set out herein and CONTRACTOR agrees to comply with said ordinance.

17. NONEXCLUSIVE AGREEMENT

CONTRACTOR understands that this is not an exclusive Agreement and that COUNTY shall have the right to negotiate with and enter into contracts with others providing the same or similar services as those provided by CONTRACTOR as the COUNTY desires.

18. NON-ASSIGNMENT

CONTRACTOR shall not assign, transfer or subcontract this Agreement or any of its rights or obligations under this Agreement without the prior written consent of COUNTY and any attempt to so assign, subcontract or transfer without such consent shall be void and without legal effect and shall constitute grounds for termination.

19. TERMINATION

A. By COUNTY. COUNTY may, by written notice to CONTRACTOR, terminate this Agreement in whole or in part at any time, whether for COUNTY's convenience, for nonappropriation of funds, or because of the failure of CONTRACTOR to fulfill the obligations herein.

1. **For Convenience.** COUNTY may terminate this Agreement in whole or in part upon thirty (30) days written notice. During the thirty (30) day period, CONTRACTOR shall, as directed by COUNTY, wind down and cease its services as quickly and efficiently as reasonably possible, without performing unnecessary services or activities and by minimizing negative effects on COUNTY from such winding down and cessation of services.
2. **For Nonappropriation of Funds.** Notwithstanding any other provision of this Agreement, in the event that no funds or insufficient funds are appropriated or budgeted by federal, state or COUNTY governments, or funds are not otherwise available for payments in the fiscal year(s) covered by the

term of this Agreement, then COUNTY will notify CONTRACTOR of such occurrence and COUNTY may terminate or suspend this Agreement in whole or in part, with or without a prior notice period. Subsequent to termination of this Agreement under this provision, COUNTY shall have no obligation to make payments with regard to the remainder of the term.

3. **For Cause.** Should CONTRACTOR default in the performance of this Agreement or materially breach any of its provisions, COUNTY may, at COUNTY's sole option, terminate or suspend this Agreement in whole or in part by written notice. Upon receipt of notice, CONTRACTOR shall immediately discontinue all services affected (unless the notice directs otherwise) and notify COUNTY as to the status of its performance. The date of termination shall be the date the notice is received by CONTRACTOR, unless the notice directs otherwise.
- B. **By CONTRACTOR.** Should COUNTY fail to pay CONTRACTOR all or any part of the payment set forth in EXHIBIT B, CONTRACTOR may, at CONTRACTOR's option terminate this Agreement if such failure is not remedied by COUNTY within thirty (30) days of written notice to COUNTY of such late payment.
- C. Upon termination, CONTRACTOR shall deliver to COUNTY all data, estimates, graphs, summaries, reports, and all other property, records, documents or papers as may have been accumulated or produced by CONTRACTOR in performing this Agreement, whether completed or in process, except such items as COUNTY may, by written permission, permit CONTRACTOR to retain. Notwithstanding any other payment provision of this Agreement, COUNTY shall pay CONTRACTOR for satisfactory services performed to the date of termination to include a prorated amount of compensation due hereunder less payments, if any, previously made. In no event shall CONTRACTOR be paid an amount in excess of the full price under this Agreement nor for profit on unperformed portions of service. CONTRACTOR shall furnish to COUNTY such financial information as in the judgment of COUNTY is necessary to determine the reasonable value of the services rendered by CONTRACTOR. In the event of a dispute as to the reasonable value of the services rendered by CONTRACTOR, the decision of COUNTY shall be final. The foregoing is cumulative and shall not affect any right or remedy which COUNTY may have in law or equity.

20. **SECTION HEADINGS**

The headings of the several sections, and any Table of Contents appended hereto, shall be solely for convenience of reference and shall not affect the meaning, construction or effect hereof.

21. **SEVERABILITY**

If any one or more of the provisions contained herein shall for any reason be held to be invalid, illegal or unenforceable in any respect, then such provision or provisions shall be deemed severable from the remaining provisions hereof, and such invalidity, illegality or unenforceability shall not affect any other provision hereof, and this Agreement shall be construed as if such invalid, illegal or unenforceable provision had never been contained herein.

22. **REMEDIES NOT EXCLUSIVE**

No remedy herein conferred upon or reserved to COUNTY is intended to be exclusive of any other remedy or remedies, and each and every such remedy, to the extent permitted by law, shall be cumulative and in addition to any other remedy given hereunder or now or hereafter existing at law or in equity or otherwise.

23. **TIME IS OF THE ESSENCE**

Time is of the essence in this Agreement and each covenant and term is a condition herein.

24. NO WAIVER OF DEFAULT

No delay or omission of COUNTY to exercise any right or power arising upon the occurrence of any event of default shall impair any such right or power or shall be construed to be a waiver of any such default or an acquiescence therein; and every power and remedy given by this Agreement to COUNTY shall be exercised from time to time and as often as may be deemed expedient in the sole discretion of COUNTY.

25. ENTIRE AGREEMENT AND AMENDMENT

In conjunction with the matters considered herein, this Agreement contains the entire understanding and agreement of the parties and there have been no promises, representations, agreements, warranties or undertakings by any of the parties, either oral or written, of any character or nature hereafter binding except as set forth herein. This Agreement may be altered, amended or modified only by an instrument in writing, executed by the parties to this Agreement and by no other means. Each party waives their future right to claim, contest or assert that this Agreement was modified, canceled, superseded, or changed by any oral agreements, course of conduct, waiver or estoppel.

26. SUCCESSORS AND ASSIGNS

All representations, covenants and warranties set forth in this Agreement, by or on behalf of, or for the benefit of any or all of the parties hereto, shall be binding upon and inure to the benefit of such party, its successors and assigns.

27. COMPLIANCE WITH LAW

CONTRACTOR shall, at its sole cost and expense, comply with all County, State and Federal ordinances and statutes now in force or which may hereafter be in force with regard to this Agreement. The judgment of any court of competent jurisdiction, or the admission of CONTRACTOR in any action or proceeding against CONTRACTOR, whether COUNTY is a party thereto or not, that CONTRACTOR has violated any such ordinance or statute, shall be conclusive of that fact as between CONTRACTOR and COUNTY.

28. CALIFORNIA LAW AND JURISDICTION

This Agreement shall be governed by the laws of the State of California. Any litigation regarding this Agreement or its contents shall be filed in the County of Santa Barbara, if in state court, or in the federal district court nearest to Santa Barbara County, if in federal court.

29. EXECUTION OF COUNTERPARTS

This Agreement may be executed in any number of counterparts and each of such counterparts shall for all purposes be deemed to be an original; and all such counterparts, or as many of them as the parties shall preserve undestroyed, shall together constitute one and the same instrument.

30. AUTHORITY

All signatories and parties to this Agreement warrant and represent that they have the power and authority to enter into this Agreement in the names, titles and capacities herein stated and on behalf of any entities, persons, or firms represented or purported to be represented by such entity(ies), person(s), or firm(s) and that all formal requirements necessary or required by any state and/or federal law in order to enter into this Agreement have been fully complied with. Furthermore, by entering into this Agreement, CONTRACTOR hereby warrants that it shall not have breached the terms or conditions of any other contract or agreement to which CONTRACTOR is obligated, which breach would have a material effect hereon.

31. **SURVIVAL**

All provisions of this Agreement which by their nature are intended to survive the termination or expiration of this Agreement shall survive such termination or expiration.

32. **PRECEDENCE**

In the event of conflict between the provisions contained in the numbered sections of this Agreement and the provisions contained in the Exhibits, the provisions of the Exhibits shall prevail over those in the numbered sections.

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Agreement for Services of Independent Contractor between the **Santa Barbara County Water Agency** and **North American Weather Consultants, Inc.**

IN WITNESS WHEREOF, the parties have executed this Agreement to be effective on the date executed by COUNTY.

ATTEST:

Mona Miyasato
County Executive Officer
Ex Officio Clerk of the Board of
Directors of the Santa Barbara
County Water Agency

**SANTA BARBARA COUNTY WATER
AGENCY:**

By: _____
Deputy Clerk

By: _____
Peter Adam, Chair, Board of
Directors

Date: _____


RECOMMENDED FOR APPROVAL:

Santa Barbara County Water
Agency

CONTRACTOR:

North American Weather Consultants,
Inc.

By: 
Scott D. McGolpin, Public Works
Director

By: 
Authorized Representative

Name: Don Griffith
Title: President

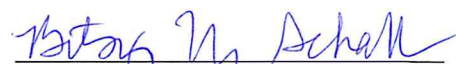
APPROVED AS TO FORM:

Michael C. Ghizzoni
County Counsel

APPROVED AS TO ACCOUNTING FORM:

Theodore A. Fallati, CPA
Auditor-Controller

By: 
Deputy County Counsel

By: 
Deputy

APPROVED AS TO FORM:

Ray Aromatorio, ARM, AIC
Risk Management

By: 
Risk Management

EXHIBIT A
STATEMENT OF WORK

**SCOPE OF WORK FOR A 2017-2018
WINTER CLOUD SEEDING PROJECT
IN NORTHERN SANTA BARBARA COUNTY
AND A PORTION OF SOUTHERN
SAN LUIS OBISPO COUNTY**

Prepared for the

Santa Barbara County Water Agency

by

**North American Weather Consultants, Inc.
8180 South Highland Dr., Suite B-2
Sandy, Utah 84093**

September 2017

**SCOPE OF WORK FOR A 2017-2018 WINTER
CLOUD SEEDING PROJECT IN
NORTHERN SANTA BARBARA COUNTY AND A PORTION OF
SOUTHERN SAN LUIS OBISPO COUNTY**

1.0 INTRODUCTION AND BACKGROUND

North American Weather Consultants (NAWC), the world's longest-standing private weather modification company, is pleased to submit a scope of work for a Santa Barbara County cloud seeding, or weather modification program for the 2017-2018 winter season.

NAWC has a long history of involvement in weather modification research in Santa Barbara County dating back to the 1950's. Some operational programs were conducted in the early 1950's and again in 1978. NAWC was involved in a research weather modification program from 1967-1973 known as Santa Barbara II (Thompson, et al., 1975). This research program has served as the foundation for the design and conduct of operational seeding programs conducted within the county by NAWC, beginning in 1981.

The Santa Barbara County Water Agency (SBCWA) completed a number of tasks during 1981 designed to reactivate cloud seeding activities within the County. These tasks included: 1) preparation of a Negative Declaration Statement (#81-ND-87), 2) conducting a public hearing (December 10, 1981), and 3) obtaining a Weather Resource Management permit from the California Department of Water Resources. North American Weather Consultants (NAWC) was awarded an initial contract from the SBCWA (dated January 11, 1982) to conduct an operational cloud seeding program during the remainder of the 1982 winter season. Two target areas were identified to be seeded: 1) the Upper Santa Ynez watershed above Cachuma Reservoir and 2) the Huasna-Alamo watershed above Twitchell Reservoir. Periodic contracts were awarded to NAWC by the SBCWA to continue these operational programs in a nearly continuous fashion through the 1997 Water Year. Atmospherics, Inc. was awarded a contract to conduct an operational program during the 1998 Water Year. Weather Modification, Inc., of Fargo, North Dakota, was awarded a contract by the SBCWA to conduct operational programs for the 1999

through 2001 Water Years. NAWC, under contract with the Agency, resumed its conduct of operations for the County during the 2001-2002 winter season. This program utilized a revised project design based upon the highly successful results of earlier research conducted by NAWC (e.g., Santa Barbara II phase I and phase II experiments). The Agency has renewed NAWC's contract to conduct the cloud seeding operations in three years blocks to the present. **NAWC has conducted this program for the Agency in 31 previous winter seasons.** NAWC and SBCWA personnel co-authored a technical paper that summarized the cloud seeding activities in Santa Barbara County dating back to the 1950's (Griffith, et al, 2005).

NAWC performed an historical target/control evaluation of the seeded winter seasons. This study was published in the Weather Modification Association's Journal of Weather Modification (Griffith, et al, 2015). The following is the abstract from this paper:

A search for potential long-term target and control precipitation measurement sites was conducted which identified three acceptable control sites and four acceptable target sites (two in each of the intended target areas). Linear and multiple-linear regression equations were developed for each of the target areas using periods without any cloud seeding in either the control or target areas. Relatively high correlations were obtained between the control and target sites with r^2 values ranging from 0.84 to 0.91.

When these regression equations were used to predict the amount of precipitation for the December-March period for the two target areas during seeded seasons, and then compared to the actual amounts of precipitation, the average results for all the seeded seasons were:

- Upper Santa Ynez Target Area: Estimated increases of 19% to 21% from the linear and multiple-linear equations (24 seeded seasons).*
- Huasna-Alamo Target Area: Estimated increases of 9% from both the linear and multiple-linear equations (27 seeded seasons).*

Realizing the importance and benefit of this additional rainfall, the water purveyors of Santa Barbara County under the administrative leadership of SBCWA has sponsored a cloud seeding program in all water years since 1982, with the exception of 1985-1986 and 2007-2008.

The 1985-1986 and 2007-2008 programs were canceled due to fires, which produced large burn areas in the project area.

The SBCWA released a Request for Proposals (RFP) dated May 1, 2017 for a 2017-2018 cloud seeding program with the potential for annual extensions for a total of a five-year program. NAWC was selected as the recipient of this contract.

There were two fires that affected Santa Barbara County during the summer of 2017: 1) Alamo Fire and 2) Whittier Fire. The Alamo fire burned areas south of Twitchell Reservoir and the Whittier Fire burned areas south of Cachuma Reservoir. Water purveyors sponsoring the Upper Santa Ynez target area decided not to support a cloud seeding project for the 2017-2018 winter season due to concerns about debris flows from this burn area that could potentially impact Highway 154 as well as Cachuma Reservoir. The water purveyors sponsoring the Huasna-Alamo target area decided to support a five-month project this winter. Although NAWC's original proposal called for both airborne and ground based seeding during the 2017-2018 winter season, the Huasna-Alamo sponsors elected to only support a ground based program this winter due to cost.

2.0 PROJECT DESIGN

Since seeding will only be conducted for the Huasna-Alamo target area for the 2017-2018 winter season which only utilizes ground based seeding equipment, the Upper Santa Ynez target area, locations of some of the ground seeding sites and results of airborne seeding are only mentioned to provide background information.

NAWC's philosophy in the design of operational precipitation enhancement programs is to base the design on the results of previously conducted successful research programs that appear to be transferable to the intended target area. We keep abreast of technological changes that may be incorporated into the design of our programs but resist the temptation to employ all of the latest "gadgets" indiscriminately. We have observed that providing too many tools and duties for field personnel to perform may become counter-productive; it is easy to become lost in

the details and lose sight of the key issues that need to be addressed in real-time. In other words, it is easy to get behind the power curve on a cloud seeding program when things are happening quickly. The question we ask ourselves is whether the addition of some new tool or technique will materially assist our field project personnel in doing a better job of identifying seeding opportunities and in more effectively treating these opportunities in a cost effective manner. **The bottom line is - will a given “improvement” to the program result in more water on the ground?** We believe this philosophy is in agreement with our clients’ fundamental goals for their programs.

Rationale for the project design is provided in the following sub-sections. Figure 2.1 provides a map that provides the locations of the two target areas (Upper and Middle Santa Ynez Watershed Target area and the Huasna-Alamo Target area). As previously mentioned, the Upper and Middle Santa Ynez target area will not be seeded this winter season.

2.1 Project Design Considerations

NAWC follows American Society of Civil Engineer’s Guidelines (ASCE 2016) and Standards (ASCE 2017). NAWC will also insure that our operations are compatible with the SBCWA’s Mitigated Negative Declaration (MND) prepared for this program in 2012. The types of precipitation augmentation programs that find the most scientific acceptance are the winter orographic (mountainous) programs. The Santa Barbara program would be considered an orographic one based upon the coastal mountain settings of the target areas.

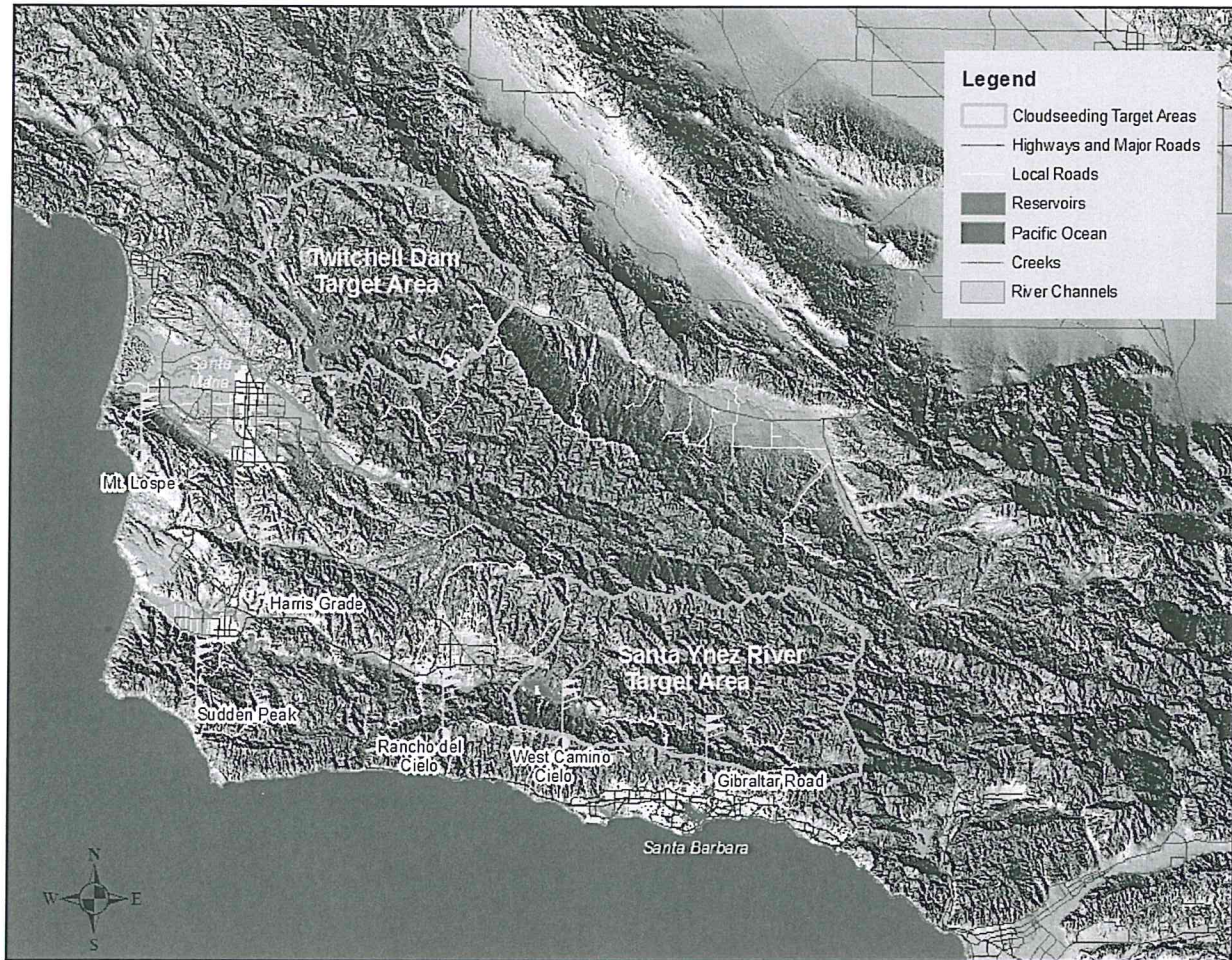


Figure 2.1 Map of the two target areas and six remotely operated flare sites that have been used in previous seeded seasons

Several professional societies have adopted capability or position statements regarding weather modification programs. The principal societies or associations that have existing weather modification statements include:

- The Weather Modification Association (WMA)
- The American Meteorological Society (AMS)
- The American Society of Civil Engineers (ASCE)

From the preceding organizational statements, the following key points regarding the current status of winter orographic seeding emerge:

- Of the primary categories of cloud seeding for precipitation increase, seeding of winter orographic storm systems seems to offer the best prospects for increasing precipitation in an economically viable manner.
- Strong (albeit largely non-randomized) statistical evidence exists for (winter) seasonal increases of the order of 5% to 15% and potentially greater in some coastal regions.
- A growing body of evidence from focused physical studies is confirming some key steps in the weather modification process, in support of the statistical evidence.
- Additional research is recommended/encouraged. It is recognized that (needed) additional applied research can shed much valuable light on the physical processes involved, leading to improved opportunity recognition and intervention, resulting in more optimum augmentation operations, especially given technological advancements in observational systems and computer modeling.
- Accurately quantifying the effects of cloud seeding programs remains a challenge.

2.2 Proposed 2017-2018 Program Design

As stated previously, it has always been NAWC's philosophy that the design of our operational programs should be based upon prior research programs that provided positive indications of increases in precipitation, to the extent that the research results are considered representative of the operational programs' conditions (i.e., transferable results). The Santa Barbara area has a unique advantage in this regard since a well-funded winter research program was conducted during the winters of 1967-1973, with funding provided by the Naval Weapons Center at China Lake, California.

Even though this research program was conducted approximately 40 years ago, it is our professional opinion that it offers the most relevant information for the design of precipitation enhancement programs for this area at the present time. There has not been any winter weather modification research programs conducted in representative coastal areas of the United States since Santa Barbara II. **This is a prime example of technology transfer from research to operations. We believe the best project design for a winter cloud seeding program in Santa Barbara County to be one that duplicates, as much as possible, the design of the Santa**

Barbara II research program. In fact, the combination of Phase I and II seeding modes (ground and airborne) should optimize the seeding potential for the area. As previously mentioned, only ground seeding will be employed this winter season.

By adopting the Santa Barbara II project design, the targets of opportunity will be convection bands that are embedded in winter storms as they pass over Santa Barbara County. These convection bands are common features of Pacific Coast storms impacting California during winter storms (Elliott and Hovind 1964). These bands are somewhat similar to summer squall lines that impact our Plains States. The bands contain upward vertical motions that lift low-level, moisture laden air near the surface to higher elevations enhancing the water content of the atmosphere within these bands that leads to clouds that contain supercooled cloud droplets as the moisture surge passes through the freezing level. Our understanding of these bands is that the low-level vertical updrafts that are fueling the band dynamics are focused along the leading edges of these bands. These inflow regions should be the ones where supercooled cloud droplets are formed then accumulate. Therefore, this should be the focus of where the seeding material should be targeted. More details regarding the proposed design are provided in a categorical fashion in the following sections.

The likely operational five-month ground based seeding period will be Nov. 15, 2017 through April 15, 2018 targeting the Huasna-Alamo target area. Three ground-based, remotely operated silver iodide flare sites will be used.

2.3 Personnel

There are three necessary staff positions: 1) a program supervisor, 2) a program meteorologist and 3) a local part-time technician who is available to maintain and service the ground based seeding equipment. The following identifies our proposed personnel.

Mr. Don Griffith, President of North American Weather Consultants, will serve as the program supervisor. Mr. Griffith has extensive experience in the design, operation and evaluation of weather modification programs. His involvement in weather modification has been

continuous, beginning in the 1960's. He worked on a weather modification research program through Fresno State College in the late 1960's and early 1970's in the Sierra Nevada of California. He also worked on another major research program in the Sierra Nevada, the Sierra Cooperative Pilot Project (SCPP) after joining NAWC. He was a resident of Santa Barbara from 1973-80, so he is very familiar with the meteorology of Santa Barbara County. He was also involved with a portion of the Santa Barbara II research experiment and is quite familiar with that research program, which serves as the foundation of the recommended NAWC design for the current operational program. Mr. Griffith is certified by the Weather Modification Association (WMA), as a Certified Manager and Operator and by the American Meteorology Society as a Certified Consulting Meteorologist (CCM). He has served as President of the Weather Modification Association for three different one year terms. The program supervisor is an important position. The ultimate success of the program rests with this individual working in concert with the Agencies' project manager.

Ms. Stephanie Beall will be NAWC's lead project meteorologist. Ms. Beall has over 13 years' experience in conducting cloud seeding programs that have included utilization of weather radar and directing airborne seeding operations. She also has significant experience in weather forecasting specifically in support of weather modification programs. As was done last winter, Ms. Beall will operate from NAWC's Sandy, Utah headquarters. Ms. Beall has served as NAWC's meteorologist on six previous winter seasons on the Santa Barbara program. Consequently, she has: 1) previous experience in seeding mid-latitude cyclones with orographic inducing terrain, 2) rain augmentation programs to produce runoff and 3) knowledge of surface hydrology (in particular in the Santa Barbara area). Ms. Beall is a WMA and currently is serving as President of the WMA. Previously Ms. Beall has served as NAWC's meteorologist as a temporary employee. Ms. Beall became a full time, permanent employee of NAWC in September 2014.

NAWC will provide experienced back-up project meteorologists to this program as needed (long operational periods, illness, family emergencies, etc.). These meteorologists would include Don Griffith, Mark Solak and David Yorty. All three have 10 or more years' experience

in directing winter orographic cloud seeding programs. All three are both WMA Certified Managers and Operators.

The project meteorologist will perform the various project duties needed to conduct a safe and effective operation. A partial list of these duties is provided in Table 2-1.

Table 2-1
Partial List of Duties to be Performed by Project Meteorologist

| | |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1) | Constantly monitor weather conditions and determine, based on meteorological data and radar observation, the approach of seedable storm systems. |
| 2) | Estimate the probable results and impacts of seeding using predictive computer models, real time rain and river flow data ("Alert System" provided by Flood Control), and other information. Such estimates shall be updated regularly as conditions change. |
| 3) | Coordinate with Flood Control and Water SBCWA personnel to determine potential flows in key water courses and determine the appropriate action regarding seeding activities. |
| 4) | Direct the actual seeding operations using appropriate storm selection and target area criteria and continuously monitor ground seeding operations using radar and remote interrogation systems. |
| 5) | Maintain constant and continuous control over all ground seeding devices and keep an accurate written or digital log of the time that each and every generator is activated and deactivated (flare fire times).. |
| 6) | Inform Flood Control and SBCWA Personnel, through prescribed communication channels and in a timely manner, of all significant events relative to the program, including beginning and ending seed times. |
| 7) | Provide necessary radar and precipitation data to Flood Control and Water SBCWA staff as requested during periods of heavy rainfall or flooding. |
| 8) | Determine when conditions are such that program operations should be suspended for any weather related reason and adhere to suspension criteria designed by Flood Control and the SBCWA prior to project initiation. |
| 9) | Maintain, and submit copies of written operations reports to the SBCWA in a timely manner. At a minimum, such reports shall be submitted after each seeding event and should involve a discussion of the above referenced items (see Communications for final report requirements). |

We also propose to have a local technician, Mr. Robert Hefferman, available to provide technical part-time support to NAWC on an as needed basis. Mr. Hefferman provided these services to NAWC for the last winter season after receiving cross training from our former technician Mr. Vic Lee. Mr. Hefferman will primarily be responsible for the installation,

recharging, maintenance and de-commissioning of the ground based flare sites. Mr. Hefferman is quite familiar with the procedures needed to access the ground sites and in some cases, like Mt. Lospe, where the local landlord does not wish there to be access to this site following heavy rainfall periods. Mr. Hefferman lives in Lompoc, which is an excellent central location to service the three remotely operated flare sites.

2.4 Weather Radar

The National Weather Service established a nationwide network of specialized weather radars in the 1980's early 1990's. These sites are known as NEXRAD (Next Generation Radar) installations. Each installation cost on the order of \$1,000,000. There are 159 NEXRAD sites now in service. NEXRAD radars provide information on precipitation intensities and wind speed and direction within the precipitation echoes. The radars step scan through 14 different elevation angles in a 5-minute period and a computer program integrates the stepped scans into a volume scan. Several very sophisticated algorithms then produce a large number of specialized displays and products from each volume scan. The maximum range for the detection of precipitation echoes is 143 miles from each site. The NWS provides all the necessary support for these systems; operation, calibration, spare parts and maintenance since the NEXRAD network is very important to NWS forecasting and public safety responsibilities, to many hydro-meteorological applications and to aviation safety. Therefore, these radars enjoy high priority support and resultant reliability. NAWC proposes to continue its use of relevant NEXRAD radar products for the conduct of the cloud seeding program in Santa Barbara County.

NEXRAD data are available in near real time at approximately 5-6 minute intervals through a variety of internet web sites. NAWC has utilized the WeatherTap (commercial, subscription) web site extensively over the past eleven years to provide radar data to conduct wintertime cloud seeding programs in Santa Barbara County. This web site provides a variety of useful products including: echo intensities (precipitation), echo tops, vertical distribution of wind speed and direction (the very useful VAD upper level wind displays), composite echo displays that integrate radar returns from all of the 14 different elevation scans, and echo tops. There are two primary NEXRAD sites that provide coverage of Santa Barbara County: Vandenberg AFB

and Los Angeles (actually located near Ojai). These locations are fortuitous and complementary, since there is the potential for some terrain blockage of the radar beam by mountain ranges. The Santa Ynez mountain range can block some radar returns from the Vandenberg radar to the south and block echoes to the north of the Ojai site. Most weather during the winter season in this area moves in from the south through northwest. The Vandenberg AFB radar will provide data, which are not blocked by terrain from the southwest to northwest directions. The Ojai radar will provide unblocked data for storms that move in from the south. This is a powerful combination for the conduct of cloud seeding programs in Santa Barbara County. All precipitation events and contoured radar scans will be recorded.

2.5 Ground Seeding Sites

Previously, SBCWA personnel working in conjunction with NAWC personnel identified six strategically located ground sites at which NAWC installed custom designed remotely operated silver iodide pyrotechnic equipment. Site locations included: Mt. Lospe, Harris Grade, Sudden Peak, Gaviota, West Camino Cielo and Gibraltar Road. The locations of these sites in relation to the project target areas were shown in Figure 2.1. The SBWCA maintains the site leases for these locations for winter seasons when both target areas are active. NAWC will install three remotely controlled high output pyrotechnic ground sites at Mt. Lospe, Harris Grade and Sudden Peak for the 2017-2018 winter season (three instead of six since the Upper Santa Ynez target area will not be seeded this winter).

NAWC developed a completely new design for a remotely controlled ground based flare system for the 2001-02 Santa Barbara winter program (AHOGS - Automated High Output Ground Seeding System). This new design has been used for the 2002-2017 programs with some upgrades with time. The AHOGS system allows automated, focused, high-output seeding releases from strategic ridgeline locations under program control from the project operations center with the proper computer software and password. These systems give the project meteorologist the ability to conduct intensive seeding of convection rain bands as they track into and across the project areas under different wind flow regimes on a 24/7 basis. Each AHOGS consists of the following primary onsite components:

- Two flare masts, which hold a total of 32, 150-gram (fast-acting AgI) flares.
- Spark arrestors that enclose each flare.
- An environmentally sealed control box containing a cellular phone communications system, digital firing sequence relays/controller, data logger and system battery.
- A solar panel/charge regulation system to maintain site power.
- Cellular phone antenna.
- Lightning protection.

Each site is controlled via a modem-equipped PC at the operations center, running custom software to manage the flare seeding operations. The meteorologist has the option of firing flares individually in real time, or to order batch firing of any number of flares at selectable intervals at each site, e.g., three flares at 15-min intervals, beginning at any selected time. The software allows monitoring and reporting of AHOGS site status information, such as flare inventory and battery voltage. These units do not require back up power since they each have their own DC battery that is recharged using a solar panel. These units have performed very reliably over the years of operations. Figure 2.2 provides a photograph of one of these sites.



Figure 2.2 AHOGS flare site at Harris Grade

Figure 2.3 shows a close-up of flares mounted in one of the masts. The original AHOGS design was modified for the 2005-2006 program through the introduction of a NAWC custom designed spark arrestor. These spark arrestors, which fit over each of the flares, were developed to assure no large sparks or embers were released from the flare burns that could pose a fire concern. Normally, this would not be a concern since flares are only burned when rain is occurring eliminating any fire danger. These arrestors were developed in case of an accidental misfire or burning flares at the beginning of a storm following an extended dry spell. Figure 2.4 provides a photo of a flare burning inside a spark arrestor.

NAWC initially used this ground-based pyrotechnic seeding approach in the operational Santa Barbara program following the completion of the research program (1982-1985), but this seeding mode was discontinued since the manufacture of high output flares (400 grams of silver iodide each) was discontinued. Table 2-2 provides information on these sites.

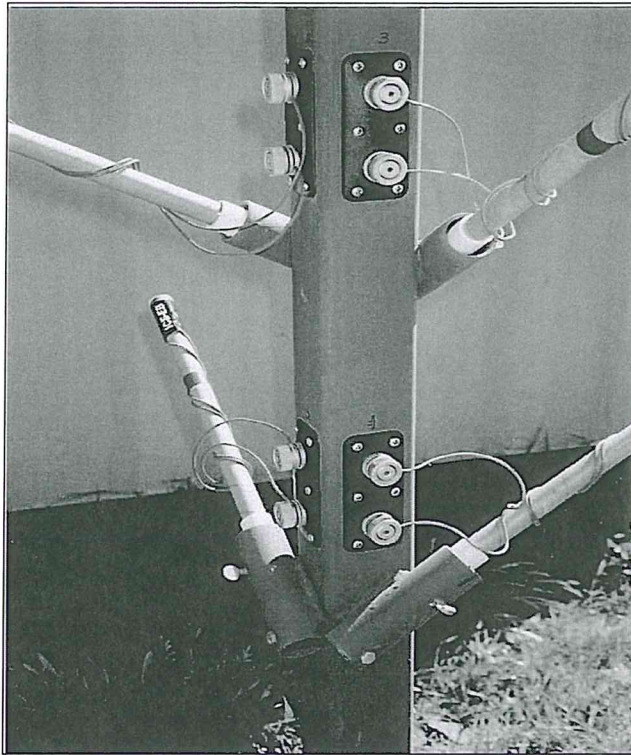


Figure 2.3 Close-up photo of flares

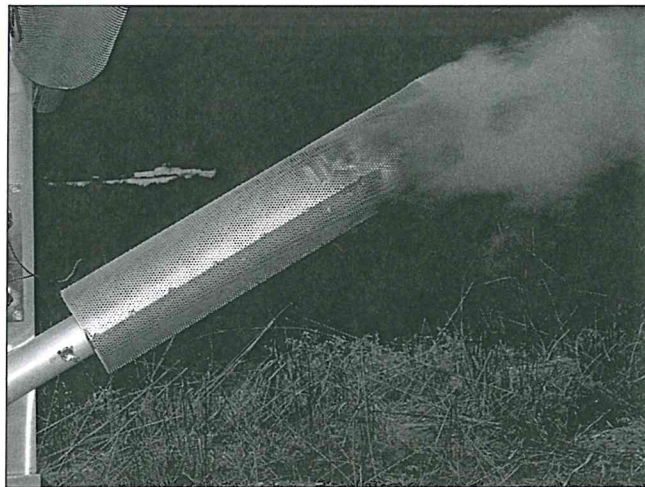


Figure 2.4 Flare burning inside spark arrestor

Table 2-2 2017-2018 AHOGS Site Locations

| Location | Latitude (N) | Longitude (W) | Elevation (ft.) |
|--------------|--------------|---------------|-----------------|
| Mt. Lospe | 34 ° 53.8' | 120 ° 35.7' | 1570 |
| Sudden Peak | 34 ° 34.5' | 120 ° 30.5' | 1540 |
| Harris Grade | 34 ° 43.8' | 120 ° 24.8' | 1204 |

The basic concept in the Santa Barbara II research program was to place as much seeding material as possible into the warmer updraft regions of the convective bands with cloud tops colder than freezing (i.e., -4 to -10⁰ or -12⁰ C). The 400 gram flares (known as LW 83's) were considered very high output at the time, but have been replaced by even more effective (in terms of nuclei production) units utilized by NAWC starting with the 2001-2002 program. The pyrotechnic flares used at the AHOGS sites will emit ~15 g of fast-acting silver iodide complex seeding material during a burn time of approximately four minutes. Ice Crystal Engineering (ICE) of Fargo, North Dakota manufactures these flares.

2.7 Seeding Operations

NAWC's conceptual model of the dynamics of the convection bands is that they are similar to summer squall lines in the Great Plains. NAWC believes that the primary low to mid-level inflow to these bands is along the leading edge of the bands. The inflow regions are thought to be the likely accumulation zones of supercooled liquid cloud droplets water, which are the targets of the seeding. Consequently, this is the desired region for the introduction of the seeding material. This would mean that flares burned at the ground sites should be timed to occur as the leading edge of the bands, as determined by the 6-minute PPI Vandenberg AFB NEXRAD radar, approach the ground sites. Low-level winds need to be considered in terms of targeting of seeding effects as well as the avoidance of seeding when suspension criteria are met. NAWC will employ selective targeting to avoid impacts over this burn area. NAWC has a variety of tools to do so including the use of the HYSPLIT model (see Section 2.9.2) in real time to predict the plume dispersion from flares burned from both ground-based sites (and airborne sources when aircraft seeding is part of the project design). The next section discusses the variety of weather

data available to NAWC meteorologists in making real-time seeding decisions. One product, Velocity Azimuth Displays (VAD) provide a time plot of wind direction and speed at 1000 foot intervals above the surface derived from the Doppler capability on the NWS NEXRAD weather radars. These displays, which are updated every six minutes, allow the meteorologist to predict the direction of seeding plumes released from ground or airborne sources, which can be used to verify the HYSPLIT plume predictions.

Special consideration will be given to the Alamo fire burn area located south of the Twitchell Dam. Specific suspension criteria will be followed concerning operations that might impact this burn area. These are the same criteria that were used to seed over the Rey burn area in the 2016-2017 winter season and are as follows:

Cloud seeding in the Huasna-Alamo drainage will consist of a 5-month ground program starting November 15, 2017. About 4% of the target area south of Twitchell Reservoir has been affected by the Alamo Fire. This portion of the burn effects tributaries, which drain directly into Twitchell Reservoir. Selective targeting measures will be implemented to reduce the potential for debris flows yet maximize the cloud seeding effort during specific precipitation events. Guidelines for selective seeding are as follows:

1. Cloud seeding will be suspended during the earlier season storm events. This will provide an opportunity for Santa Barbara County personnel to monitor the effect of precipitation on the burn area and determine how the intensity, distribution, and quantity of precipitation impact the watershed. This information will allow for a better understanding of the type of storm, which can safely be seeding without adverse consequences. Additionally, early season program suspension will allow the ground cover time to respond.

2. Following early season precipitation and monitoring, low-intensity events will be seeded in order to enhance rainfall. Storms that are predicted to produce precipitation quantities below 2.0 inches in a 24 hour period will be seeded. These predications are based on National Weather Service (NWS) forecasts. As the season progresses, progressively higher-intensity events may be seeded and will depend on ground cover response and slope erosion.

3. Cloud seeding will be suspended if high intensity precipitation events of 0.8 inches per hour or greater are predicted or observed in the target area. These predications are made by the NWS. In addition, a network of real-time precipitation gages is monitored by Santa Barbara County Flood Control personnel.

NAWC will use selective seeding where possible to avoid the Alamo burn area under certain wind regimes. The HYSPLIT model described in Section 2.9.2 can assist in using this selective seeding approach. Figure 2.5 provides the location of the Twitchell Reservoir target area, the Alamo burn area and the three ground-based, remotely operated flare sites.

Other more standard suspension criteria will be followed in addition to the above specific criteria. These criteria will be agreed upon by SBCWA and NAWC personnel prior to the beginning of any seeding activities.

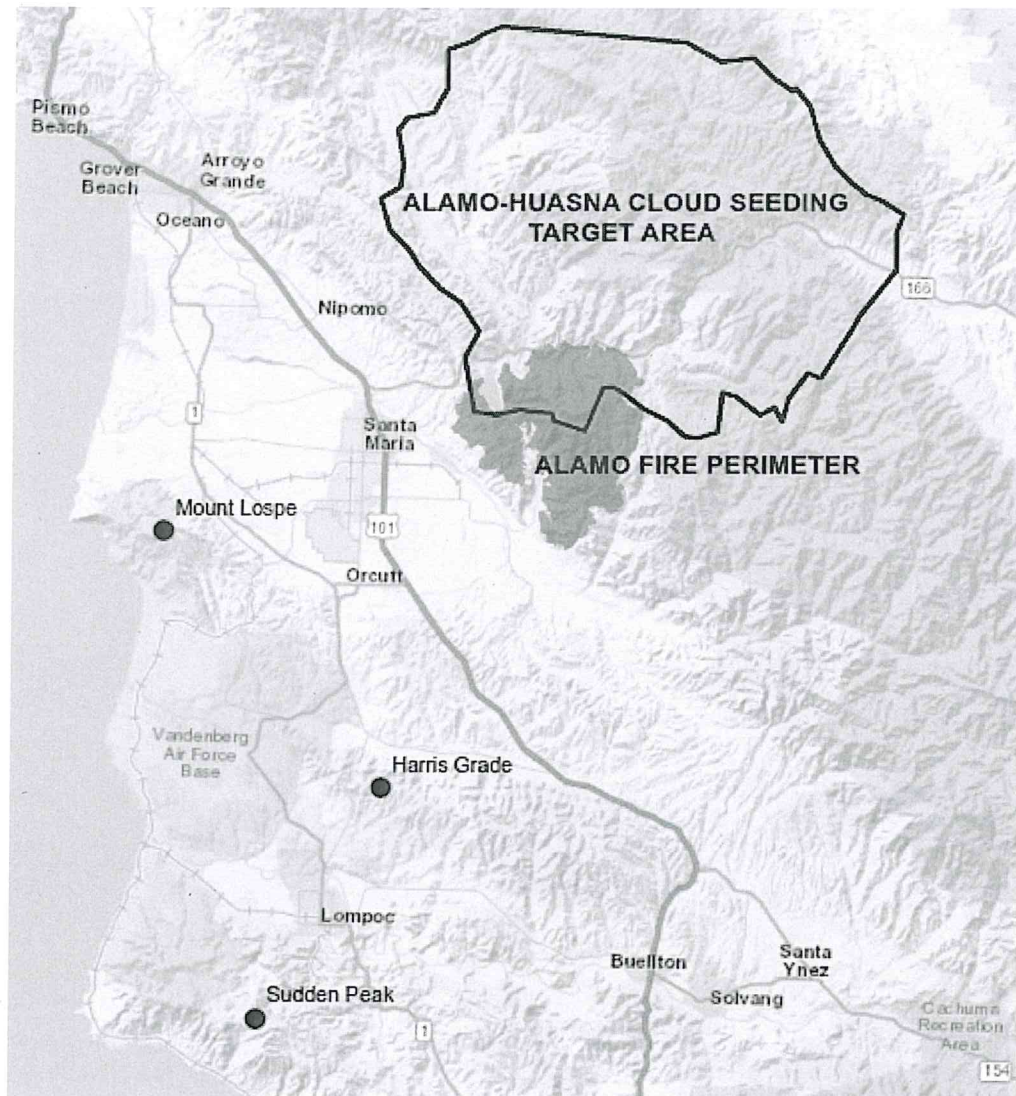


Figure 2.5 Locations of the Twitchell Reservoir Target Area, the Alamo Fire Burn Area and the Three Ground Based Flare Sites

As in previous seasons, a detailed Operations Plan (developed specifically for the Santa Barbara Program) will be available as a reference for all program personnel. This plan will include all the project seeding suspension criteria.

NAWC will be able to respond quickly in setting up the seeding program. One reason for this fast response capability is due to the fact that most of the AHOGS equipment is already on

site at the three ground sites. Consequently, we could bring this ground-based program to operational status in two to three weeks or less following receipt of an approved contract.

2.8 Equipment and Services

We agree to provide all routine and special maintenance of all equipment provided by NAWC. All equipment will be maintained in good working condition throughout the duration of the contract. Equipment will include the AHOGS ground sites, computers, and radios. NAWC does not propose any operations that would require propane.

Facilities

An operations center will be located at NAWC's headquarters located in Sandy, Utah. This operations center is equipped with several computers and the necessary communications equipment to conduct operations around the clock as needed. In addition to this operations center, all NAWC meteorologist have home computer systems and communications equipment so they can monitor the weather conditions and make seeding decisions on a 24/7 basis. All of the above computers will have the special software installed to operate the AHOGS sites remotely.

Weather Data

There is a wealth of weather information available via the internet. There are a number of products that are useful in the conduct of cloud seeding operations. NAWC's web site (www.nawcinc.com) contains an extensive list of useful weather links.

The following list some of the weather products that were used in the conduct of the 2016-2017 Santa Barbara seeding program and will be used in the conduct of the 2017-2018 program:

- 1) The SBWCA Alert weather network.

- 2) The National Weather Service surface, upper air and precipitation observations and predictions (e.g., the GFS, NAM and WRF models). Other forecast models are discussed in the next section.
- 3) The California River Forecast Center Quantitative Precipitation Forecasts (QPFs).
- 4) Satellite images; infrared (IR), water vapor (WV), or visible. IR images provide Information both day and night and also provide information on cloud top temperatures. Visible images are only available during daylight hours but the resolution on the images is better than the resolution on the IR products.
- 5) National Weather Service NEXRAD radar images, showing reflectivity values associated with precipitation near the times when seeding occurred. These displays are called Plan Position Indicator (PPI) images which are horizontal depictions of the radar reflectivity values within range of the radar. These images give an indication of the type, intensity, and extent of precipitation during seeding periods. Wind direction and velocity are also observed by the NEXRAD radars through the Doppler feature, which is part of the NEXRAD design. Plots of winds in the vertical in 1000-foot increments are available with a 6-minute time resolution from NEXRAD radars. These displays are called Velocity Azimuth Displays (VAD). Customized programs utilizing NWS NEXRAD data will also be used; for example WeatherTap and GR2.
- 6) Skew-T upper-air soundings from Vandenberg AFB. The skew-T sounding is a plot of temperature, dew point, and winds vs. height, observed by a radiosonde (balloon borne weather instrument). This sounding information is useful for analyzing various parameters of the atmosphere including temperature and moisture profiles, and convection potential. Soundings are available twice daily at 0400 and 1600 PST. The 700 mb (approximately 10,000 feet) temperatures are frequently reported in the following storm summaries. NAWC typically prefers to see these temperatures at -5°C or colder during seeded periods since silver iodide becomes effective as a seeding agent between -4° and -5°C . The closer the height of the -5°C level is to the ground seeding, the quicker a seeding effect will begin to be produced as the convection elements embedded in the convection bands begin to move over Santa Barbara County. These convective elements vertically transport the seeding material from the ground seeding sites to colder temperatures aloft.

- 7) Rainfall maps of Santa Barbara County are presented, showing approximate storm rainfall totals at various county stations. These totals are based on data obtained from the Santa Barbara County Flood Control District, which contains 24-hour accumulated totals.
- 8) National Weather Service weather watches, weather warnings, and flash flood warnings.

2.9 Computer Modeling

NAWC will utilize specialized computer models in the conduct of this program. These models are of two basic types: 1) those that forecast a variety of weather parameters useful in the conduct of the cloud seeding program (e.g. NAM or WRF) and 2) those that predict the transport and diffusion of seeding materials (e.g., HYSPLIT).

In some previous winter seasons NAWC had used the standard National Oceanic and Atmospheric Administration (NOAA) atmospheric models: NAM (formerly ETA) and GFS in forecasting seedable events and associated parameters of interest (e.g. temperatures, winds, precipitation). NAWC will continue to use the NAM and GFS models, especially for longer range forecasts. A more sophisticated model will be used for shorter range forecasts. This is the Weather Research and Forecasting (WRF) model developed by the National Center for Atmospheric Research (NCAR) and NOAA. Recently this model has shown considerable skill in predicting precipitation, pressure fields, wind fields and a variety of other parameters of interest in conducting the cloud seeding operations. There are several web sites that provide WRF model output (e.g., NOAA, NCAR, and University of Utah).

The GUIDE model (Rauber, et al, 1988) had been used for many years to predict the transport and diffusion of seeding material and fallout of seeded precipitation. There has been significant advancement in computer models that predict the transport and diffusion of particles released either from the ground or aircraft since the GUIDE model was developed. NAWC recognized that newer, more sophisticated computer models would provide more accurate predictions than those produced by GUIDE. For example, the HYSPLIT model developed by NOAA provides forecasts of the transport and diffusion of either ground or aerial releases of

some material, which in our case would be silver iodide seeding particles. NAWC utilized predictions from the HYSPLIT model to assist in making seeding decisions during the 2011-2012 through the 2016-2017 winter seasons. NAWC will continue the use of this model for plume targeting purposes during the 2017-2018 winter season. The WRF and HYSPLIT models will be discussed separately in the following.

2.9.1 WRF Model

The Weather Research and Forecasting (WRF) Model is a next-generation mesoscale numerical weather prediction system designed to serve both operational forecasting and atmospheric research needs. It features multiple dynamical cores, a 3-dimensional variational (3DVAR) data assimilation system, and a software architecture allowing for computational parallelism and system extensibility. WRF is suitable for a broad spectrum of applications across scales ranging from meters to thousands of kilometers.

The effort to develop WRF has been a collaborative partnership, principally among the National Center for Atmospheric Research (NCAR), the National Oceanic and Atmospheric Administration (the National Centers for Environmental Prediction (NCEP) and the Forecast Systems Laboratory (FSL), the Air Force Weather SBCWA (AFWA), the Naval Research Laboratory, the University of Oklahoma, and the Federal Aviation Administration (FAA). WRF allows researchers the ability to conduct simulations reflecting either real data or idealized configurations. WRF provides operational forecasting a model that is flexible and efficient computationally, while offering the advances in physics, numerics, and data assimilation contributed by the research community.

NAWC utilized NOAA's Earth Systems Research Laboratory's High Resolution Rapid Refresh (HRRR) version of the WRF model during the 2013-2014 winter season. **This model has a 3km grid spacing compared to the more standard grid model spacing of 12km (e.g. NAM model), plus it is re-initialized every hour using the latest radar observations.** The NAM and GFS models are currently re-initialized every 6 hours. Hourly forecast outputs from the HRRR model are available for a variety of parameters out to 15 hours. Table 2-3 provides a summary of some of forecast parameters of interest in conducting cloud seeding program.

Table 2-3 HRRR Forecast Parameters of Interest

| Parameter | Application |
|------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1km above ground level reflectivity | Forecast of convection band locations based on radar returns 1km above ground |
| Composite reflectivity | Forecast of convection band locations using reflectivity values from different scan elevations. This is useful when bands approach the radar site since low elevation scans may go underneath the bands. |
| Max 1km above ground level reflectivity | Forecasts that pinpoints the location of the heart of the convection bands |
| 1 hour accumulated precipitation | Forecasts of radar derived estimates of precipitation reaching the ground in a one-hour period (QPF). |
| Total accumulated precipitation | Forecasts of radar derived estimates of precipitation reaching the ground for a specified time period, for example 1-6 hours in the future (QPF). |
| 850 mb winds | Forecasts of the 850 mb (~4,000 feet) wind direction is useful in determining if and when wind directions may go out of bounds in regards to suspension criteria.(e.g., avoiding burn areas) |
| 700mb temperature | NAWC uses this level, which is ~10,000 feet, to indicate whether silver iodide will activate. Temperatures < -5 ⁰ C are desirable at this level |
| 700mb vertical velocity | Forecasts the strength of the upward or downward movement at ~the 10,000 foot level. Stronger updrafts favor transport of seeding material to colder, more effective cloud regions. |
| Echo top height | Forecasts of cloud echo tops. Can be useful in determining whether the cloud tops are forecast to be cold enough for silver iodide to be effective (~-5 ⁰ C) and perhaps too cold <-25 ⁰ C to produce positive seeding effects. |

Based on the design of the program which is focused upon seeding convection bands, and the seeding techniques, it can be seen that forecasts of convective band locations are not a requirement but are useful when using the ground-based seeding sites. Seeding decisions for ground-based sites can be made using real-time NEXRAD radar information indicating when a convection band is approaching a particular seeding site. The precipitation type forecasts are useful when considering suspension criteria.

The HRRR model will be used during the conduct of the 2017-2018 winter program.

2.9.2 HYSPLIT Model

The HYSPLIT (HYbrid Single-Particle Lagrangian Integrated Trajectory) model is the newest version of a complete system for computing simple air parcel trajectories to complex dispersion and deposition simulations. As a result of a joint effort between NOAA and Australia's Bureau of Meteorology, the model has recently been upgraded. New features include improved advection algorithms, updated stability and dispersion equations, a new graphical user interface, and the option to include modules for chemical transformations. Without the additional dispersion modules, HYSPLIT computes the advection of a single pollutant particle, or simply its trajectory.

The dispersion of particles released into the atmosphere is calculated by assuming either puff or particle dispersion. In the puff model, puffs expand until they exceed the size of the meteorological grid cell (either horizontally or vertically) and then split into several new puffs, each with its share of the pollutant mass. In the HYSPLIT particle model, a fixed number of initial particles are advected about the model domain by the mean wind field and a turbulent component. The model's default configuration assumes a puff distribution in the horizontal and particle dispersion in the vertical direction. In this way, the greater accuracy of the vertical dispersion parameterization of the particle model is combined with the advantage of having an ever-expanding number of particles represent the pollutant distribution.

The model can be run interactively on the Web through the READY system on the NOAA site, or the code executable and meteorological data can be downloaded to a Windows PC. The Web version has been configured with some limitations to avoid computational saturation of the web server. The registered PC version is complete with no computational restrictions, except that the user must download the necessary meteorological data files. The unregistered version is identical to the registered version except that it will not work with forecast meteorology data files.

NAWC has utilized the HYSPLIT model to predict the transport and diffusion of silver iodide seeding material during selected storm periods in Santa Barbara County during the past six winter seasons of operations.

The real-time predictions of plume transport that were used previously utilized input fields from the NAM model at a 12km grid spacing. Data are now available for real-time simulations that have a grid resolution of 4 km (similar to some of the WRF models). The 3km data are not archived due to the size of the files, thus providing only simulations in real-time. Simulations for prior storm events may be run using NAM 12 km archived data. The accuracy of the plume predictions is sensitive to the grid size, especially in areas that have underlying complex terrain (e.g. mountainous areas). The smaller the grid spacing becomes the better the predictions in these situations. This feature should provide more accurate real time plume predictions from HYSPLIT model during the conduct of the 2017-2018 winter cloud seeding program.

2.10 Transportation, Board and Lodgings

NAWC shall provide transportation and lodging of all of the Contractor's personnel used in conducting the project. NAWC shall provide transportation and storage for all of the Contractor's equipment used in conducting the project.

2.11 Project Operations

Previous sections have outlined how we intended to conduct the operations. A detailed Operations Plan will be prepared, in conjunction with SBCWA personnel, for all project personnel to follow.

2.12 Communications

NAWC shall keep SBCWA informed of the program status at all times including equipment failures and personnel changes affecting the program. NAWC shall notify Flood Control and

SBCWA personnel at the initiation and conclusion of seeding activities and provide SBCWA with records of seeding locations and duration at the conclusion of each storm event. In addition, NAWC shall provide SBCWA a **draft** copy of the final report by 40 days following the termination of a particular season's activities and **3 paper copies and one digital copy of a final report by 60 days** following the termination of a particular season's activities as well as a copy of all data files for archive after the conclusion of each operational season. This report shall include, at a minimum, a description of equipment and techniques used, a log of all operations conducted, the total amount of seeding solution dispensed from both ground and aerial operations, a summary of overall weather conditions and storm events and an assessment of program results. NAWC shall obtain approval from SBCWA before disseminating any information regarding the program.

2.13 Costs

The estimated costs to conduct this project are provided as a separate document.

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EXHIBIT B

PAYMENT ARRANGEMENTS

Periodic Compensation (with attached Schedule of Fees)

- A. For CONTRACTOR services to be rendered under this Agreement, CONTRACTOR shall be paid a total contract amount, including cost reimbursements, not to exceed **\$147,300**.
- B. Payment for services and /or reimbursement of costs shall be made upon CONTRACTOR's satisfactory performance, based upon the scope and methodology contained in **EXHIBIT A** as determined by COUNTY. Payment for services and/or reimbursement of costs shall be based upon the costs, expenses, overhead charges and hourly rates for personnel, as defined in **Attachment B1** (Schedule of Fees). Invoices submitted for payment that are based upon **Attachment B1** must contain sufficient detail to enable an audit of the charges and provide supporting documentation if so specified in **EXHIBIT A**.
- C. **Monthly**, CONTRACTOR shall submit to the COUNTY DESIGNATED REPRESENTATIVE an invoice or certified claim on the County Treasury for the service performed over the period specified. These invoices or certified claims must cite the assigned Board Contract Number. COUNTY DESIGNATED REPRESENTATIVE shall evaluate the quality of the service performed and if found to be satisfactory and within the cost basis of **Attachment B1** shall initiate payment processing. COUNTY shall pay invoices or claims for satisfactory work within 30 days of receipt of correct and complete invoices or claims from CONTRACTOR.
- D. COUNTY's failure to discover or object to any unsatisfactory work or billings prior to payment will not constitute a waiver of COUNTY's right to require CONTRACTOR to correct such work or billings or seek any other legal remedy.
- E. CONTRACTOR shall comply with the California Labor Code, including but not limited to the payment of prevailing wage when required. The general prevailing wage rates determined by the Director of Industrial Relations, for the county or counties in which the work is to be done, are on file at the office of the Santa Barbara County Water Agency, 130 E. Victoria Street, Suite 200, Santa Barbara, CA 93101. Copies of these general prevailing wage rates shall be made available to any interested party on request. Changes, if any to the general prevailing wage rates will be available at the same location. The prevailing wage rates are also available from the California Department of Industrial Relations' Internet web site at <http://www.dir.ca.gov/dlsr/pwd>.

2017-2018 CLOUD SEEDING PROGRAM ATTACHMENT B1

FIXED AND REIMBURSABLE COST FOR A FIVE MONTH GROUND WEATHER MODIFICATION PROGRAM FOR TWITCHELL RESERVOIR WATERSHEDS

| | |
|--------------------------------------------------------------|------------------|
| 1. Set-up, Removal, and Reporting Fixed Costs | \$22,800 |
| (includes \$2,000,000 professional liability insurance) | |
| 2. Monthly Fixed Costs | |
| Five months @ \$20,150 (ground only for Twitchell watershed) | \$100,750 |
| 3. Estimated Reimbursable Costs | |
| 250 ground flares @ \$95/flare | \$23,750 |
| 4. Estimated total cost | \$147,300 |

- **NOTE – invoicing schedule will be the following:**

½ the setup cost (\$11,400) will be invoiced on November 15th, the beginning date of the program. The other ½ of the setup cost shall be invoiced upon receipt of the final report and upon agreement by Santa Barbara County Water Agency that all conditions of the contract are met. Monthly invoices for fixed costs as well as reimbursable costs shall be submitted at the end of each operational month.

EXHIBIT C

Indemnification and Insurance Requirements (For Professional Contracts)

INDEMNIFICATION

CONTRACTOR agrees to indemnify, defend (with counsel reasonably approved by COUNTY) and hold harmless COUNTY and its officers, officials, employees, agents and volunteers from and against any and all claims, actions, losses, damages, judgments and/or liabilities arising out of this Agreement from any cause whatsoever, including the acts, errors or omissions of any person or entity and for any costs or expenses (including but not limited to attorneys' fees) incurred by COUNTY on account of any claim except where such indemnification is prohibited by law. CONTRACTOR's indemnification obligation applies to COUNTY's active as well as passive negligence but does not apply to COUNTY's sole negligence or willful misconduct.

NOTIFICATION OF ACCIDENTS AND SURVIVAL OF INDEMNIFICATION PROVISIONS

CONTRACTOR shall notify COUNTY immediately in the event of any accident or injury arising out of or in connection with this Agreement. The indemnification provisions in this Agreement shall survive any expiration or termination of this Agreement.

INSURANCE

CONTRACTOR shall procure and maintain for the duration of this Agreement insurance against claims for injuries to persons or damages to property which may arise from or in connection with the performance of the work hereunder and the results of that work by the CONTRACTOR, its agents, representatives, employees or subcontractors.

A. Minimum Scope of Insurance

Coverage shall be at least as broad as:

1. **Commercial General Liability (CGL):** Insurance Services Office (ISO) Form CG 00 01 covering CGL on an "occurrence" basis, including products-completed operations, personal & advertising injury, with limits no less than \$1,000,000 per occurrence and \$2,000,000 in the aggregate.
2. **Automobile Liability:** ISO Form Number CA 00 01 covering any auto (Code 1), or if CONTRACTOR has no owned autos, hired, (Code 8) and non-owned autos (Code 9), with limit no less than \$1,000,000 per accident for bodily injury and property damage.
3. **Workers' Compensation:** as required by the State of California, with Statutory Limits, and Employer's Liability Insurance with limit of no less than \$1,000,000 per accident for bodily injury or disease.
4. **Professional Liability** (Errors and Omissions) Insurance appropriate to the CONTRACTOR'S profession, with limit of no less than \$1,000,000 per occurrence or claim, \$2,000,000 aggregate.

If the CONTRACTOR maintains higher limits than the minimums shown above, the COUNTY requires and shall be entitled to coverage for the higher limits maintained by the CONTRACTOR. Any available insurance proceeds in excess of the specified minimum limits of insurance and coverage shall be available to the COUNTY.

B. Other Insurance Provisions

The insurance policies are to contain, or be endorsed to contain, the following provisions:

1. **Additional Insured** – COUNTY, its officers, officials, employees, agents and volunteers are to be covered as additional insureds on the CGL policy with respect to liability arising out of work or operations performed by or on behalf of the CONTRACTOR including materials, parts, or equipment furnished in connection with such work or operations. General liability coverage can be provided in the form of an endorsement to the CONTRACTOR's insurance at least as broad as ISO Form CG 20 10 11 85 or if not available, through the addition of both CG 20 10 and CG 20 37 if a later edition is used).
2. **Primary Coverage** – For any claims related to this Agreement, the CONTRACTOR's insurance coverage shall be primary insurance as respects the COUNTY, its officers, officials, employees, agents and volunteers. Any insurance or self-insurance maintained by the COUNTY, its officers, officials, employees, agents or volunteers shall be excess of the CONTRACTOR's insurance and shall not contribute with it.
3. **Notice of Cancellation** – Each insurance policy required above shall provide that coverage shall not be canceled, except with notice to the COUNTY.
4. **Waiver of Subrogation Rights** – CONTRACTOR hereby grants to COUNTY a waiver of any right to subrogation which any insurer of said CONTRACTOR may acquire against the COUNTY by virtue of the payment of any loss under such insurance. CONTRACTOR agrees to obtain any endorsement that may be necessary to effect this waiver of subrogation, but this provision applies regardless of whether or not the COUNTY has received a waiver of subrogation endorsement from the insurer.
5. **Deductibles and Self-Insured Retention** – Any deductibles or self-insured retentions must be declared to and approved by the COUNTY. The COUNTY may require the CONTRACTOR to purchase coverage with a lower deductible or retention or provide proof of ability to pay losses and related investigations, claim administration, and defense expenses within the retention.
6. **Acceptability of Insurers** – Unless otherwise approved by Risk Management, insurance shall be written by insurers authorized to do business in the State of California and with a minimum A.M. Best's Insurance Guide rating of "A- VII".
7. **Verification of Coverage** – CONTRACTOR shall furnish the COUNTY with proof of insurance, original certificates and amendatory endorsements as required by this Agreement. The proof of insurance, certificates and endorsements are to be received and approved by the COUNTY before work commences. However, failure to obtain the required documents prior to the work beginning shall not waive the CONTRACTOR's obligation to provide them. The CONTRACTOR shall furnish evidence of renewal of coverage throughout the term of the Agreement. The COUNTY reserves the right to require complete, certified copies of all required insurance policies, including endorsements required by these specifications, at any time.
8. **Failure to Procure Coverage** – In the event that any policy of insurance required under this Agreement does not comply with the requirements, is not procured, or is canceled and not replaced, COUNTY has the right but not the obligation or duty to terminate the Agreement. Maintenance of required insurance coverage is a material element of the Agreement and failure to maintain or renew such coverage or to provide evidence of renewal may be treated by COUNTY as a material breach of contract.
9. **Subcontractors** – CONTRACTOR shall require and verify that all subcontractors maintain insurance meeting all the requirements stated herein, and CONTRACTOR shall ensure that COUNTY is an additional insured on insurance required from subcontractors.

10. Claims Made Policies – If any of the required policies provide coverage on a claims-made basis:

- i. The Retroactive Date must be shown and must be before the date of the contract or the beginning of contract work.
- ii. Insurance must be maintained and evidence of insurance must be provided for at least five (5) years after completion of contract work.
- iii. If coverage is canceled or non-renewed, and not replaced with another claims-made policy form with a Retroactive Date prior to the contract effective date, the CONTRACTOR must purchase "extended reporting" coverage for a minimum of five (5) years after completion of contract work.

11. Special Risks or Circumstances – COUNTY reserves the right to modify these requirements, including limits, based on the nature of the risk, prior experience, insurer, coverage, or other special circumstances.

Any change requiring additional types of insurance coverage or higher coverage limits must be made by amendment to this Agreement. CONTRACTOR agrees to execute any such amendment within thirty (30) days of receipt.

Any failure, actual or alleged, on the part of COUNTY to monitor or enforce compliance with any of the insurance and indemnification requirements will not be deemed as a waiver of any rights on the part of COUNTY.