: Contract Number : BC - 10 - 066 - - -

D1. Fiscal Year ..... : FY 2009-10
D2. Budget Unit Number *(plus -Ship/-Bill codes in paren's)* : 054
D3. Requisition Number ..... :
D4. Department Name ..... : Water Agency
D5. Contact Person ..... : Dennis Gibbs
D6. Phone ..... : ext. 8781

K1. Contract Type *(check one)*: [ ] Personal Service [ ] Capital Project/Construction
K2. Brief Summary of Contract Description/Purpose : environmental document for project
K3. Original Contract Amount ..... : $168,200
K4. Contract Begin Date ..... : October 13, 2009
K5. Original Contract End Date ..... : June 30, 2010
K6. Amendment History *(leave blank if no prior amendments)*:

Seq#	*EffectiveDate*	*ThisAmndtAmt*	*CumAmndtToDate*	*NewTotalAmt*	*NewEndDate*	*Purpose (2-4 words)*
		$	$	$		

K7. Department Project Number ..... : WA8209

B1. Is this a Board Contract? *(Yes/No)* ..... : yes
B2. Number of Workers Displaced *(if any)* ..... : N/A
B3. Number of Competitive Bids *(if any)* ..... : N/A
B4. Lowest Bid Amount *(if bid)* ..... : $
B5. If Board waived bids, show Agenda Date ..... :
B6. ... and Agenda Item Number ..... : #
B7. Boilerplate Contract Text Unaffected? *(Yes / or cite ¶¶)* :

F1. Encumbrance Transaction Code ..... : 1701
F2. Current Year Encumbrance Amount ..... : $
F3. Fund Number ..... : 3050
F4. Department Number ..... : 054
F5. Division Number *(if applicable)* ..... : 04
F6. Account Number ..... : 7460, Program: 3009
F7. Cost Center number *(if applicable)* ..... :
F8. Payment Terms ..... : Net 30

V1. Vendor Numbers *(A=uditor; P=urchasing)* ..... : A-240538
V2. Payee/Contractor Name ..... : North American Weather Consultants, Inc.
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. Contractor's Federal Tax ID Number *(EIN or SSN)* : 87-0635825
V7. Contact Person ..... : Don Griffith
V8. Workers Comp Insurance Expiration Date ..... :
V9. Liability Insurance Expiration Date[s] *(G=enl; P=rofl)* :
V10. Professional License Number ..... : #
V11. Verified by *(name of County staff)* ..... :
V12. Company Type *(Check one)*: [ ] Individual [ ] Sole Proprietorship [ ] Partnership [ ] Corporation

I certify: information 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. having its principal place of business 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.

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

1. **DESIGNATED REPRESENTATIVE.** Dennis Gibbs at phone number (805) 739-8781 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 first class mail, postage prepaid, or otherwise delivered as follows:

To COUNTY: Thomas D. Fayram, Santa Barbara County Water Agency, 123 E. Anapamu Street, Suite 240, Santa Barbara, CA 93101

To CONTRACTOR: Don Griffith, NAWC, 8180 South Highland Dr., 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. Notices and consents under this section, which are sent by mail, shall be deemed to be received five (5) days following their deposit in the U.S. mail.

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 13, 2009 and end performance upon completion, but no later than June 30, 2010 unless otherwise directed by COUNTY or unless earlier terminated.

5. **COMPENSATION OF CONTRACTOR.** 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.** CONTRACTOR shall perform all of its services under this Agreement as an independent contractor and not as an employee of COUNTY. 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.

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. **TAXES.** 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.

9. **CONFLICT OF INTEREST.** CONTRACTOR covenants that CONTRACTOR presently has no interest and shall not acquire any interest, direct or indirect, 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.

10. **RESPONSIBILITIES OF COUNTY.** COUNTY shall provide all information reasonably necessary by CONTRACTOR in performing the services provided herein.

11. **OWNERSHIP OF DOCUMENTS.** 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, and any material necessary for the practical use of the data and/or documents 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 materials under this section except after prior written approval of COUNTY.

No materials produced in whole or in part under this Agreement shall be subject to copyright in the United States or in any other country except as determined at the sole discretion of COUNTY. COUNTY shall have the unrestricted authority to publish, disclose, distribute, and other use in whole or in part, any reports, data, documents or other materials prepared under this Agreement.

12. **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 practices. 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.

13. **INDEMNIFICATION AND INSURANCE.** CONTRACTOR shall agree to defend, indemnify and save harmless the COUNTY and to procure and maintain insurance in accordance with the provisions of EXHIBIT C attached hereto and incorporated herein by reference.

14. **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.

15. **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.

16. **ASSIGNMENT.** CONTRACTOR shall not assign any of its rights nor transfer any of its obligations under this Agreement without the prior written consent of COUNTY and any attempt to so assign or so transfer without such consent shall be void and without legal effect and shall constitute grounds for termination.

17. **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 or because of the failure of CONTRACTOR to fulfill the obligations herein. Upon receipt of notice, CONTRACTOR shall immediately discontinue all services effected (unless the notice directs otherwise), and deliver to COUNTY all data, estimates, graphs, summaries, reports, and all other records, documents or papers as may have been accumulated or produced by CONTRACTOR in performing this Agreement, whether completed or in process.

1. For Convenience. COUNTY may terminate this Agreement upon thirty (30) days written notice. Following notice of such termination, CONTRACTOR shall promptly cease work and notify COUNTY as to the status of its performance.

Notwithstanding any other payment provision of this Agreement, COUNTY shall pay CONTRACTOR for service 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 effect any right or remedy which COUNTY may have in law or equity.

2. 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 this Agreement by written notice, which shall be effective upon receipt by CONTRACTOR.

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.

18. **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.

19. **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.

20. **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.

21. **TIME IS OF THE ESSENCE.** Time is of the essence in this Agreement and each covenant and term is a condition herein.

22. **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.

23. **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.

24. **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.

25. **COMPLIANCE WITH LAW.** CONTRACTOR shall, at his 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 be 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.

26. **CALIFORNIA LAW.** 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.

27. **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.

28. **AUTHORITY.** All 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.

29. **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.

SANTA BARBARA COUNTY WATER AGENCY

By: _____
Chair, Board of Directors

Date: _____

ATTEST:
MICHAEL F. BROWN
CLERK OF THE BOARD

By: _____
Deputy

CONTRACTOR
North American Weather Consultants, Inc.

By: _____

Title: President

SocSec or TaxID Number: 87-0655825

APPROVED AS TO FORM:
DENNIS MARSHALL
COUNTY COUNSEL

By: _____
Deputy County Counsel

APPROVED AS TO ACCOUNTING FORM:
ROBERT W GEIS, CPA
AUDITOR-CONTROLLER

By: _____
Deputy

Dept: 054
Fund: 3050
Acct: 7460
Program: 3009

APPROVED AS TO FORM:
RAY AROMATORIO, ARM, AIC
RISK PROGRAM ADMINISTRATOR

By: _____

Exhibit A
Statement of Work

North American Weather Consultants, Inc.

TECHNICAL PROPOSAL FOR A 2009-2010 WINTER CLOUD SEEDING PROJECT IN SANTA BARBARA COUNTY AND A PORTION OF SOUTHERN SAN LUIS OBISPO COUNTY

Prepared for

Santa Barbara County Water Agency

by

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

Proposal No. 09-250

August 2009

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TECHNICAL PROPOSAL FOR A 2009-2010 WINTER CLOUD SEEDING PROJECT IN SANTA BARBARA COUNTY AND A PORTION OF SOUTHERN SAN LUIS OBISPO COUNTY
Proposal No. 09-250

1.0 INTRODUCTION AND BACKGROUND

North American Weather Consultants (NAWC) is pleased to submit a proposal (#09-250) for a Santa Barbara County cloud seeding, or weather modification program for the 2009-2010 winter season. NAWC was selected as the contractor to perform the work outlined in a 2007 request for proposals (RFP) from the Santa Barbara County Water Flood Control & Water Conservation District and Water Agency (Agency). Due to the Zaca fire that impacted a large portion of the upper Santa Ynez watershed during the summer and fall of 2007, no cloud seeding operations were conducted during the 2007-2008 winter season. A limited program was conducted during the 2008-2009 winter season. The target area for this program was restricted to the Huasna-Alamo watershed in northern Santa Barbara and southern San Luis Obispo Counties. No aircraft seeding was conducted, rather the seeding activities were restricted to three ground based, high output seeding flare sites.

Mr. Dennis Gibbs of the Agency requested that NAWC provide a proposal to conduct another limited program for the 2009-2010-winter season. This proposal is submitted in response to this request.

2. 0 PROJECT DESIGN

For the 2001-02 Santa Barbara winter program, NAWC proposed and the Agency accepted several modifications to the project design previously used in the conduct of this project. These changes were suggested to more closely duplicate the earlier Santa Barbara II research program, which was quite successful. The basic components of this revised design included: three newly designed, ground-based, high output, remotely controlled flare release sites that were established at Mt. Lospe, Sudden Peak and Rancho Dos Vistas. These sites

replaced a network of eight ground based liquid fueled cloud nuclei generators used previously. A specially modified twin engine Beechcraft Baron aircraft was used to treat cloud systems (using acetone-silver iodide generators) over the Pacific Ocean to the west and south of the county. The aircraft was equipped with a GPS radio modem, which provided aircraft location and altitude information to the project operations center. The project operations center was established at the Santa Barbara Airport. Another change consisted of the use of National Weather Service NEXRAD weather radar sites to provide needed radar information instead of installing project dedicated weather radar. Formerly, NAWC had installed and operated such a radar sited at an exposed location on former President Reagan's ranch located on the Santa Ynez Mountain ridgeline north of Gaviota. This same revised design was used in the conduct of the 2002-2007 winter projects with two modifications. These modifications consisted of 1) the establishment of three additional ground based, remotely controlled high output flare sites (West Camino Cielo, Gibraltar Road, Harris Grade) 2) the use of a higher performance Cessna 340 aircraft replacing the Beechcraft Baron beginning with the 2004-2005 program, and 3) utilization of high output seeding flares on the Cessna 340 aircraft instead of the acetone-silver iodide generators used previously. The Cessna 340 aircraft was equipped with two 24-posiotion-flare racks that fired the same high output flares used at the ground sites. This modified design, with modifications, was used to guide the 2008-2009 winter program. This basic design, again with some modifications, is proposed to guide the conduct of the 2009-2010 winter program. The target area for the 2009-2010 program will be expanded to cover both of the target areas (Huasna-Alamo and the Upper Santa Ynez due to vegetation recovery in the Zaca burn area). The recent Gap, Tea and Jesusita fires that impacted the South Coast will require adoption of specific seeding suspension criteria to insure no seeding impacts occur in these areas. The area surrounding one of the six automated ground-seeding systems was severely impacted by the Jesusita fire. As a consequence this site, known as the Gibraltar Road site, will not be activated for the 2009-2010 winter program.

The primary changes from the basic design described in the above are:

- No aircraft seeding will be conducted.

- Five of the six previously established ground-based, remotely operated flare sites will be used (Mt. Lospe, Harris Grade, Sudden Peak, Gaviota and West Camino Cielo).

Figure 2.1 provides a map of the two target areas and the remotely operated, ground based seeding sites.

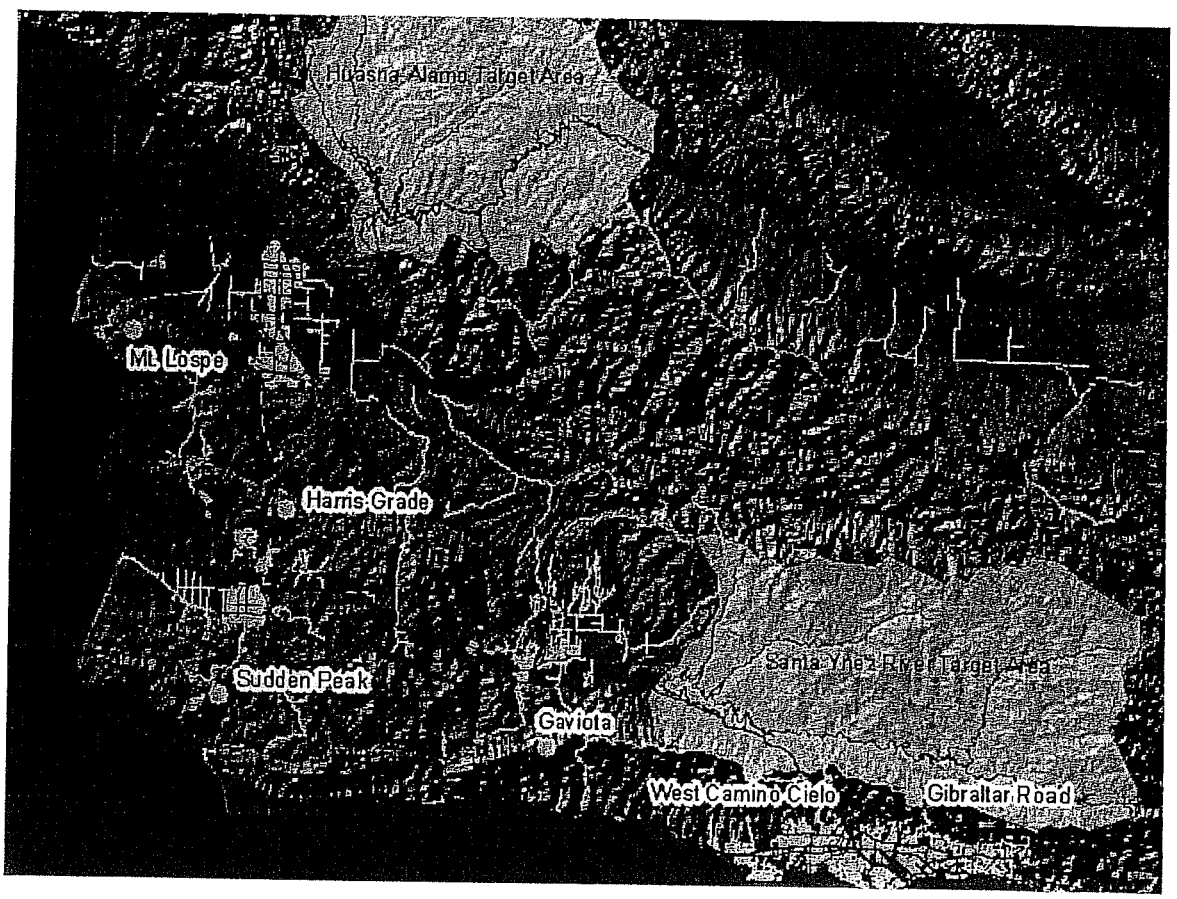

Figure 2.1 Map of the 2009-2010 Target Area

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.

2.1 Proposed 2009-2010 Program Design

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 to be 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. This program was known as the Santa Barbara II research program (an earlier research program, Santa Barbara I, was also conducted by NAWC). The Santa Barbara II program focused on seeding convective bands embedded in naturally occurring winter storms. The occurrence of convective bands and their importance in producing rainfall in Santa Barbara County had been documented in an earlier study performed by NAWC (Elliott and Hovind, 1964). These bands were found to be a common feature of winter coastal California storms, which produced 50% or more of the precipitation that falls in the Santa Barbara area. **The bands also exhibited stronger upward vertical motions and higher supercooled liquid water contents, characteristics which make them prime candidates for ice phase cloud seeding. In fact, the storm regions on either side of these convective bands seem to offer very limited seeding potential.** The research in Santa Barbara II was conducted in two phases; a single point ground seeding site using high output pyrotechnics (phase I) and airborne seeding of the bands off the west coast of Santa Barbara County (phase II). A large array of rain gage sites (168 gages) either already in place or installed for the program was used to evaluate the results of the seeding. The results were impressive and similar for the two phases; the magnitude of the precipitation increase was of the order of 50-100% within the seeded bands and 25-50% of the storm total! A number of the precipitation rain gage results were statistically significant (i.e., they were very unlikely to be chance occurrences). A paper (Griffith, et al, 2005) summarizes this research program as well as the follow-on operational programs conducted in Santa Barbara County.

Even though this research program was conducted approximately 30 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 have 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.** One of the reasons we feel this research program is so valuable in this area is due to the location of Santa Barbara County. Since the county faces the Pacific Ocean to the west and south and the fact that winter storms move through the county from these directions, there are no upwind land areas that provide precipitation measurements outside of areas potentially impacted by the seeding. NAWC has often used a target and control approach in an attempt to evaluate the effects of operational seeding programs. Precipitation data from upwind control areas are used to estimate natural target area precipitation. These estimates are then compared to the actual precipitation that falls in the target areas during the seeded period. Systematic differences may then be inferred to be the result of seeding. Due to the unique location of Santa Barbara County, there are no upwind control measurements that can be used to perform this type of analysis. This leaves the question most frequently asked about operational programs, "Did the seeding work and, if so, how much did it contribute?" unanswered. As a consequence of the above, **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 phases I and II seeding modes should optimize the seeding potential for the area. Our design is based upon this approach.** More details regarding the proposed design are provided in a categorical fashion in the following sections.

2.2 Personnel

NAWC has access to several experienced weather modification meteorologists. These meteorologists include: Don Griffith, Mark Solak, and David Yorty. All three have significant winter cloud seeding experience. Both Mr. Griffith and Mr. Solak have operated previous NAWC cloud seeding programs in Santa Barbara County. All three are certified by the WMA

as certified operators. Since only ground based seeding equipment will be used this winter, these operations will be conducted from NAWC's home office located in Sandy, Utah. Any of the above three meteorologists may serve as the project meteorologist who 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 Agency 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 and keep an accurate written log of the time that seeding begins or ends.
6)	Inform Flood Control and Water Agency Personnel, through prescribed communication channels and in a timely manner, of all significant events relative to the program.
7)	Maintain, and submit copies of written operations reports to the Water Agency in a timely manner. At a minimum, such reports shall be submitted subsequent to each seeding event (see Communications for final report requirements).
8)	Provide necessary radar and precipitation data to Flood Control and Water Agency staff as requested during periods of heavy rainfall or flooding.
9)	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 Water Agency prior project initiation.

Mr. Don Griffith, President of NAWC, will provide overall supervision of the program. 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 (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 also was involved with a portion of the Santa Barbara II research experiment and is quite familiar with this 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 is currently serving as Past President of the Weather Modification Association.

We also propose to have a local technician, Mr. Steve Eagleston, available to provide technical part-time support to NAWC on an as needed basis. Mr. Eagleston has provided these services to NAWC for the previous six programs and has been primarily responsible for the recharging and maintenance of the six ground based flare sites. He is therefore quite familiar with the procedures needed to access these sites and in some cases, like Mt. Lospe, when the local landlord does not wish that there to be access to this site following heavy rainfall periods. Mr. Eagleston now lives at the mouth of Refugio Canyon, which is an excellent central location, considering the locations of the five ground sites.

Appendix A contains resumes of key personnel.

2.3 Weather Radar

In years prior to the 2001-2002 winter season, NAWC used a dedicated project radar to direct operations for the Santa Barbara project to avoid reliance on Vandenberg AFB's radar to direct operations (as was done in the 1982-1988 period). Scheduling the use of the Vandenberg AFB radar was difficult at times due to other activities that utilized this facility. Another reason for dedicated project radar was the lack of usable weather radar information from the National Weather Service (NWS) in this area. This was a common shortcoming of

NWS radar products in the western United States prior to the mid 1990's. This situation changed dramatically when the NWS, through a modernization effort in the 1990's, installed a network of very sophisticated 5 cm weather radars throughout the U.S. These sites are known as NEXRAD (Next Generation Radar) installations. Each installation costs on the order of $1,000,000. Figure 2.2 provides the array of these sites across the U.S. There are approximately 160 NEXRAD sites now in service. Each NEXRAD radar provides 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

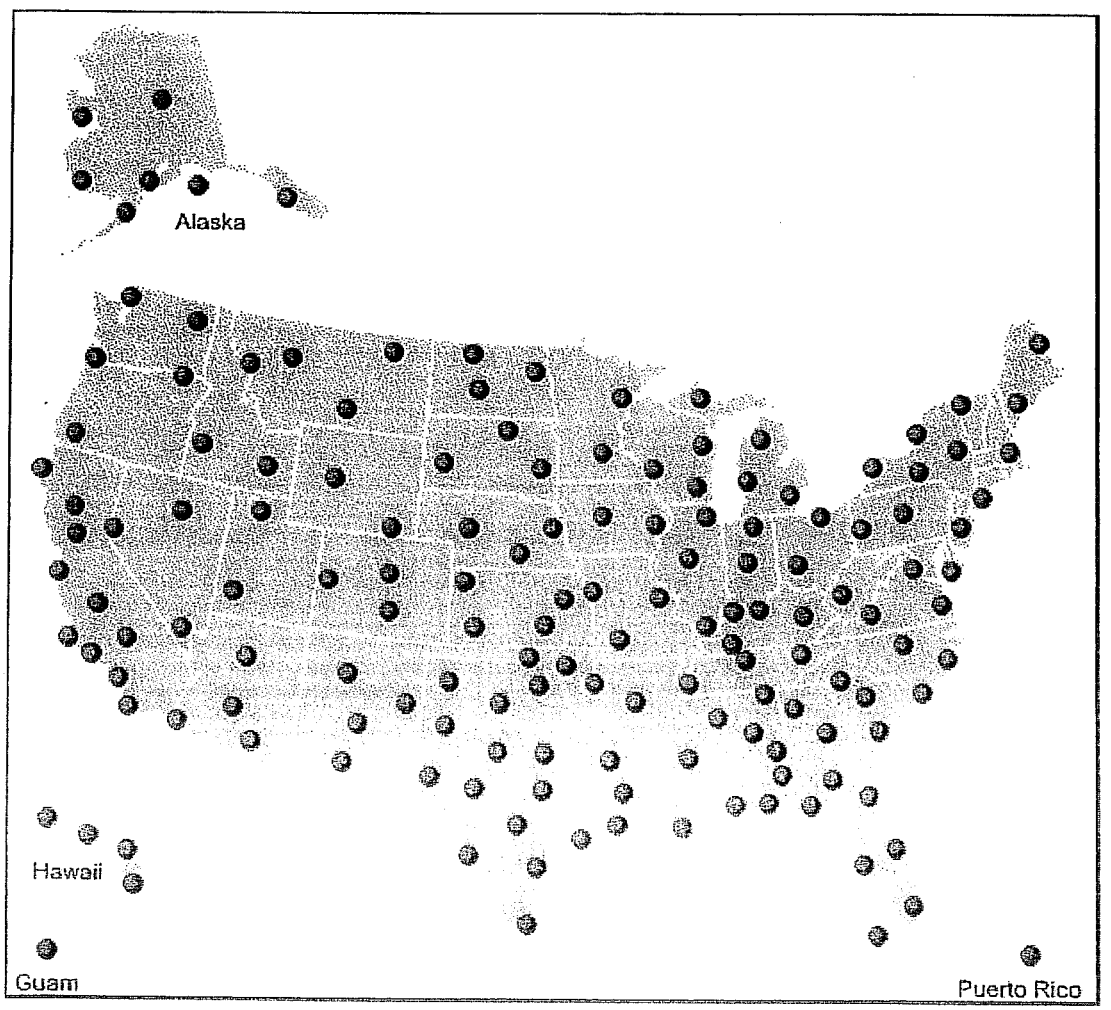

Figure 2.2 US NEXRAD Radar Locations

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. Because the NEXRAD network is important to NWS forecasting and public safety responsibilities, to many hydrometeorological applications and to aviation safety, these radars enjoy high priority support and resultant reliability. NAWC proposes to continue its use of relevant NEXRAD radar products, which are readily available in near real-time via the internet, for the conduct of the winter 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 six years to provide radar data to conduct wintertime cloud seeding programs. This web site provides a variety of useful products including: echo intensities (precipitation), echo tops, vertical wind speed and direction (the very useful VAD displays mentioned earlier) and composite echo displays that integrate radar returns from all of the 14 different elevation scans. 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 wintertime 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.

Figure 2.3 provides a Vandenberg Air Force Base NEXRAD radar image showing a convection band approaching Santa Barbara County. The different colors in this figure represent different radar reflectivity (dBz) levels, which correspond to different rainfall rates.

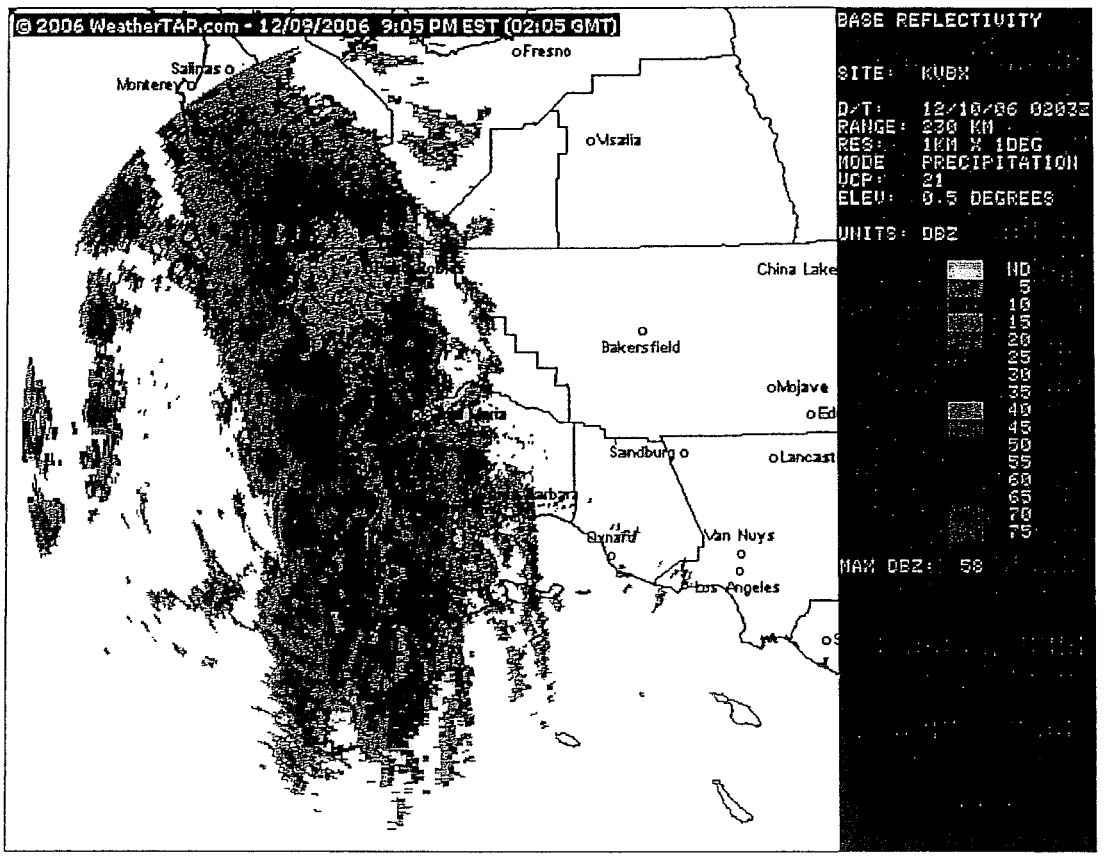

Figure 2.3 Radar image at 1805 PST on December 9, 2006

(This image shows a frontal convection band moving into Santa Barbara County)

2.4 Ground Seeding Sites

NAWC proposes to re-activate five of six previously installed remotely controlled high output pyrotechnic ground sites. These three sites are known as Mt. Lospe, Harris Grade, Sudden Peak, Gaviota and West Camino Cielo. Table 2-2 provides information on these sites The Agency has existing land use permits for these sites Locations of the sites in relation to the project target areas were provided in Figure 2.1.

Table 2-2 AHOGS Site Locations

Location	Latitude (N)	Longitude (W)	Elevation (ft.)
Mt. Lospe	34 ^{0} 53.8'	120 ^{0} 35.7'	1570
Sudden Peak	34 ^{0} 34.5'	120 ^{0} 30.5'	1540
Harris Grade	34 ^{0} 43.8'	120 ^{0} 24.8'	1204
Gaviota	34 ^{0} 31.9'	120 ^{0} 05.5'	2580
West Camino Cielo	34 ^{0} 30.3'	119 ^{0} 51.1'	2790

NAWC developed a completely new design for a remotely controlled ground based flare site for the 2001-02 winter program (AHOGS-Automated High Output Ground Seeding Systems). This new design was used for the 2001-2007 programs. **These sites can be accessed/programmed on a 24/7 basis through a cell phone modem that uses a special Campbell Scientific computer program customized for this program and is a password driven system.** Figures 2.4 and 2.5 provide photographs of an installation of one of these units at the Gaviota site. This design was modified for the 2005-2006 project 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 burning 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 at the beginning of a storm following an extended dry spell. Figure 2.6 provides a photo of the site at Harris Grade (installed for the 2006-2007 winter season) with the spark arrestors installed. Figure 2.5 shows the flares installed without the spark arrestors in place.

Figure 2.4 AHOGS Site at Gaviota

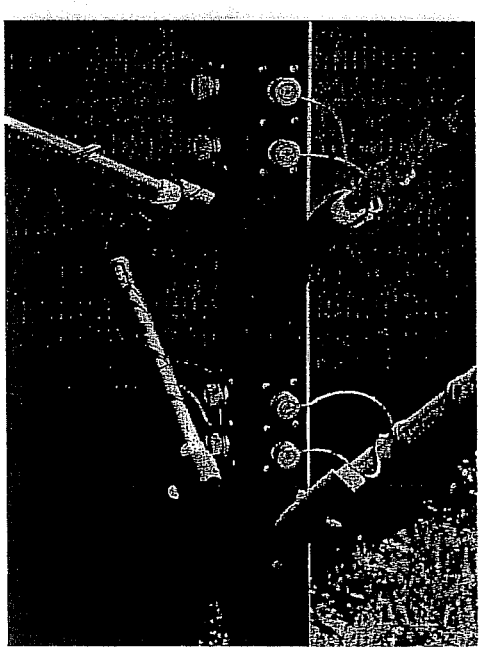

Figure 2.5 **Close-up of Flares at Gaviota**

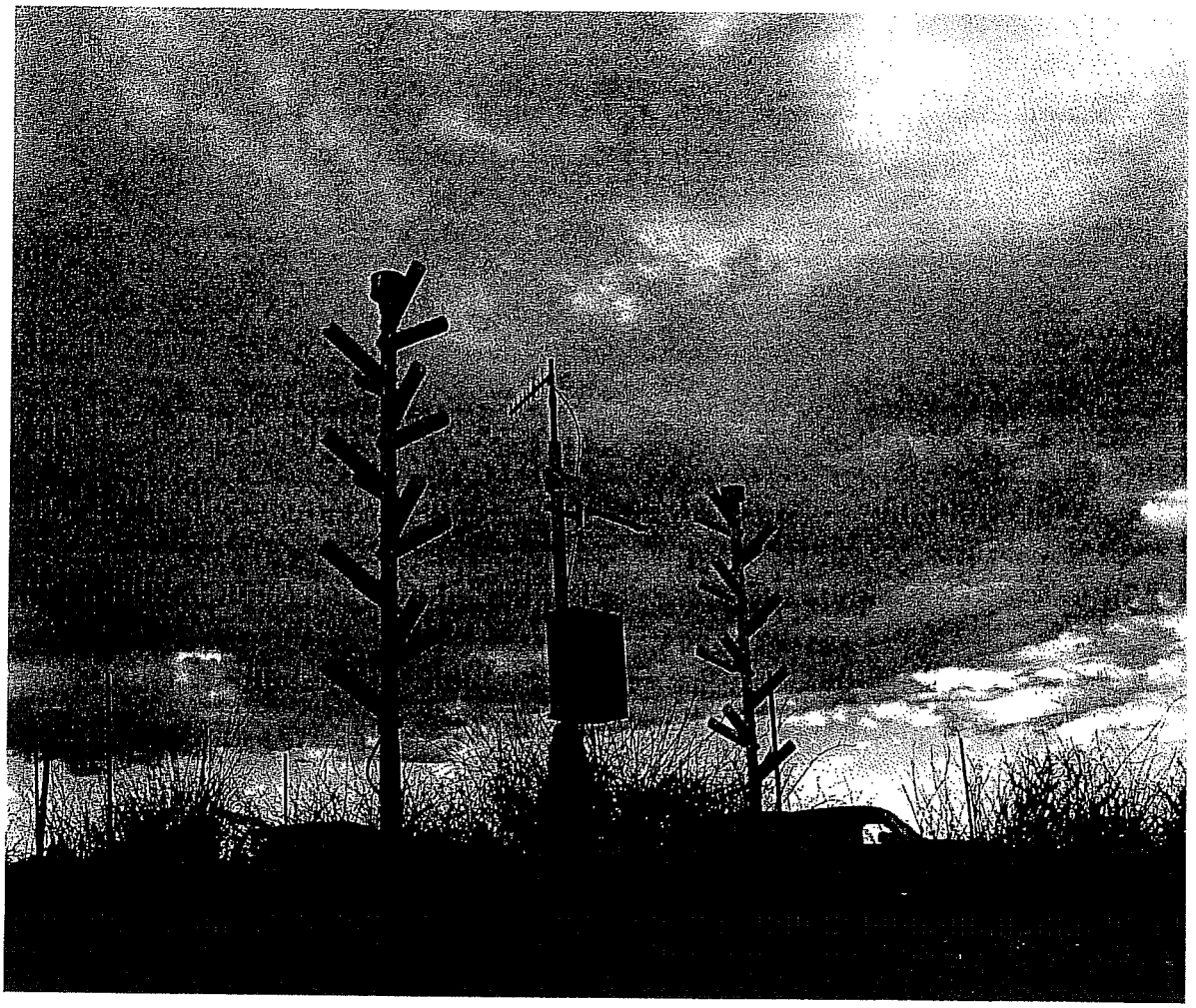

Figure 2.6 The Harris Grade AHOGS site

The basic concept of both the aircraft and ground seeding 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-10 or -12C). High output silver iodide generators were flown on the aircraft and 400-gram output ground flares were fired every 15 minutes during the passage of convective bands over the seeding sites. 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 are high output, each emitting 150 g of fast-acting silver iodide complexes during a burn time of approximately five minutes. Ice Crystal Engineering (ICE) of Fargo, North Dakota manufactures these flares. Some information concerning the flare manufacturer ICE is as follows: ICE was incorporated in 1999. ICE primarily manufactures three types of flares; an ejectable 20 gram silver iodide flare, a burn in place 150 gram silver iodide flare and a burn in place 1000 gram hygroscopic flare. ICE supplies flares to 20 different countries on 5 continents. Over 90% of ICE sales are to customers outside the United States.

The output of these ICE flares has been tested at the Colorado State University (CSU) Cloud Simulation Laboratory. Table 2-3 provides the results of this testing. These flares exhibited activity up to temperatures of -4C, which is considered very desirable since activity at these warm temperatures can result in the creation of more artificially generated ice crystals at lower altitudes in the clouds. A couple of advantages can result:

- Ground releases of seeding material can activate more quickly since the -4C level will be reached sooner than say -6 to -8C which may have been the case with earlier generation flares.
- Conversion of water droplets to ice crystals at the -4C level can release additional latent heat of fusion at lower altitudes within the seeded clouds, which should

enhance the dynamic response of the clouds to seeding (refer to section 2.0 for a discussion of this dynamic response).

A second important outcome of the testing of these flares at the Cloud Simulation Laboratory was that, when the seeding material was introduced into the cloud chamber, 63% of the ice crystal nucleation was produced within the first minute of introduction of the material into the chamber (see Figure 2.7). It was therefore concluded that these flares were operating by the condensation-freezing mechanism. This is also considered to be an advantage over the earlier generation flares that no doubt operated by the contact nucleation process, which is much slower. This should mean that nearly all of the seeding material that reaches temperatures of -4C within target clouds should be utilized in producing ice crystals. Use of the earlier LW-83 flares, due to the slowness of the process, could mean that some of the seeding material was not activated in time to produce a seeding effect in the intended target areas. In fact, this characteristic may partially explain the extended downwind effects shown in Southwest Kern County during the conduct of Santa Barbara II, Phase I.

Table 2-3 CSU Cloud Chamber Test Results for Ice Crystal Engineering Flare

Pyro type	Temp (°C)	LWC (g m^{-3})	Raw Yield (g^{-1} Agl)	Corr. Yield (g^{-1} Agl)	Raw Yield (g^{-1} pyro)	Corr. Yield (g^{-1} pyro)	Yield (per pyro)
ICE	-3.8	1.5	3.72×10^{11}	3.87×10^{11}	4.01×10^{10}	4.18×10^{10}	6.27×10^{12}
	-4.0	1.5	9.42×10^{11}	9.63×10^{11}	1.02×10^{11}	1.04×10^{11}	1.56×10^{13}
	-4.2	1.5	1.66×10^{12}	1.70×10^{12}	1.80×10^{11}	1.84×10^{11}	2.76×10^{13}
	-4.3	1.5	2.15×10^{12}	2.21×10^{12}	2.32×10^{11}	2.39×10^{11}	3.53×10^{13}
	-6.1	1.5	6.01×10^{13}	6.13×10^{13}	6.49×10^{12}	6.62×10^{12}	9.93×10^{14}
	-6.3	1.5	5.44×10^{13}	5.56×10^{13}	5.87×10^{12}	6.00×10^{12}	9.00×10^{14}
	-6.4	1.5	6.22×10^{13}	6.34×10^{13}	6.72×10^{12}	6.85×10^{12}	1.03×10^{15}
	-10.5	1.5	2.81×10^{14}	2.85×10^{14}	3.03×10^{13}	3.07×10^{13}	4.61×10^{15}
	-10.5	1.5	2.34×10^{14}	2.37×10^{14}	2.87×10^{13}	2.91×10^{13}	4.37×10^{15}
	-4.2	0.5	1.41×10^{12}	1.45×10^{12}	1.53×10^{11}	1.57×10^{11}	2.36×10^{13}
	-6.0	0.5	7.42×10^{13}	7.73×10^{13}	8.01×10^{12}	8.34×10^{12}	1.25×10^{15}
	-10.5	0.5	2.38×10^{14}	2.41×10^{14}	2.91×10^{13}	2.96×10^{13}	4.44×10^{15}

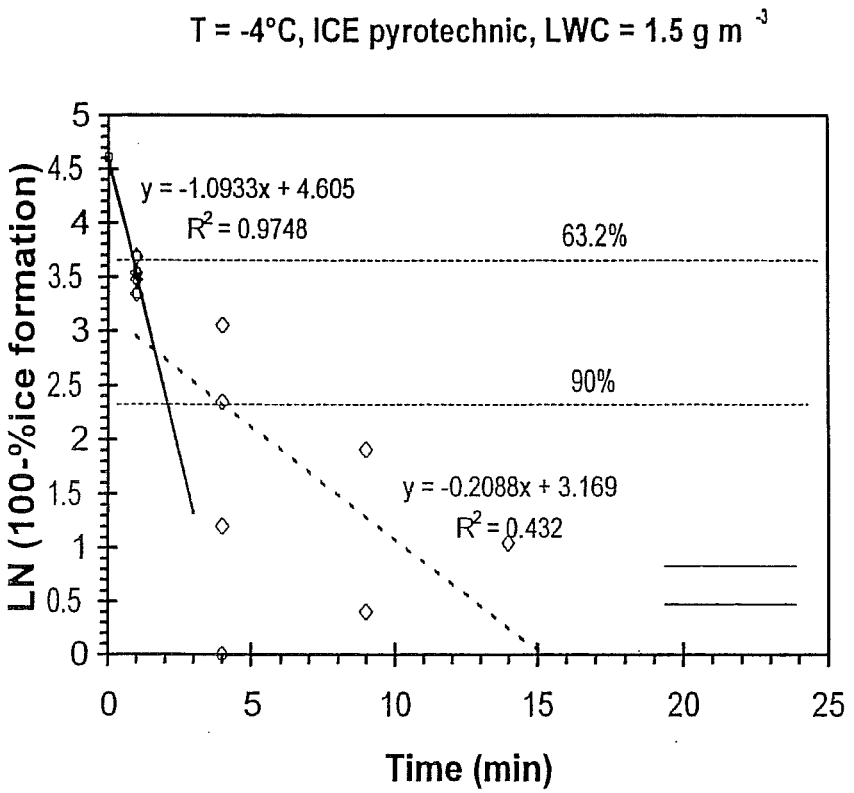

Figure 2.7 Ice Crystal Formation Kinetics for ICE Pyrotechnic Aerosol in Four Experiments Performed at the Higher LWC Condition at Approximately -4 C. The slope of the linear regression equations gives the rate constants for the initial fast rate and later slower rates of ice formation. The slower process was not observed at lower temperatures. The horizontal dashed lines indicate ice formation percentages

The newer ICE flare can be compared to the earlier LW 83 flare based upon tests conducted at the CSU Cloud Simulation Laboratory. Figure 2.8 provides a visual comparison of the nucleating characteristics of the ICE and the LW 83 flares. The figure demonstrates that the ICE flare is more effective in the warmer temperature regions of -4C to -10C. This temperature region is of prime importance to seeding-induced increases in precipitation in Santa Barbara County. Freezing supercooled water droplets in the upper (colder) portions of the bands may not necessarily contribute substantially to the production of increased rainfall at the ground.

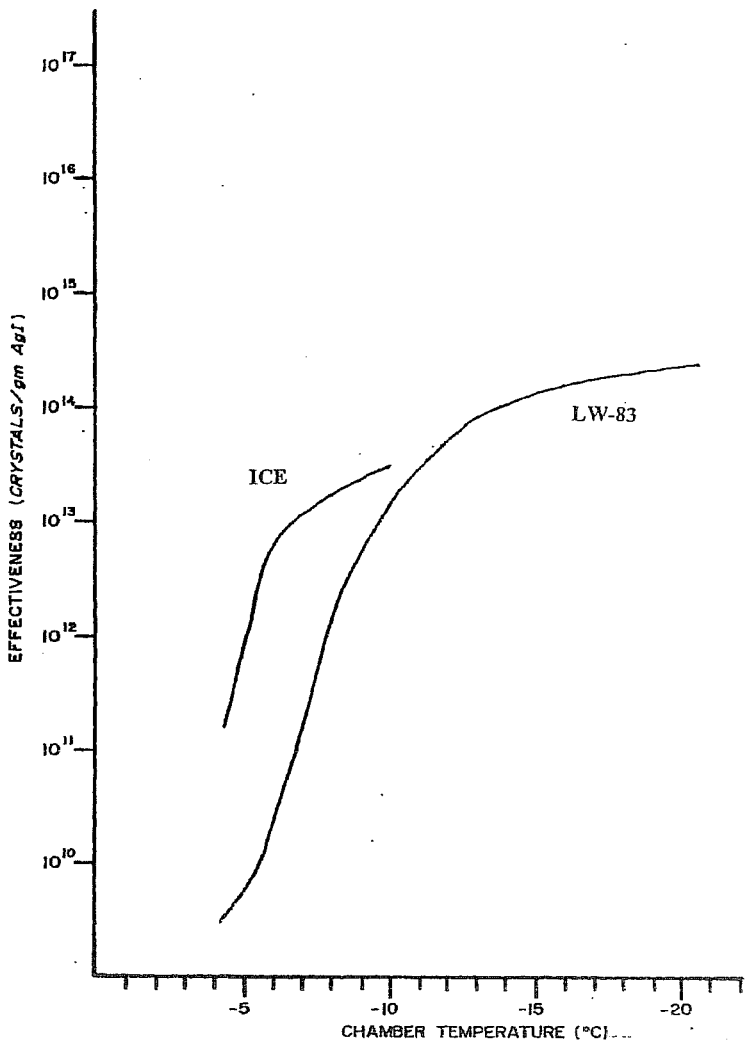

Figure 2.8 Comparison of Effectiveness of the LW-83 verses the ICE Burn-in-Place Flare, CSU Cloud Chamber results.

2.5 Summary of Proposed Cloud Seeding Design

For the conduct of the 2009-2010 winter program, we propose that as the convective bands move onshore, flares from selected pyrotechnic ground sites (selected with consideration given to the targeting of the seeding effects within the intended target areas) would be fired at approximately 15-minute intervals as the band passes over each site. Sites to be used would be determined on a case-by-case basis and would be

concerned with the likely targeting of the effects of seeding in the intended target areas. This concept of targeting will be discussed in a later section. Thus, the very positive, statistically significant results of Santa Barbara II, Phase I will be replicated.

2.6 Computer Model

One of the major questions in conducting a weather modification program is where the seeding should be conducted in order to achieve proper targeting of seeding effects within the intended target area. Past research programs have demonstrated that this has not always been achieved with consistency.

The basic problem is that the wind flow can be highly variable within storms and from storm to storm. The winds can be light or strong and they can be blowing from different directions. These conditions can also vary from one level to another in the atmosphere. Research in the Sierra Nevada, the Sierra Cooperative Pilot Project (SCPP), and elsewhere has demonstrated that mountain barriers can exert a major effect on lower level wind flow (both speed and directional effects). Temperature profiles can likewise vary considerably from storm to storm. Given this large degree of naturally variability, the task of the weather modification operator is to know where seeding should be conducted in a given storm event at a given time. Silver iodide does not become an active ice nucleus at temperatures warmer than -4C. An ice crystal created at -5C will grow a different rate than one created at -15C. The ice crystal at -5C will also be closer to the ground and subject to different winds than the one at -15C and will consequently impact the ground at a different point. In fact, the ice crystal created at -15C may never reach the ground, instead being blown over the barrier and evaporating in subsidence flow on the lee side of the barrier. Given these complexities it is readily apparent that flying one or two fixed flight tracks in all storm situations is an overly simplistic approach to solving a complex problem. Additionally, running all ground-based seeding sites for a storm or portion of a storm is often inappropriate.

Mr. Robert Elliott of NAWC originally developed the GUIDE model while

working on a Bureau of Reclamation research program in Central California, the Sierra Cooperative Pilot Project (SCPP). This model predicts the area of fallout of seeded precipitation from either ground-based or aerial seeding sources (Rauber et al., 1988). It should be emphasized that, to our knowledge, this is still the only real-time decision making model that has undergone some actual field verification as indicated in the Rauber article and in a later program conducted in the Feather River Basin of California (Reynolds, 1994). We feel it is important to use a model that can be run in a few minutes without requiring a large mainframe computer, as do some of the more sophisticated three-dimensional models. We propose to continue the use of the GUIDE model in the conduct of the 2009-2010 winter program.

The GUIDE model can be used real-time in assisting (it definitely is not the only consideration) in the selection of aircraft flight locations and deciding which ground flare sites should be utilized. We used this GUIDE model for on the operational Santa Barbara programs conducted by NAWC beginning with the 2001-2002-winter season. The GUIDE model runs in less than two minutes on an on-site computer, which contains the model plus topographical information for the county. The project meteorologist inputs relevant atmospheric information and different flight tracks and/or ground generator locations. The model then computes the formation and fallout of the seeded precipitation. Figure 2.9 provides an example of a GUIDE prediction of precipitation fallout during a seeded storm, from a seeding release at the Gaviota AHOGS site on December 31, 2006. The centerline of the predicted seeding plume is shown in green and the centerline of the primary precipitation fallout area in red. The yellow rectangular boxes are areas of predicted fallout of seeded precipitation reaching the ground. Each box represents a 5-minute time step from the GUIDE calculations.

The problem with all computer models (including GUIDE) that can be run in real-time is that the calculation of the effects of seeding will only include microphysical effects. The dynamic effects of seeding are not well understood, let alone included in models. The analyses of the Santa Barbara II research program gave the strong indication that both microphysical and dynamic effects occurred with both the ground-based and

airborne seeding. The manifestation of this dynamic effect was strongly positive results to the right of any effects that might be expected based solely upon windflow and microphysical considerations. It is for these reasons that we accept the use of a model to provide some *general* guidance to the seeding decisions. Our approach of attempting to duplicate the seeding procedures used in the Santa Barbara II removed some of the uncertainty of where the effects of seeding were likely to occur.

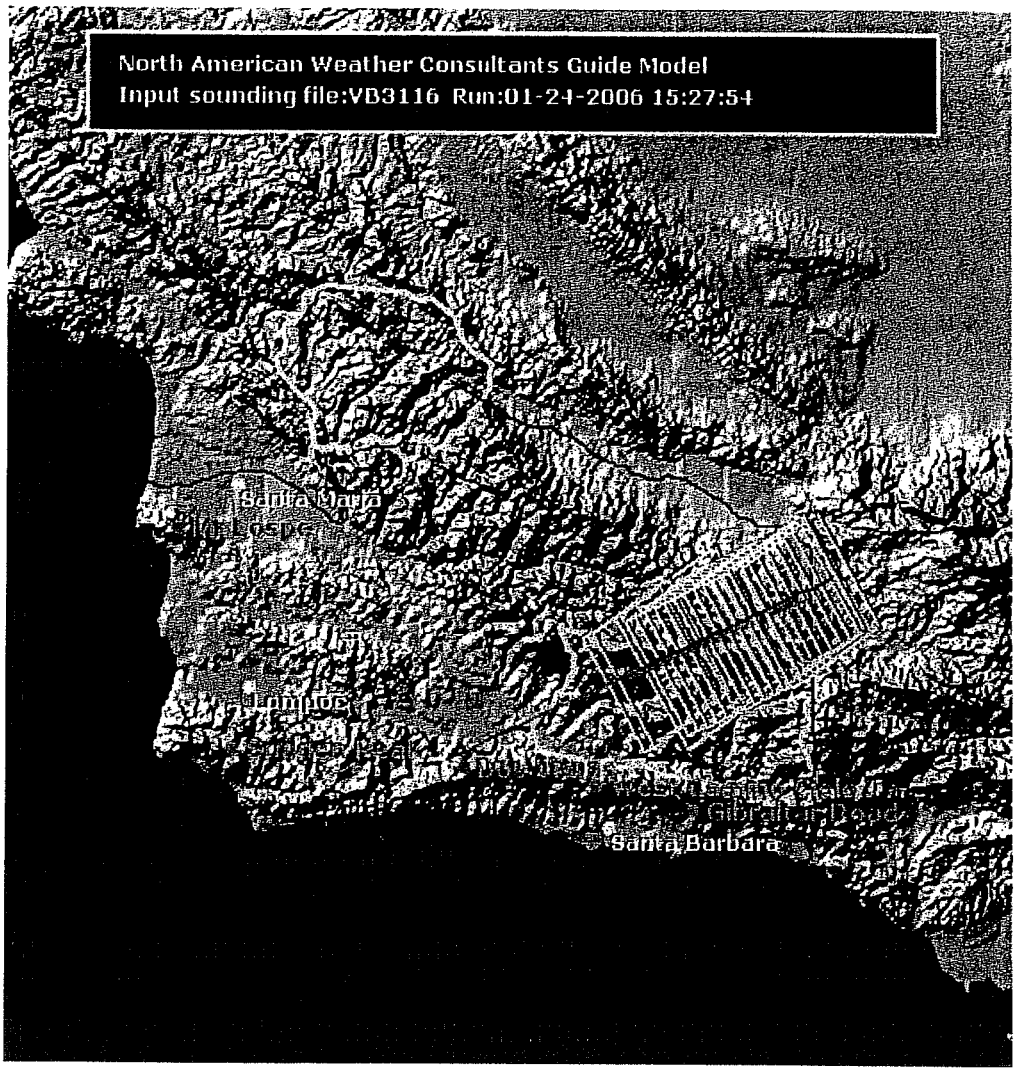

Figure 2.9 Example of GUIDE Model prediction of precipitation fallout from the Gaviota AHOGS site on December 31, 2005.
(The yellow rectangular boxes are predicted fallout of seeded precipitation reaching the ground)

2.7 Operations Plan

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.

2.8 Communications

NAWC personnel shall keep the Agency informed of the program status at all times including information on any equipment failures and proposed personnel changes. NAWC's designated contact for operational information will be the project meteorologist. Personnel changes will not be made (except in emergency situations) without prior notification of designated Agency personnel. NAWC's project meteorologist shall notify Agency personnel at the initiation and conclusion of seeding activities and provide the Agency with records of seeding locations and duration at the conclusion of each storm event.

2.9 Operational Period

As requested by the Agency, a five-month project is proposed to be conducted during the 2009-2010 winter season. This five-month period would be November 15th through April 15th, with possible extension through April 30th.

2.10 Suspension Criteria

The Agency is revising the previously used suspension criteria for use during the 2009-2010 winter season. These revisions were needed to avoid any impacts of seeding within the Gap, Tea and Jesusita fire burn areas.

2.11 Installation, Operations, Maintenance and Removal of Equipment

NAWC shall be responsible for the installation, operation, maintenance and removal of all equipment necessary to perform this work for the Agency. NAWC personnel assisted by our part time technician will perform the installation, maintenance and removal of the equipment.

2.12 Transportation, Board and Lodging

NAWC shall provide for all transportation, board and lodging requirements of NAWC personnel or subcontractors utilized by NAWC to perform this work. Transportation and storage of equipment shall also be provided by NAWC, as well as for NAWC vehicles needed on the project.

2.13 Reporting

NAWC will perform the necessary reporting functions at the State and Federal levels. This includes initial, interim and final reports on the program that are required to be submitted to the National Oceanic and Atmospheric Administration. NAWC assumes that, as in past seasons, the Agency will publish a Notice of intent in the local newspaper.

NAWC will prepare a final operations report by June 15, 2010. This report shall include a description of the equipment and techniques used, a log of all operations conducted, the total amount of seeding solution dispensed, a summary of overall weather conditions and storm events and an assessment of program results. Ten copies of this report will be provided to the Agency following acceptance of a draft report submitted to the Agency.

2.14 Scheduling Considerations

We request at least three five weeks to bring the program to an operational status following receipt of an approved contract.

3. 0 PROPOSAL REQUIREMENTS

The RFP requests a list of six items to be provided in response to the RFP. These items are discussed below. Most of these items have been discussed in previous sections of this proposal, but responses are summarized in the following sub-sections.

3.1 List of Equipment

- Weather radar- NAWC proposes the use of data from the National Weather Services (NWS) NEXRAD system. These sophisticated radars are owned, operated, calibrated and maintained by the NWS.
- Five remotely controlled silver iodide ground based flare racks owned by NAWC. NAWC had these units custom manufactured in Salt Lake City. All five currently located at the selected sites in an inactive status.
- NAWC will provide project vehicles as needed.
- NAWC owns and maintains three computers at its headquarters in Sandy, Utah that can be used to monitor the weather, run the GUIDE model and to fire the ground based flares in Santa Barbara County using a special Campbell Scientific software program that has been customized for the flare operations. A T-1 line provides high-speed internet access.
- NAWC's three meteorologists located in Utah also have computers at their homes which can be used to monitor the weather, run the GUIDE model and operate the Santa Barbara flare sites.

3.2 Proposed Individuals or Firms Serving as Subcontractors

NAWC will not employ any subcontracors in the performance of this work.

3.3 Primary Personnel

Mr. Don Griffith, President of NAWC, will serve as overall program supervisor. He is an American Meteorological Society Certified Consulting Meteorologist (CCM) and holds the WMA Operator and Manager certifications. He has 42 years of weather modification experience, including several years of research and operations experience on this specific project. His resume is included in Appendix A.

Two additional NAWC personnel with direct experience on this project will be available as necessary for operations and support. They are Mark Solak and David Yorty. Mr. Solak has more than thirty years experience in weather modification research and operations, holds the WMA Operator and Manager certifications, and is an AMS member. He has worked directly on this project in past seasons. Mr. Yorty, an AMS member and holder of the WMA Operator certification, also has worked on the project. NAWC proposes to use Mr. Steven Eagleston as a NAWC part-time technician. Resumes for these individuals are also included in Appendix A.

3.4 NAWC's Previous Work Experience

NAWC is the longest-standing weather modification company in the world, with continuous active corporate experience in the discipline since it's founding in 1950. **NAWC has more weather modification experience in coastal southern California than any other firm. Most importantly, NAWC has more direct experience on the Santa Barbara project than any other firm. This corporate experience dates back to the 1950's.**

Appendix B provides listings of previous NAWC experience in conducting operational and weather modification programs. Specific programs of relevance to the conduct of this program are provided in Table 3-1. References, contact names and their telephone numbers are included in that table. A summary paper on the Santa Barbara project, with co-authors from the Agency, was published in the peer-reviewed section of the 2005 edition of the Weather Modification's Association *Journal of Weather Modification.*

3.5 A Copy of a Final Report

The Agency is in possession of a number of prior operational final reports prepared by NAWC documenting our work on the Santa Barbara program. NAWC Report WM 09-1 (Griffith, D.A., D. Yorty and M.E. Solak, 2009) is the most recent final report submitted to the Agency, in June 2009, describing the 2008-2009 weather modification operations conducted in Santa Barbara County for the Agency.

Table 3-1
Some Representative NAWC Weather Modification Programs

- Santa Barbara County operational winter seeding program, 2001-2007, 2008-2009 winter seasons. Airborne seeding and ground seeding using three to six high output, ground based flare sites and a cloud seeding aircraft. NEXRAD weather radar output used in place of project specific radar.

- Santa Barbara County operational winter seeding program, most winters 1978-1997. Seeding conducted using both ground based and aerial seeding. Weather radar support was provided by the Air Force from Vandenberg Air Force base until 1988. NAWC installed independent weather radar for program operations beginning in 1989.

- Upper Kings River winter seeding program for the Kings River Conservation District, ground based and aircraft seeding with weather radar control, 1988-1993, 2007-2009.

- Southern California Edison winter and summer seeding program for the Upper San Joaquin River Basin in the southern Sierra Nevada 1951-1987; 1990-1992. Ground based and airborne seeding.

- Santa Catalina Island, operational winter seeding program for the winters of 1977-78 and 1982-83. Airborne seeding utilizing NAWC provided weather radar.

- Los Angeles County Flood Control District winter operational seeding program in the San Gabriel Mountains. Ground based seeding program conducted each winter from 1961-1975. Program began again in spring of 1991 and continued in 1992, 1993, and 1997 to 2002, then suspended due to fire burn areas. NAWC has provided weather forecast support to this District since 2002 (contact, Bill Saunders, 626-458-6186). Program being re-activated for the 2009-2010 winter season after recovery from a fire in one of the target area watersheds.

- Sacramento Municipal Utility District winter weather forecast support and recommendations of silver iodide generators to be used during storm periods for their internally operated cloud seeding program; three year contract which began in the spring of 2004. (contact, Dudley McFadden, 916-732-5953).

- California Department of Water Resources, Northern California Drought relief program conducted during the 1988-89 winter season. NAWC conducted airborne seeding utilizing two seeding aircraft and supported with an on-site weather radar.

- Southern and Central Utah, State of Utah Division of Water Resources, operational winter cloud seeding program 1974-1983 and 1984-present. Ground generators used supplemented with aircraft seeding (up to four aircraft) in some of the winters. (contact, David Cole, 801-538-7269).

- Northern Utah, State of Utah Division of Water Resources, operational winter cloud seeding program 1988-present. Ground generator program (contact, David Cole, 801-538-7269).
- High Uinta Mountains, Utah, State of Utah Division of Water Resources, operational winter cloud seeding program 1977, 1989, 2003-present (contact, David Cole, 801-538-7269).

- El Cajon Dam drainage area, Honduras, 1993-95, and 1997. Airborne and ground based seeding program supported with an on-site weather radar

3.6 Insurance

The RFP asks for the provision of several types of insurance. One category includes General, Automobile and Aircraft liability insurance. The Agency, District and participating entities will be named additional insureds on these policies.

The RFP requests a special type of insurance to cover the consequential effects of weather modification. NAWC has a current policy that provides this very difficult to obtain special coverage.

3.7 Bonding

The RFP mentions performance bonding and/or liquidated damages as a requirement in the terms of the contract. NAWC can provide bonding if required. We also understand the liquidated damages that will be assessed for loss of use of various types of project equipment. We will make every effort possible to insure there are not missed seeding opportunities on this program.

3.8 Costs

The costs to conduct this project were provided to the Agency under separate cover.

Submitted by:

Don A. Griffith
President
North American Weather Consultants, Inc.

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APPENDIX A
RESUMES

DON A. GRIFFITH, CCM

EDUCATION

B.S., Meteorology, University of Utah, Salt Lake City, Utah, 1967
Mathematics, Westmont College, Santa Barbara, California, 1967
B.S., Industrial Construction and Management, Colorado State University, 1963

TECHNICAL SPECIALTIES

Mr. Griffith has 41 years of experience in meteorology. Some of Mr. Griffith's technical specialties include:

- Research in Weather Modification
- Design, Operation, and Evaluation of Operational Weather Modification Programs
- Synoptic Weather Forecasting
- Climatological Studies
- Design, Operation, and Evaluation of Atmospheric Tracer Programs
- Applied Meteorological Applications
- Probable Maximum Precipitation Site-Specific Studies
- Forensic Meteorology

REPRESENTATIVE EXPERIENCE

Mr. Griffith is currently serving as President of North American Weather Consultants (NAWC), located in Salt Lake City, Utah. NAWC provides meteorological consulting services in air quality, applied meteorology, climatological studies, forensic meteorology, weather forecasting, probable maximum precipitation studies, and weather modification. He is responsible for the overall management and supervision of NAWC and the technical direction and supervision of NAWC's weather modification activities. Mr. Griffith has directed these weather modification activities since 1977. Activities encompass participation in field research programs in weather modification and the design, conduct, and evaluation of operational cloud seeding programs. Programs are conducted in the western United States and a number of foreign countries.

Mr. Griffith has authored or co-authored 32 journal articles and over 150 technical reports. He has presented 53 technical presentations at a variety of professional conferences.

PROFESSIONAL AFFILIATIONS

American Meteorological Society, Professional Member
Past Member, Committee on Planned and Inadvertent Weather Modification
Certified Consulting Meteorologist, Applied Meteorology
American Society of Civil Engineers, Affiliate Member
Vice Chairman, Standards Committee on Atmospheric Water Management
Past Chairman, Weather Modification Committee
Past Chairman, Weather and Climate Change Committee
Past Member, Weather and Climate Change Committee
Past Member, Research and Education Committee

Weather Modification Association, Certified Manager and Operator
Past President, 1976-77
Member, Legislative Affairs Committee
Past Member, Standard and Ethics Committee
Past Member, Publications Committee
Past Chairman, Certification Committee
Chairman, Awards Committee
Past President, 2009-10

WORK HISTORY

President
North American Weather Consultants
Utah
1999 - Present

Senior Vice President/General Manager
TRC North American Weather Consultants
Utah
1994 - 1999

Senior Vice President/Research Meteorologist
North American Weather Consultants/TRC Environmental Corporation
Utah 1992 - 1994

Senior Vice President/Research Meteorologist
North American Weather Consultants
Utah and California
1973 - 1992

Meteorologist/Assistant Director, Atmospheric Water Resources Research
Fresno State College Foundation, California
1968 - 1973

Meteorologist
Booz-Allen Applied Research, Inc., California
1967 - 1968

Weather Officer
United States Air Force, California and Vietnam
1964 - 1967

AWARDS

Air Force Commendation Medal, 1967
Environmental & Water Resources Institute, Standards Development C/CE-4 Award
Listed in Strathmore's Who's Who, 2002
Thunderbird Award, Weather Modification Association, 1993

MARK E. SOLAK

EDUCATION

B.S., Geography, Eastern Michigan University, Ypsilanti, 1971

TECHNICAL SPECIALTIES

Mr. Solak has nearly 35 years experience encompassing:

Design, Management, Conduct and Evaluation of Weather Modification Operations and Meteorological Research Field Programs

Radar Meteorology
Research Aviation Operations and Data Analysis
Design, Management and Conduct of Multi-Aircraft Air Quality Field Studies
Probable Maximum Precipitation (PMP) Studies
Technical Writing/Editing
Project Management (all aspects)
Marketing of Technical Services
Weather Forecasting

REPRESENTATIVE EXPERIENCE

Mr. Solak, Vice President of North American Weather Consultants, and Project Scientist/Senior Project Manager since 1989, has extensive experience in conducting and managing weather modification operations and research programs, domestic and international, plus management of airborne ambient air quality field programs. He has been involved in site-specific Probable Maximum Precipitation (PMP) studies for several western states watersheds. Currently based in Salt Lake City, Utah, he managed North American Weather Consultants' branch office in California from 1989-1993.

Weather Modification

Mr. Solak has nearly 35 years of experience in weather modification operations and research. He spent several years at the National Center for Atmospheric Research and has been involved in numerous operational and research field programs in the U.S. and overseas. Holding Weather Modification Association certifications as a program Operator and Manager, he is well qualified to design, manage, conduct, evaluate and provide consulting services on a wide variety of weather modification applications.*hunderstorm Research, Field Operations and Data Management, National Center for Atmospheric Research (NCAR), Boulder, Colorado.* For seven years (1972-1979), initially as an Assistant Data Manager and then as a Support Scientist at NCAR,

was deeply involved with the radar and aviation aspects of NCAR's large field research programs, especially the National Hail Research Experiment (NHRE). Directed cloud seeding and research aircraft flight operations focused on high plains thunderstorms and analyzed weather radar and aircraft data as part of an evaluation of randomized cloud seeding trials. Following completion of NHRE, continued on the staff of the Convective Storms Division.

Winter Storm Field Measurements and Data Analysis, U.S. Bureau of Reclamation, Northern California. Was field project supervisor from 1979 through 1984 on a contract with the U.S. Department of the Interior for meteorological and precipitation data collection and analysis. The work was part of a weather modification research program conducted in the central Sierra Nevada Range of California. Large networks of instrument sites were established and operated, followed by analysis and publication of the data to characterize seeded and natural storms.

Hail Suppression Operations and Research, Greek Government Agency. Managed/conducted a large scale multi-aircraft hail suppression project for the Greek government in 1985. Three separate regions were involved in the cloud seeding operations; one included a randomized statistical experiment to evaluate the effects of the cloud seeding efforts. Data from a network of hailpads were analyzed to estimate cloud seeding effectiveness in reducing damaging hail.

Winter Storm Research, State/Federal Cooperative Research Program, Utah. Conducted studies of low altitude supercooled liquid water (SLW) in winter storms using tower-mounted ice detectors and supporting meteorological sensors during the winter of 1986-87. Analyzed and published the observational data, demonstrating the utility of the specialized systems in identifying seeding opportunities and in providing documentation of seasonal low altitude SLW occurrence and magnitude. Compared time-resolved SLW measurements with precipitation rate observations to identify periods of apparent low natural precipitation efficiency, i.e., apparent cloud seeding opportunity.

Research and Operations on Deep Summer Convection, Water District, San Angelo, Texas. Directed radar-coordinated airborne cloud seeding operations on deep convective clouds in Texas. In 1989, operated radar to support and coordinate carefully controlled, randomized airborne cloud seeding trials to obtain experimental units toward evaluation of the effectiveness of the dynamic seeding method.

Weather Modification Research, Operations and Technology Transfer, Taiwan, Republic of China. Managed/conducted cloud seeding and related research project operations in Taiwan in 1992, 1993 and 1994 for Taiwan's Central Weather Bureau (CWB). Ground-based and airborne operational cloud seeding and SF_6 plume tracking studies, plus airborne meteorological measurements by an instrumented aircraft were coupled with climatology efforts. Toward technology transfer, gave presentations to CWB staff on cloud seeding methodologies and provided hands-on training on various aspects of applying the technology in Taiwan.

Weather Modification Operations, Several Water Districts/Agencies, Municipalities. From 1979 through the present, has designed, managed, conducted and evaluated numerous projects, primarily for precipitation increase, in several States and overseas. Many of the projects involved target-control statistical evaluations.

Weather Modification Research and Operations, Large Mining Operation, Northern Utah. Conducted a climatological study of cold fog occurrences which hamper mine operations. Based on the climatological study, designed and conducted a field demonstration project for fog dispersal in the mine area using cloud seeding technologies.

Weather Modification Operation, Honduras, Central American. Directed airborne cloud seeding operation for rainfall increase from deep convective clouds in Honduras in 1997.

Weather Modification Fesibility Studies. Conducted a number of feasibility studies for prospective cloud seeding projects.

SPECIALIZED TRAINING

Hydrologic measurement principles and data analysis for meteorology, Atmospherics, Inc., Fresno, CA, 1986
BASIC Programming and Computer System Ops, TEKTRONIX, Santa Clara, CA, 1979
Short Course on Cloud Physics, University of Colorado, 1977
Air Traffic Control Phraseology, FAA, Longmont, CO, 1973
Radar Meteorology, Technology Service Corporation, Silver Spring, MD, 1975
FORTRAN IV, beginning level, NCAR, Boulder, CO, 1974

PROFESSIONAL AFFILIATIONS

Member - American Meteorological Society

Weather Modification Association Member since 1975
President 1993-1994
Certified Project Manager (#10), since 1986
Certified Project Operator (#50), since 1986

Member - Association of State Dam Safety Officials

Member - American Water Resources Association

WORK HISTORY

Vice President
North American Weather Consultants
Salt Lake City, Utah
1999 - Present

Physical Scientist/Project Manager/ Radar Meteorologist
TRC North American Weather Consultants
Fresno, California and Salt Lake City, Utah
1989 - 1999

Field Program Supervisor/Physical Scientist/Radar Meteorologist
Atmospherics, Inc.

Auburn and Fresno, California
1979 - 1989

Support Scientist/Assistant Data Manager
National Center for Atmospheric Research
Boulder, Colorado
1972 - 1979

PUBLICATIONS AND PRESENTATIONS

Mr. Solak has authored or co-authored more than 100 publications, including reviewed Journal papers, technical reports, conference papers and project reports. He has presented many papers at technical conferences.

AWARDS

Weather Modification Association – Thunderbird Award, 2004

David Yorty

EDUCATION

M.S., Meteorology, University of Utah, 2001
B.S., Meteorology, University of Utah, 1999

FORECASTING AND WEATHER MODIFICATION EXPERIENCE AND SKILL

- Hurricane forecasting, 2005-2006
- Daily forecasts for a water district in California, Oct-May season, 2004-2006
- Forecasting for weather modification programs in Idaho, Utah, and Colorado, 2001-2006
- Participated in University of Utah local weather forecast contest during four academic years; ranked first place for two of those years
- Produced campus weather forecasts for University of Utah
- Official storm spotter for National Weather Service
- Good understanding of synoptic and mesoscale meteorology
- General knowledge of meteorological processes in a variety of latitudes and climate zones

REPRESENTATIVE EXPERIENCE

David Yorty is currently a Staff Meteorologist for North American Weather Consultants (NAWC) in Salt Lake City, Utah. NAWC provides meteorological consulting services in applied meteorology, weather forecasting, probable maximum precipitation studies, and weather modification. David conducts real-time weather monitoring and forecasting for weather modification activities, and directs cloud seeding operations. He has experience with this type of monitoring and forecasting over the past five years, for cloud seeding programs in Utah, Idaho, California, and Colorado. He also tracks the usage and servicing of a large array of ground-based Cloud Nucleating Generators (CNGs), and participates in data collection and analysis related to the effects of cloud seeding conducted by NAWC.

PROFESSIONAL AFFILIATIONS

American Meteorological Society
Weather Modification Association

RELATED WORK HISTORY

Staff Meteorologist
North American Weather Consultants, Inc.
Sandy, Utah
2001-present

Research Assistant, Meteorology
University of Utah
Salt Lake City, UT
2000-2001

Teaching Assistant, Meteorology
University of Utah
Salt Lake City, UT
1999-2000

Volunteer work
National Weather Service
Boise, Idaho
1998 (summer)

PUBLICATIONS

Extreme Convection Observed by the Tropical Rainfall Measuring Mission (Master's Thesis, University of Utah, 2001)

Griffith, D. A., M. E. Solak and D. P. Yorty, 2005: Is Air Pollution Impacting Winter Orographic Precipitation in Utah?, J. of Wea. Modif., Vol. 37, pp. 14-20.

Solak, M.E., D. P. Yorty and D. A. Griffith, 2005: Observation of Rime Icing in the Wasatch Mountains of Utah: Implications for Winter Season Cloud Seeding, J. of Wea. Modif., Vol. 37, pp. 28-34.

Solak, M.E., D. P. Yorty and D.A. Griffith, 2003: Estimations of Downwind Cloud Seeding Effects in Utah, J. of Wea. Modif., Vol. 35, pp. 52-58.

EXHIBIT B

PAYMENT ARRANGEMENTS
Periodic Compensation (with attached Schedule of Fees)

A. For CONTRACTOR services to be rendered under this contract, CONTRACTOR shall be paid a total contract amount, including cost reimbursements, not to exceed **$ 168,200.00.**

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 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 presentation.

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.

EXHIBIT B: COSTS

The costs to conduct the project, as described in NAWC's technical proposal No. P09-250 are provided in the following. The 2009-2010 program would target the Upper Santa Ynez and the Twitchell watersheds. Five high output flare ground-based sites would be used during the five-month period of November 15, 2009 through March 15, 2010. No airborne operations would be conducted. Operations would be directed by a qualified meteorologist from NAWC's corporate offices located in Sandy, Utah.

Five Months with Five Ground Flare Sites
(Mt.Lospe, Harris Grade, Sudden Ranch, Gaviota and West Camino Cielo)

1. Set-up, Take-down and Reporting		$36,900
2. Five months Fixed Cost @ $20,500		102,500
	Sub-Total	$139,400
3. Estimated Reimbursable Costs		
320 ground flares @ $90/flare		28,800
	Estimated Total	$168,200

The Agency would only be charged for the actual usage of the reimbursable elements in this budget.

Submitted by:

NORTH AMERICAN WEATHER CONSULTANTS

Approved by:

Don A. Griffith, CCM
President
August 4, 2009

EXHIBIT C
STANDARD INDEMNIFICATION AND INSURANCE PROVISIONS
for Cloud Seeding Program

INDEMNIFICATION

CONTRACTOR shall defend, indemnify and save harmless the COUNTY, its officers, agents and employees from any and all claims, demands, damages, costs, expenses (including attorney's fees), judgements or liabilities arising out of this Agreement or occasioned by the performance or attempted performance of the provisions hereof; including, but not limited to, any act or omission to act on the part of the CONTRACTOR or his agents or employees or other independent contractors directly responsible to him; except those claims, demands, damages, costs, expenses (including attorney's fees), judgements or liabilities resulting from the sole negligence or willful misconduct of the COUNTY.

CONTRACTOR shall notify the COUNTY immediately in the event of any accident or injury arising out of or in connection with this Agreement.

Without limiting the CONTRACTOR's indemnification of the COUNTY, CONTRACTOR shall procure the following required insurance coverages at its sole cost and expense. All insurance coverages are to be placed with insurers which (1) have a Best's rating of no less than A: VII, and (2) are admitted insurance companies in the State of California. All other insurers require the prior approval of the COUNTY. Such insurance coverage shall be maintained during the term of this Agreement. Failure to comply with the insurance requirements shall place CONTRACTOR in default. Upon request by the COUNTY, CONTRACTOR shall provide a certified copy of any insurance policy to the COUNTY within ten (10) working days.

1. Workers' Compensation Insurance: Statutory Workers' Compensation and Employers Liability Insurance shall cover all CONTRACTOR's staff while performing any work incidental to the performance of this Agreement. The policy shall provide that no cancellation, or expiration or reduction of coverage shall be effective or occur until at least thirty (30) days after receipt of such notice by the COUNTY. In the event CONTRACTOR is self-insured, it shall furnish a copy of Certificate of Consent to Self-Insure issued by the Department of Industrial Relations for the State of California. This provision does not apply if CONTRACTOR has no employees as defined in Labor Code Section 3350 et seq. during the entire period of this Agreement and CONTRACTOR submits a written statement to the COUNTY stating that fact.

2. General and Automobile Liability Insurance: The general liability insurance shall include bodily injury, property damage and personal injury liability coverage, shall afford coverage for all premises, operations, products and completed operations of CONTRACTOR and shall include contractual liability coverage sufficiently broad so as to include the insurable liability assumed by the CONTRACTOR in the indemnity and hold harmless provisions [above] of the Indemnification Section of this Agreement between COUNTY and CONTRACTOR. The automobile liability insurance shall cover all owned, non-owned and hired motor vehicles that are operated on behalf of CONTRACTOR pursuant to CONTRACTOR's activities hereunder. CONTRACTORS shall require all subcontractors to be included under its policies or furnish separate certificates and endorsements to meet the standards of these provisions by each subcontractor. The following entities, and their respective officers, agents, and employees shall be Additional Insured status on any policy:

County of Santa Barbara
Santa Barbara County Flood Control and Water Conservation District
Santa Barbara County Water Agency
Carpinteria Valley Water District
Goleta Water District
City of Lompoc
Montecito Water District
City of Santa Barbara
City of Santa Maria
Santa Maria River Water Conservation District
Santa Ynez River Water Conservation District, Improvement District #1
Golden State Water Company
Vandenberg Village Community Services District

A cross liability clause, or equivalent wording, stating that coverage will apply separately to each named or additional insured as if separate policies had been issued to each shall be included in the policies. A copy of the endorsement evidencing that the policy has been changed to reflect the Additional Insured status must be attached to the certificate of insurance. The limit of liability of said policy or policies for general and automobile liability insurance shall not be less than $1,000,000 per occurrence and $2,000,000 in the aggregate. Any deductible or Self-Insured Retention {SIR} over $10,000 requires approval by the COUNTY.

Said policy or policies shall include a severability of interest or cross liability clause or equivalent wording. Said policy or policies shall contain a provision of the following form:

"Such insurance as is afforded by this policy shall be primary and if the COUNTY has other valid and collectible insurance, that other insurance shall be excess and non-contributory."

If the policy providing liability coverage is on a 'claims-made' form, the CONTRACTOR is required to maintain such coverage for a minimum of three years following completion of the performance or attempted performance of the provisions of this agreement. Said policy or policies shall provide that the COUNTY shall be given thirty (30) days written notice prior to cancellation or expiration of the policy or reduction in coverage.

3. Aircraft Liability Insurance: Aircraft liability insurance shall cover all owned, non-owned, and hired aircraft operated on behalf of CONTRACTOR pursuant to CONTRACTOR's activities hereunder and shall include coverage for consequential losses. The limit of liability of said policy or policies for aircraft liability insurance shall not be less than $2,000,000 per occurrence combined single limit for bodily injury and property damage. Said policy or policies shall provide that the COUNTY shall be given thirty (30) days written notice prior to cancellation or expiration of the policy or reduction in coverage. The following entities, and their respective officers, agents, and employees shall be Additional Insured status on any policy:

County of Santa Barbara
Santa Barbara County Flood Control and Water Conservation District
Santa Barbara County Water Agency
Carpinteria Valley Water District
Goleta Water District

City of Lompoc
Montecito Water District
City of Santa Barbara
City of Santa Maria
City of Solvang
Santa Maria River Water Conservation District
Santa Ynez River Water Conservation District, Improvement District #1
Vandenberg Village Community Services District
Vandenberg Air Force Base, Department of Air Force, US Government
Golden State Water Company
Vandenberg Village Community Services District

CONTRACTOR shall submit to the office of the designated COUNTY representative certificate(s) of insurance documenting the required insurance as specified above prior to this Agreement becoming effective. COUNTY shall maintain current certificate(s) of insurance at all times in the office of the designated County representative as a condition precedent to any payment under this Agreement. Approval of insurance by COUNTY or acceptance of the certificate of insurance by COUNTY shall not relieve or decrease the extent to which the CONTRACTOR may be held responsible for payment of damages resulting from CONTRACTOR'S services of operation pursuant to the contract, nor shall it be deemed a waiver of COUNTY'S rights to insurance coverage hereunder.

In the event the CONTRACTOR is not able to comply with the COUNTY'S insurance requirements, COUNTY may, at their sole discretion and at the CONTRACTOR'S expense, provide compliant coverage.

The above insurance requirements are subject to periodic review by the COUNTY. The COUNTY's Risk Manager is authorized to change the above insurance requirements, with the concurrence of County Counsel, to include additional types of insurance coverage or higher coverage limits, provided that such change is reasonable based on changed risk of loss or in light of past claims against the COUNTY or inflation. This option may be exercised during any amendment of this Agreement that results in an increase in the nature of COUNTY's risk and such change of provisions will be in effect for the term of the amended Agreement. Such change pertaining to types of insurance coverage or higher coverage limits must be made by written amendment to this Agreement. CONTRACTOR agrees to execute any such amendment within thirty (30) days of acceptance of the amendment or modification.