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Presentation Report



# Integrated Pest Management Analysis at Santa Barbara Airport

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## *Abstract:*

The Santa Barbara Airport has implemented an Integrated Pest Management (IPM) program which utilizes ArcView 3.3 GIS technology for tracking, management and analysis. Various methods of pest control are used including pesticide application and environmentally sensitive methods such as weed removal, mulching and trapping. Comparative analysis is performed to report and modify IPM techniques. A form and map are used to field record method, area and associated data. These data are recorded in an MS Access database, and a polygon theme is generated for each application area to evaluate the efficiency of these methods. Overlapping polygons illustrate "hotspots" to avoid excessive application of chemical treatments, and the buffers are used for wind consideration and proximity to buildings and water bodies. The SQL feature is utilized to join the Access database to ArcView 3.3. Staff training enables system management directly through ArcView, facilitating an impressive proactive and comprehensive IPM program.

## *Introduction*

Integrated Pest Management promotes minimized pesticide use, enhanced environmental stewardship, and sustainable systems. The roots of IPM can be traced to the late 1880s when "ecology" was identified as the foundation of scientific plant protection. The advent of modern synthetic insecticides in the mid 1940s resulted in a shift of focus to pesticide technology. Over the next 30 years, recognition of the limitations, and often detrimental consequences of over reliance on insecticides, led to the formulation of the concepts of IPM. In 1972, President Nixon formally committed the U.S. government to the development and promotion of IPM. In reality, pesticide-based pest control still predominates U.S. agriculture. However, biologically intensive control technologies are increasingly displacing chemically intensive technologies. Benefits of IPM include:

- Promotes sound structures and healthy plants, which better withstand damage from pests.
- Reduces the need for pesticides by using several pest management methods.
- Reduces excessive or unnecessary pesticide applications, which can negatively affect human health and the environment.
- Promotes clean water. Pesticides can pollute streams, groundwater, or coastal regions.
- Typically provides long-term and less expensive control of pests, as opposed to more conventional short-term treatments.

Since 2001, the Santa Barbara Airport has been implementing an Integrated Pest Management (IPM) Program and tracking the data in a Microsoft Access database, which is stored on a departmental server. All relevant information that is reported on the Pest treatment Record Form is entered into the database. Examples of information collected in the access database are: date, target pest, method, weather conditions, wind speed, and formulations and concentration of chemicals applied. In 2004, Airport Engineering and Planning staff sought to collect location data of these methods and link it to the Access database using the SQL feature in ArcView 3.3. A procedure was developed to collect and report locational information at the same time that the pest treatment record is filled out by the reporting individual. The description of the procedure for data collection, SQL connection of the IPM data in access to ArcView 3.3 and the resulting data analysis capabilities are described below.

## *Background*

The Santa Barbara Airport is located on the South Coast of Santa Barbara County in the City of Santa Barbara. The Airport property is 950 acres. The airfield and terminal comprises 325 acres, the Airport-owned portion of the Goleta Slough Ecological Reserve comprises 400 acres of the Slough's total 430 acres, and Airport leases commercial areas, which accounts for an additional 225 acres (AFP, 2003). Santa Barbara Airport provides regional service for both commercial and general aviation aircraft. In 2000, there were a total of 167,376 aircraft operations at Santa Barbara Airport, of which approximately twenty three percent were commercial (AFP, 2003). Figure A is an aerial photograph showing the airport property, the Goleta Slough Ecological Reserve, and the Pacific Ocean.

In compliance with various regulatory agencies, SBA has initiated a proactive IPM program that utilizes various alternative methods to pest control and strictly monitors chemical methods.

Steps for the program include:

1. Proper identification of the pest.
2. Understanding of pest biology including life cycle and food.
3. Monitor environment to determine pest levels.
4. Determine action threshold.
5. Choose tactics.
6. Evaluate results.

## *Methods*

Since 2003, the Santa Barbara Airport has been implementing an Integrated Pest Management (IPM) Program and tracking the data in a Microsoft Access database, which is stored on a departmental server. In 2004, the Airport sought to collect locational data related to the program and link the data to information collected in the Access database related to each application. The data link and the data collection and entry procedures are described below.

Using ArcView 3.3, a new project was created called Ipmsql.apr. A new Polygon theme was created titled "IPM". Next, the tabular data from the Access database was loaded into the "IPM" project using the SQL connect feature (ESRI, 1996). The tabular data was joined to the attribute table of the IPM polygon theme. The join was based on the unique record number that was found both in the Access database on the server and in the ArcView tabular data. As the unique identification number is the first field of information in both databases, all fields of the IPM information were joined – those which appeared in the Access database also appeared in the IPM theme attribute table.

Once the Pest Treatment Form is completed and the map has been marked, the form data is entered into the Access database by Airport Operations personnel. As described above, each entry in the Access database has a unique record number. Once this information has been saved in the Access database, the IPM Project is opened in ArcView 3.3. Each time the project is opened, the user must navigate to the Access table on the server to reinitiate the data linkage. Once the project is completely opened, the polygon of the treatment application is entered into the "IPM" theme using the "start editing" tool, in very close proximity to the treatment reported on the map attached to the form. Once the polygon is created, the "IPM" theme table is opened and the unique identification number from the Access table for

that application is entered in the record for the polygon that was entered in the project view. Next, the user saves the project, and all information from the Access database for that application is transferred to the polygon attribute record information. Figure D below shows the "IPM" theme in the Project Layout. Figure E below shows a screen shot of the "IPM" theme attribute table, once the record identification number has been entered, which demonstrates the data join to the Access file on the server.

Variations of analysis may be done using the various fields in the IPM database. For a chronological analysis to be done, a new IPM theme will be created for each year. Trends can then be monitored and applications coordinated accordingly. Extrapolation for future budget and staffing could also prove this a useful application.

Figure D is an example of pesticide hotspot analysis. To perform the hotspot analysis the following methods were used. The IPM theme was formatted for a unique value based on the pesticide name. The select feature was then applied for features within 50 feet of the building theme. Next a buffer was created for these selected features. Note that the map units and distance must be established before the buffer tool invoked. Also, do not dissolve the buffers as these will be intersected for the hotspots later. Save the buffer as a graphic in the view. Upon inspection of the buffers and where many overlap, select these separate buffers with the pick tool and the shift key. Under the Edit menu enter the Intersect Graphics tool. Note that if 3 or more graphics are selected that do not ALL intersect, the buffers will disappear. It may be necessary to repeat the above procedure for each set of 2 buffers that intersect. The resulting polygon will represent the 'hotspot' of overlapping pesticide applications. This graphic may now in turn be buffered to demonstrate 'sensitive zones' around the hot spot.

## *Results and Discussion*

The procedure to incorporate locational data with IPM information was made straightforward by the use of a paper map attached to the Pest Treatment Report Form. While the map is not as accurate as collecting the information with a Global Positioning System (GPS) unit, it is accurate enough to assess general trends in IPM location.

A benefit of this method for data collection is that it is easily transferable to new staff. In addition, the procedure has almost no cost and is not time consuming. In the future, it may be prudent to invest in a GPS unit to collect IPM data that could be used by Maintenance personnel when collecting information on IPM, in order to collect more precise information.

The SQL data linkage was more problematic using ArcView 8.x rather than ArcView 3.3. In discussions with ESRI technical support, it was decided that the continued use of ArcView 3.3 would be more desirable for this application.

The IPM application provides useful information to Airport staff, managers, maintenance and operations staff. Also staff may evaluate general or specific trends as to where IPM alternative efforts are most effective with respect to operations, species, weather, and season. This comparison sheds light on the nature of pest control and could be used to evaluate future applications of the program, performance goals and budget analysis. Analysis based on various attributes in the database facilitates determination of effectiveness of various methods and potential hot spots useful in prevention of hazardous environmental situations. The comprehensive monitoring, reporting and modeling of the program offer accountability to the community.

## *Conclusion and Future Work*

The IPM data linkage and integration process has proven to be an uncomplicated means to collect and organize locational data related to the Integrated Pest Management program and link it to data collected on the Pest Treatment Report Form. The data collection and input is a transferable skill to Airport Maintenance staff, thus allowing for continuity in the reporting process. This linkage provides valuable information to airport operators and managers as to the specific nature of IPM location as related to various factors. It could be possible to contrast this information with other operational information such as construction and habitat restoration projects which occur in and near the Goleta Slough.

As more IPM data becomes available, it could be possible to analyze several relationships between manageable environmental factors, the traditional chemical pesticides applications and Integrated Pest Management techniques. Such factors could include the analysis of time invested to various methods. This is critical in budget management and staff planning. A comprehensive study of the program will insure a cost effective program and provides substantiation for fiscal support of the department.

Also, IPM locational information could become increasingly useful for the upcoming Goleta Slough Tidal Restoration Project, which will measure the relative increase or decrease in wildlife hazards with the reintroduction of tidal circulation to formerly tidal basins in the Goleta Slough. The ability to analyze the locational information of pest management prior to and after the implementation of the Tidal Restoration project could be useful in determining how Tidal Restoration affects environmental hazards.

## *Acknowledgement:*

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*Appendix:*

*Figure A: Santa Barbara Airport 2003. Photo by Golden State Aerial Surveys*



# City of Santa Barbara Airport Department Pest Treatment Record

## Section 1: Project Description

|   |  |
|---|--|
| Target Pest:  | Work Order Number:   |
| <input type="checkbox"/> Mechanical/Physical/Cultural or Biological Pest Control Effort<br><input type="checkbox"/> Pesticide Application | ? (Complete Sections 1 & 2)<br>? (Complete Sections 1 & 3) |
| Description of Specific Area Treated:   |  |

### Identify Project Location on Reverse

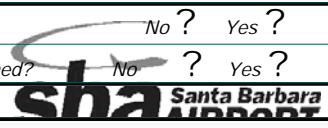
|       |               |                                  |                           |              |  |                          |
|-------|---------------|----------------------------------|---------------------------|--------------|--|--------------------------|
| Zone: | Airfield<br>? | Terminal Complex<br>Landscapes ? | Northside<br>Landscapes ? | Indoors<br>? | Roadways, parking lots, medi<br>ans and<br>rights - of-way ? | Creeks and Wetlands<br>? |
|-------|---------------|----------------------------------|---------------------------|--------------|--|--------------------------|

## Section 2: Mechanical/Physical/Cultural/Biological Pest Control Effort

|                                     |                       |                            |
|-------------------------------------|-----------------------|----------------------------|
| Date:                               | Approx. Size of Area: | Hours Dedicated to Effort: |
| Description of Pest Control Effort: |                       |                            |
|                                     |                       |                            |
| Comments:                           |                       |                            |
|                                     |                       |                            |

## Section 3: Pesticide Application

|   |                           |   |
|---|---------------------------|---|
| <b>Notification</b> – Attach a Copy of the Notification |                           |   |
| Notification Post Date                                  | Notification Removal Date | Bilingual Notification ?<br>No ? Yes ?    |
|   |                           | Copy of Notification Attached? No ? Yes ? |



|   |                        |                        |
|---|------------------------|------------------------|
| <b>Pesticide</b>  |                        |                        |
| Product Applied:  | EPA Reg. No.:          | Application Date/Time: |
| Exemption Required? No ? Yes ? If yes, attach approval. |                        |                        |
| Dosage Rate:  | Total Product Applied: | Application Method:    |

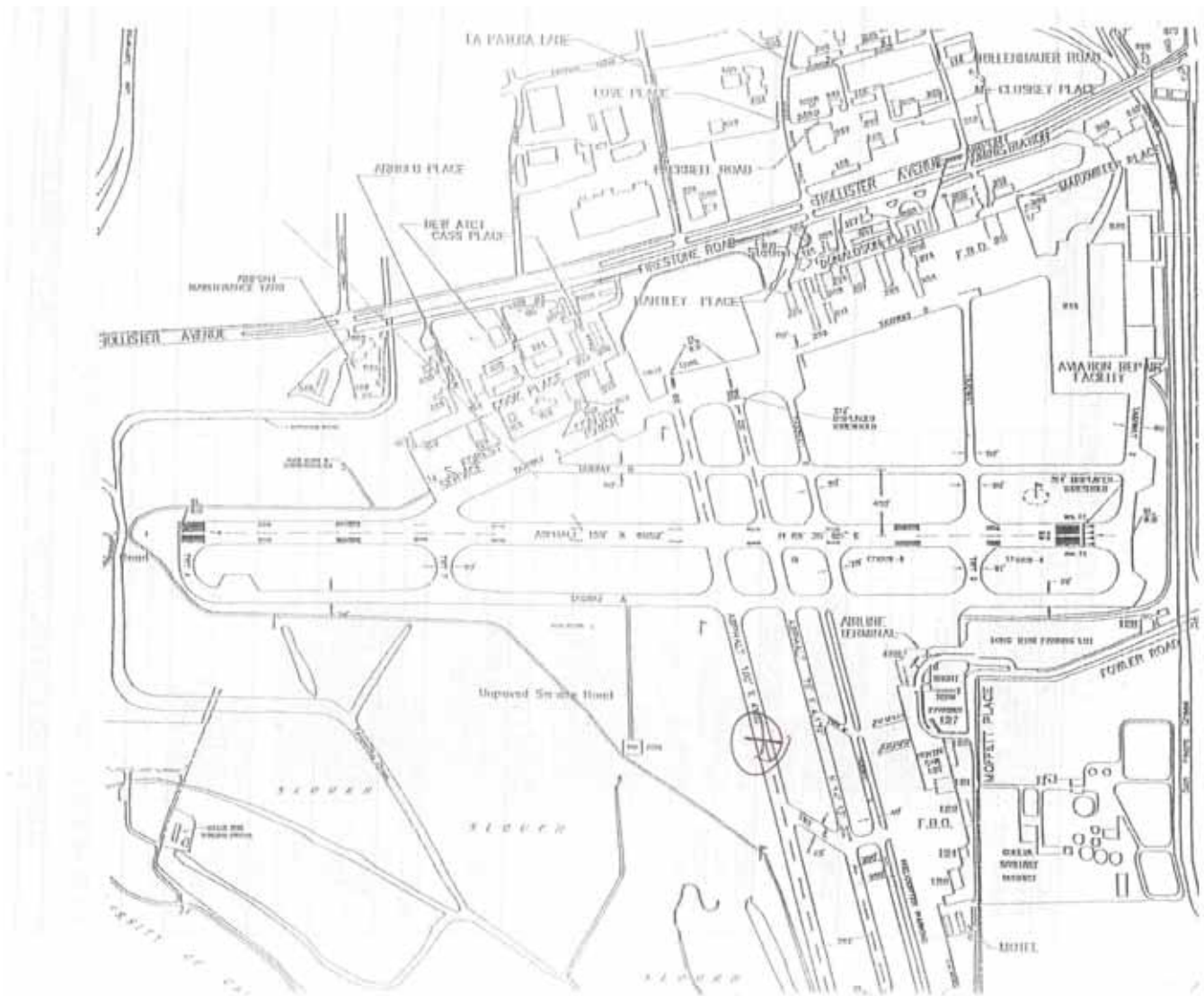
|                            |              |          |        |
|----------------------------|--------------|----------|--------|
| <b>Weather Conditions:</b> |              |          |        |
| Wind Speed:                | Temperature: | Weather: | Other: |

|                     |                 |                  |                 |
|---------------------|-----------------|------------------|-----------------|
| <b>Applicators:</b> |                 |                  |                 |
| Applicator Name:    | Amount Applied: | Applicator Name: | Amount Applied: |
|                     |                 |                  |                 |
| Applicator Name:    | Amount Applied: | Applicator Name: | Amount Applied: |
|                     |                 |                  |                 |

Figure B: Pest Treatment Report Form



Figure C: Example of Standard Map Used to Record IPM location



Standard Santa Barbara Airport Vicinity Map, City of Santa Barbara

Figure D: IPM Chemical and Alternative Methods

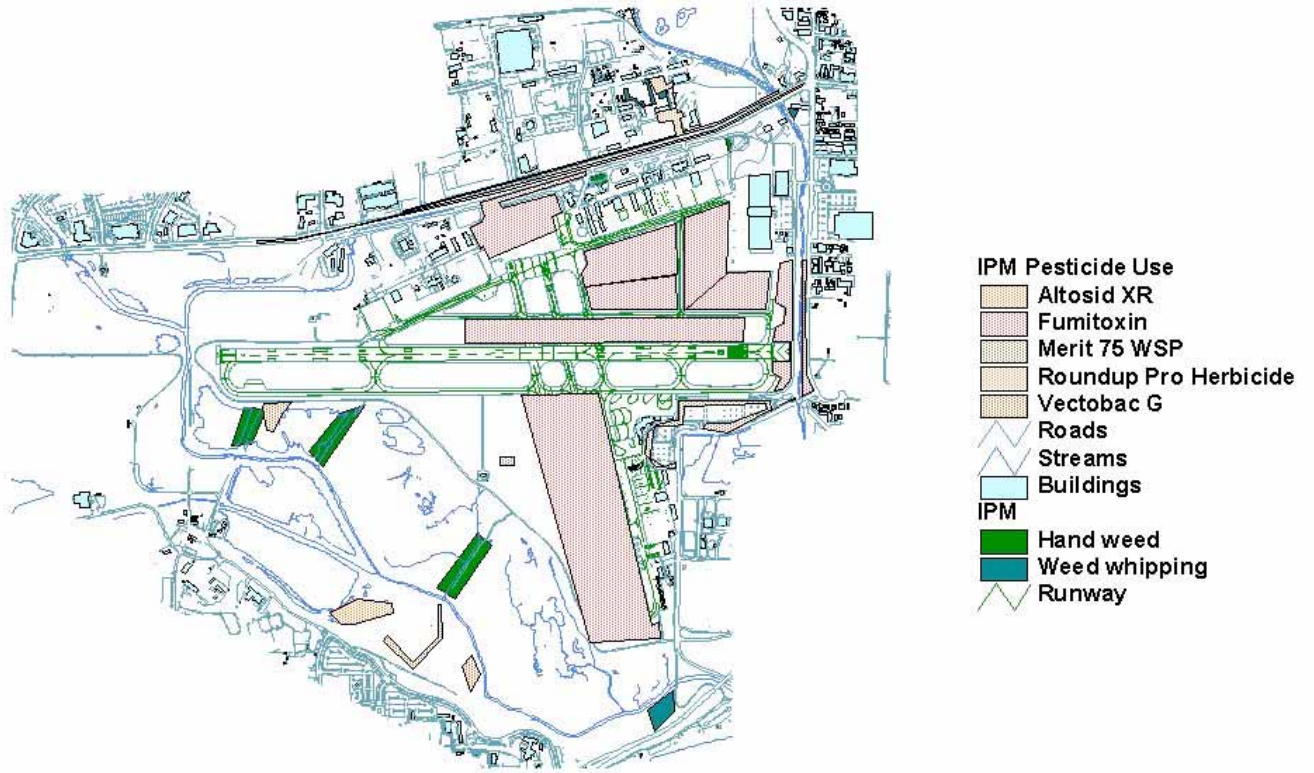


Figure E: IPM database table

| ID  | TARGET PEST | WORK ORDER NUMBER | DESCRIPTION   | ZONE | ALTERNATIVE EFFORT DATE | AREA (Acres)        | ALTERNATIVE DESCRIPTION | IPM HOURS     | NOTIFICATION DATE | TARGET PEST | EPA_REG_ NO  | APPLICATION DATE | DOSAGE RATE         | TOTAL PRODUCT | UNITS | WIND SPEED | TEMP (F) | WEATHER | APPLICATOR  |
|-----|-------------|-------------------|---|------|-------------------------|---------------------|-------------------------|---------------|-------------------|-------------|--------------|------------------|---------------------|---------------|-------|------------|----------|---------|-------------|
| 224 | Gophers     | 36966.1           | Airfield Safety Areas                                   |      | 1                       |                     |                         | 0             |                   | Gophers     | 72959-1-5857 | 2004-11-08 00:00 | 300 tablets per bur | 100           | lbs.  |            |          |         | Muraura     |
| 232 | Gophers     | 36966.1           | Airfield Safety Areas                                   |      | 1                       |                     |                         | 0             |                   | Gophers     | 72959-1-5857 | 2004-11-18 00:00 | 300 tablets per bur | 100           | lbs.  |            |          |         | Muraura     |
| 225 | Gophers     | 36966.1           | Airfield Safety Areas                                   |      | 1                       |                     |                         | 0             |                   | Gophers     | 72959-1-5857 | 2004-11-09 00:00 | 300 tablets per bur | 100           | lbs.  |            |          |         | Muraura     |
| 226 | Gophers     | 36966.1           | Airfield Safety Areas                                   |      | 1                       |                     |                         | 0             |                   | Gophers     | 72959-1-5857 | 2004-11-10 00:00 | 300 tablets per bur | 100           | lbs.  |            |          |         | Muraura     |
| 227 | Gophers     | 36966.1           | Airfield Safety Areas                                   |      | 1                       |                     |                         | 0             |                   | Gophers     | 72959-1-5857 | 2004-11-11 00:00 | 300 tablets per bur | 100           | lbs.  |            |          |         | Muraura     |
| 228 | Gophers     | 36966.1           | Airfield Safety Areas                                   |      | 1                       |                     |                         | 0             |                   | Gophers     | 72959-1-5857 | 2004-11-12 00:00 | 300 tablets per bur | 100           | lbs.  |            |          |         | Muraura     |
| 228 | Gophers     | 36966.1           | Airfield Safety Areas                                   |      | 1                       |                     |                         | 0             |                   | Gophers     | 72959-1-5857 | 2004-11-12 00:00 | 300 tablets per bur | 100           | lbs.  |            |          |         | Muraura     |
| 228 | Gophers     | 36966.1           | Airfield Safety Areas                                   |      | 1                       |                     |                         | 0             |                   | Gophers     | 72959-1-5857 | 2004-11-12 00:00 | 300 tablets per bur | 100           | lbs.  |            |          |         | Muraura     |
| 230 | Gophers     | 36966.1           | Airfield Safety Areas                                   |      | 1                       |                     |                         | 0             |                   | Gophers     | 72959-1-5857 | 2004-11-16 00:00 | 300 tablets per bur | 100           | lbs.  |            |          |         | Muraura     |
| 320 | Weeds       |                   | Safety Area Grading mitigation area                     |      | 6                       | 2005-02-23 00:00:00 | 5                       | Hand weed     | 128               | Weeds       |              |                  |                     |               |       |            |          |         |             |
| 320 | Weeds       |                   | Safety Area Grading mitigation area                     |      | 6                       | 2005-02-23 00:00:00 | 5                       | Hand weed     | 128               | Weeds       |              |                  |                     |               |       |            |          |         |             |
| 320 | Weeds       |                   | Safety Area Grading mitigation area                     |      | 6                       | 2005-02-23 00:00:00 | 5                       | Hand weed     | 128               | Weeds       |              |                  |                     |               |       |            |          |         |             |
| 321 | Weeds       | 33576             | Northside rights of way                                 |      | 5                       |                     |                         |               | 0                 | Weeds       | 524-475      | 2005-03-10 00:00 | 10%                 | 80            | oz.   | calm       | 65       | clear   | Carricaburu |
| 322 | Weeds       | 33620.1           | Caltrans mitigation area                                |      | 6                       | 2005-03-01 00:00:00 |                         | Weed whipping | 1                 | Weeds       |              |                  |                     |               |       |            |          |         |             |
| 323 | Weeds       |                   | Building 258 landscape                                  |      | 3                       | 2005-03-02 00:00:00 |                         | Hand weed     | 1                 | Weeds       |              |                  |                     |               |       |            |          |         |             |
| 324 | Weeds       |                   | Fowler Ave.   |      | 2                       | 2005-03-03 00:00:00 |                         | Weed whipping | 3                 | Weeds       |              |                  |                     |               |       |            |          |         |             |
| 325 | Weeds       | 33750.1           | Lot adjacent to Super 8                                 |      | 3                       | 2005-03-04 00:00:00 |                         | Weed whipping | 2                 | Weeds       |              |                  |                     |               |       |            |          |         |             |
| 326 | Weeds       | 33750.1           | Lot at 107 Lopez Rd                                     |      | 3                       | 2005-03-16 00:00:00 |                         | Weed whipping | 1                 | Weeds       |              |                  |                     |               |       |            |          |         |             |
| 327 | Weeds       | 33810.1           | Lopez Rd and Cinema corner landscape                    |      | 3                       | 2005-03-18 00:00:00 |                         | Hand weed     | 2                 | Weeds       |              |                  |                     |               |       |            |          |         |             |
| 329 | Weeds       |                   | Vines long Terminal loop road                           |      | 2                       | 2005-03-21 00:00:00 |                         | Hand weed     | 1                 | Weeds       |              |                  |                     |               |       |            |          |         |             |
| 330 | Weeds       | 33860.1           | Fuel farm   |      | 1                       | 2005-03-21 00:00:00 |                         | Hand weed     | 1                 | Weeds       |              |                  |                     |               |       |            |          |         |             |
| 331 | Weeds       | 33843.1           | Lopez and Botello                                       |      | 3                       | 2005-03-23 00:00:00 |                         | Weed whipping | 1                 | Weeds       |              |                  |                     |               |       |            |          |         |             |
| 332 | Weeds       |                   | Area adjacent to 225 and fence line                     |      | 3                       | 2005-03-23 00:00:00 |                         | Weed whipping | 0                 | Weeds       |              |                  |                     |               |       |            |          |         |             |
| 132 | Aphids      | 31785             | Long and short term parking lots, visitor's center tree |      | 2                       |                     |                         |               | 0                 | Aphids      | 3124-439     | 2004-07-12 00:00 | 10%                 | .032          | oz.   | calm       | 65       | clear   | Carricaburu |
| 347 | Weeds       |                   | Hollister Ave islands                                   |      | 5                       |                     |                         |               | 0                 | Weeds       | 524-475      | 2005-03-31 00:00 | 10%                 | 4             | gal.  | calm       | 70       | clear   | Agri-Turf   |
| 348 | Mosquitoes  |                   | Near radar site   |      | 6                       |                     |                         |               | 0                 | Mosquitoes  | 73049-10     | 2005-01-21 00:00 | 20%                 | 5             | lbs.  | calm       | 69       | clear   | SBCVCD      |
| 349 | Mosquitoes  |                   | Area J  |      | 6                       |                     |                         |               | 0                 | Mosquitoes  | 2724-421     | 2005-01-24 00:00 | 201%                | 79.65         | lbs.  | calm       | 72       | clear   | SBCVCD      |
| 350 | Mosquitoes  |                   | Area I  |      | 6                       |                     |                         |               | 0                 | Mosquitoes  | 73049-10     | 2005-01-31 00:00 | 20%                 | 7.5           | lbs.  | calm       | 69       | clear   | SBCVCD      |
| 351 | Mosquitoes  |                   | Area I  |      | 6                       |                     |                         |               | 0                 | Mosquitoes  | 73049-10     | 2005-01-31 00:00 | 20%                 | 7.5           | lbs.  | calm       | 69       | clear   | SBCVCD      |
| 352 | Mosquitoes  |                   | Peres Rd  |      | 3                       |                     |                         |               | 0                 | Mosquitoes  | 73049-10     | 2005-02-01 00:00 | 10%                 | 0.286         | lbs.  | calm       | 70       | clear   | SBCVCD      |
| 353 | Mosquitoes  |                   | Area C & D  |      | 6                       |                     |                         |               | 0                 | Mosquitoes  | 73049-10     | 2005-02-07 00:00 | 20%                 | 21            | lbs.  | calm       | 59       | clear   | SBCVCD      |

Figure F: ArcView Pesticide Hot Spot Analysis Exhibit

# IPM Pesticide Sensitive Zones



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