



BAY AREA  
AIR QUALITY  
MANAGEMENT  
DISTRICT

January 24, 2003

Robert D. Fletcher, Chief  
Planning and Technical Support Division  
California Air Resources Board  
P. O. Box 2815  
Sacramento, CA 95812

Dear Mr. Fletcher:

I am writing to provide comments on California Air Resources Board (ARB/Board) proposals related to Ozone Transport Regulations in response to your December 20, 2002 workshop notice.

The Bay Area Air Quality Management District (BAAQMD/District), as a source and receptor area, is keenly aware of pollutant transport between air basins. We will be active partners in all reasonable efforts to reduce local emissions and to reduce interbasin transport.

Two possible concepts mentioned in your workshop notice as "under consideration" are requirements that upwind areas have new source review (NSR) and All Feasible Measures as effective as those in downwind areas. We believe these concepts have merit and should be subject to further analysis and development. We suggest that the effectiveness of rules should be judged on the basis of overall results achieved, rather than by merely comparing emission standards and exemption levels without regard to the number and types of sources being regulated. The interaction between sources and rules can be very complex, with different thresholds, applicability, and exemptions producing emission reduction results that are not obvious from looking at a rule alone. Overall results are the best indicator of effectiveness.

In addition to the above, we suggest the following eight principles as appropriate to guide transport mitigation efforts:

**1. Responsibility should be proportional to contribution**

The responsibilities of upwind and downwind districts should bear a reasonable relationship to each district's contribution, in magnitude and in frequency, to an air quality problem. If all exceedances are the result of overwhelming transport, the upwind source area would be deemed wholly responsible for the problem and the solutions. If modeling shows the relative contributions of transported and local pollutants to exceedances, the responsibilities for mitigation should be proportional to the contribution.

**2. Reciprocity should be expected when responsibility is shared**

An obvious extension of the equal effectiveness concepts, when responsibility is shared, is that downwind areas should have measures at least as effective as the upwind areas. This is a corollary of principle #1 above. There may be opportunities to extend reciprocity when a new or modified source in one basin can provide offsets in another basin, upwind or downwind.

**3. Mitigation measures should be feasible and cost-effective**

Mitigation measures should be effective in reducing ozone, and more cost-effective measures should have higher priority for implementation. We also recognize that there may be instances when a measure is feasible in one district, but for various reasons would not be feasible or appropriate in another.

**4. Transport regulations should provide net air quality and health benefits**

Though this principle might appear obvious, there may be instances when reducing emissions from some sources may increase emissions of other pollutants, or increase overall exposure to pollutant levels over standards. Such undesirable consequences should be avoided.

To provide the most significant air quality and health benefits, transport mitigation should focus on reducing transport of fine particulate matter and PM precursors. The health and economic impacts of PM exposure are much more severe than ozone effects. We urge ARB to seek legislative changes, or take other actions as necessary to expand the transport mitigation regulations to address PM.

**5. All precursor sources should be considered**

For a comprehensive approach to reducing transport, mitigation measures should consider all source categories, not just permitted stationary sources. The majority of emissions come from area and mobile sources, so these should be subject to careful review. Districts should promote smart land use decisions, expanded public transit, travel demand reduction, and transportation control measures to reduce precursor emissions. The transport mitigation discussion should consider indicators such as growth rates (population and vehicle miles traveled), proportion of transportation funding for roads versus alternative transportation modes, and transportation mode splits. Cooperation on transport mitigation should extend to State and federal actions as well. We encourage the ARB to review the stringency of measures controlling sources under their jurisdiction, and to work with the U. S. Environmental Protection agency to strengthen programs that reduce emissions from sources under federal jurisdiction. Ships, aircraft, locomotives, and offroad vehicles emit significant quantities of ozone precursors, and important reductions could be achieved.

**6. Decisions should be based on good science**

Transport mitigation requirements should be based on good science. The definition of transport couples should be more rigorous than in the past. The Central California ozone and PM studies

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provide a rich new data base that can be used with current state-of-the-art models to provide more reliable and quantitative assessments of transport impacts than have been available in the past. Lake Michigan, Houston, Atlanta, and the Eastern States have developed air quality modeling systems to analyze and quantify their ozone problems. California should leverage its substantial investment in field studies to develop sound, science-based approaches to solving local and transported pollution problems. Good analysis will include the use of grid-based air quality models, consideration of transport aloft, and comparisons of population exposures. The Bay Area's 2004 Ozone Plan process will include photochemical modeling, and will provide opportunities to quantify transport impacts during one or more recent ozone episodes.

Currently, we have some analyses using trajectory models to show transport paths during selected high ozone and PM episodes. The attached results indicate upper level transport from Sacramento to the Bay Area on seven high ozone days, and transport from the San Joaquin Valley to Livermore during two recent high-PM episodes. We encourage ARB to provide a more complete assessment of these episodes through application of grid-based modeling procedures.

**7. Funding should follow requirements**

This principle is a common sense element of any program to reduce transport. If new control requirements are imposed, financial incentives should be distributed proportional to the costs associated with the new requirements.

**8. Mitigation requirements should be applied equitably statewide**

Measures required for one transport couple should apply to all other similar transport couples.

We look forward to the development of practical and cost-effective approaches, based on sound science, to mitigate California's pollutant transport problems.

Sincerely,



William C. Norton  
Executive Officer

Attachment

cc: Gayle Sweigert

# An Assessment of the Transport of Pollutants to the San Francisco Bay Area

January 24, 2003

The potential for the transport of pollutants from the Central Valley to the San Francisco Bay Area is assessed using HYSPLIT trajectory analyses. During high ozone or high PM days, a high pressure is usually over the Bay Area. Associated with the high pressure is a strong and shallow inversion layer, which traps the pollutants. If the center of the high pressure is to the north of the Bay Area, there is a potential for the clockwise wind around the high pressure to bring pollutants from the Central Valley to the Bay Area. This work is separated in two parts. The first part is the assessment of transport affecting summer time ozone. The second part is the assessment of transport affecting fall-winter time PM.

## 1. Transport affecting summer time ozone.

For this part of work, backward trajectories were computed for all days with ozone exceedance in the Bay Area based on the federal one hour standard for the years 1998-2002. There were 17 ozone exceedance days during this 5-year period. For each of the ozone exceedance days, backward trajectories were computed for the station with maximum ozone. The duration of the trajectories was 48 hours and the ending time of the trajectories was 4 AM PST on that day. The 4 AM ending time was selected because the sea breeze effect at this time would be small and the transport potential from the Central Valley to the Bay Area could be more clearly seen. Table 1 lists the 17 ozone exceedance days in this 5-year period. For each of these days, trajectories were computed at 3 different height levels: 50, 750 and 1500 meters. Previous experiments had shown that the transport of pollutants from the Central Valley in the summer time occurred not on the surface, but at a higher level. These pollutants could be mixed downward in the afternoon in the Bay Area. Because of vertical motion, the heights of the trajectories do change with time but they are referenced as the 50, 750 and 1500 meter trajectories. The 50 m trajectories invariably passed through a narrow area along the coastline of Northern California and they are not shown in Table 1. For the 750 and 1500 m trajectories, there is a clear evidence of transport from the Sacramento Valley to the Bay Area: 7 of the 17 trajectories pass through the Sacramento Valley on each of the two levels. Two trajectories also pass through the northern part of the San Joaquin Valley on the 1500 m.

## 2. Transport affecting fall-winter time PM.

The fall-winter time PM exceedance data are not well documented at this time. David Fairley and Mark Stoelting indicated that November 27-28 and Dec 8-9, 2002 are possible candidates for PM exceedances. Forty-eight-hour backward trajectories were computed for these two episodes at two locations: Vallejo, where there was evidence of PM exceedance during the November episode; and Livermore, which represents the east side of the Bay Area. The results are shown in Figures 1-4. The ending time of these trajectories are 8 PM PST, November 27 (4 AM, November 28, UTC) and 8 PM PST, December 8 (4 AM, December 9, UTC), 2002. The ending time of 8 PM is chosen because this is the time the PM problem usually is the worst. The heights of the trajectories were on the 50, 100 and 300 m levels. For the fall-winter season, the

interaction between the boundary layer and the layer above is weak and trajectories in the lower levels are more representative of pollutant transport.

For the November episode, there is a clear indication of pollutant transport from the Sacramento Valley to Vallejo and from the San Joaquin Valley to Livermore. There is no significant difference in the trajectories at the 3 height levels. For the December episode, pollutant transports to both Vallejo and Livermore came from the northern part of the San Joaquin Valley.

### 3. Summary

Trajectory analyses have been used to assess the potential pollutant transport from the Central Valley to the San Francisco Bay Area. For potential summer time pollutant transport, backward trajectories were computed for 17 Bay Area ozone exceedance days for the period 1998-2002. The trajectories in 7 out of the 17 days showed transport from the Sacramento Valley to the Bay Area on each of the 750 and 1500 m height levels. Trajectories in 2 out of the 17 days showed transport from the northern part of the San Joaquin Valley to the Bay Area on the 1500 m height levels. The PM exceedances in the Bay Area were not well documented for past years. But for 2002, there were 2 episodes of possible PM exceedances, one on November 27-28 and the other on December 8-9. In the November episode, there was clear low-level transport from Sacramento Valley to Vallejo and from San Joaquin Valley to Livermore. For the December episode, there were transports to Vallejo and Livermore from the northern part of the San Joaquin Valley. Additional episodes need to be evaluated to determine the significance of the Central Valley transport to the Bay Area during the fall-winter PM seasons.

Table1. Transport to the San Francisco Bay Area from the Sacramento Valley (SaV) and the San Joaquin Valley (SJV) for the Bay Area ozone exceedance days between 1998 and 2002. The areas traversed are determined by the 700 m and 1500 m level trajectories.

Date	Station of Max O <sub>3</sub>	O <sub>3</sub> Value	Areas Traversed	
			700 m Trajectory	1500 m Trajectory
7-18-98	San Jose	147	SaV	
8-3-98	San Martin	142		SaV
8-4-98	San Martin	144		
8-12-98	Concord	147		SJV
8-29-98	Livermore	131		
9-2-98	Livermore	139		
9-3-98	Concord	130		SaV
9-13-98	Livermore	136	SaV	SaV
7-11-99	Livermore	146		SaV
7-12-99	Concord	156	SaV	SJV
8-25-99	Vallejo	129		
5-22-00	Concord	138	SaV	SaV
6-15-00	Livermore	152	SaV	SaV
7-31-00	Livermore	126		
7-3-01	Concord	134		
7-9-02	Livermore	135	SaV	SaV
7-10-02	Livermore	160	SaV	

NATIONAL OCEANIC ATMOSPHERIC ADMINISTRATION  
Backward trajectories ending at 04 UTC 28 Nov 02  
EDAS Meteorological Data

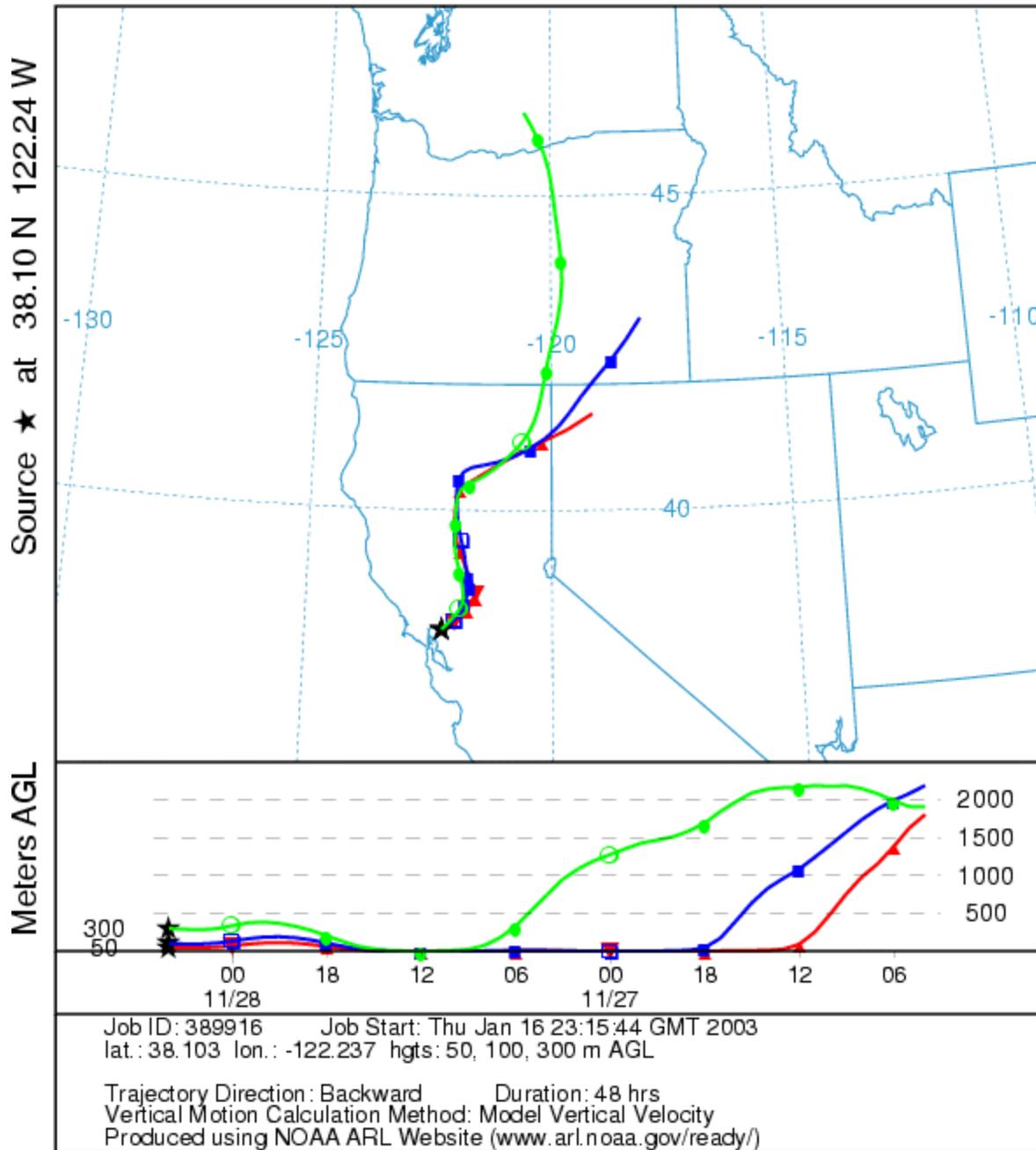


Figure 1. Backward trajectories ending at 8 PM, November 27, 2002 at Vallejo. The height levels of the trajectories are 50, 100 and 300 m.

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 Backward trajectories ending at 04 UTC 28 Nov 02  
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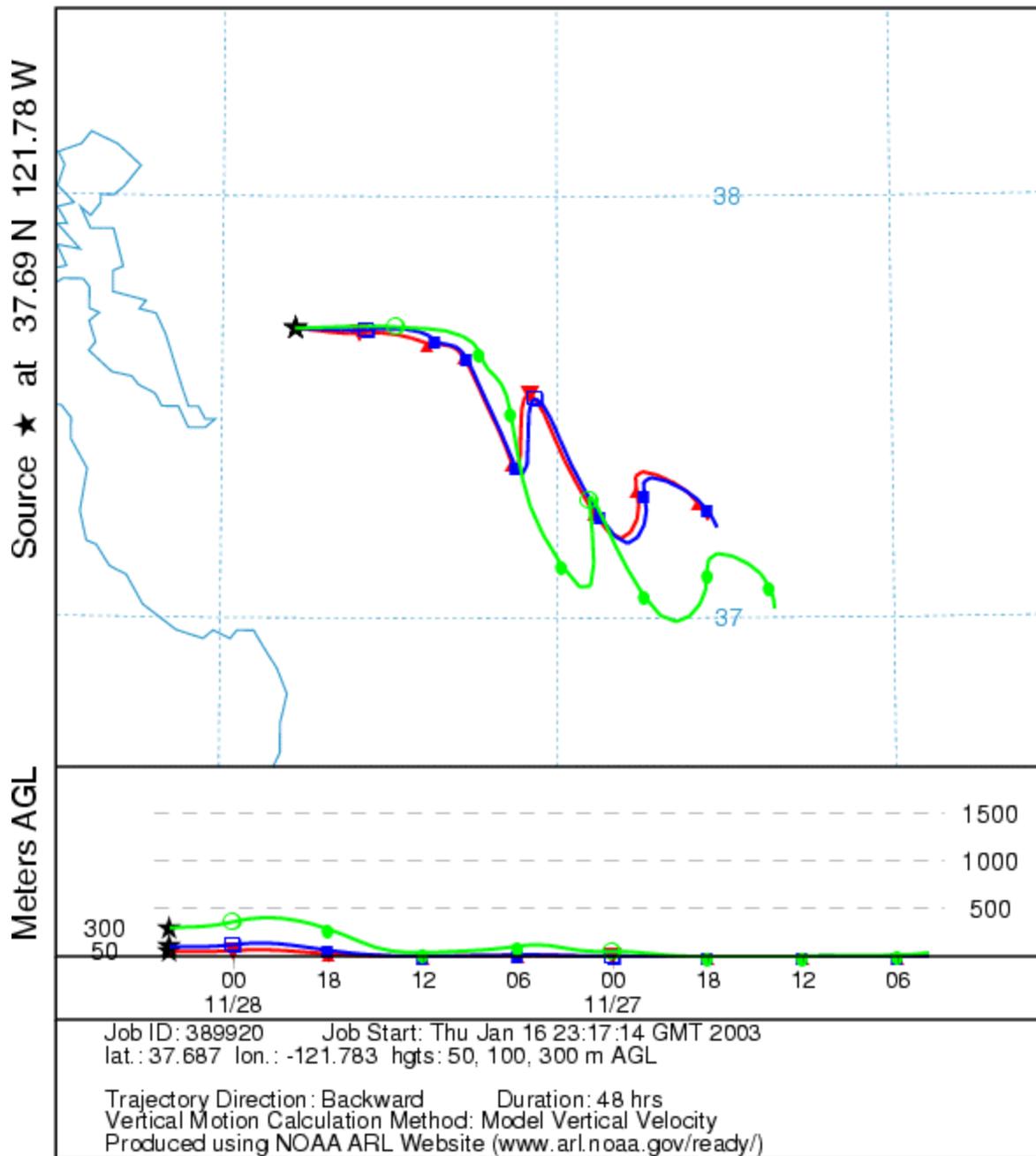


Figure 2. Backward trajectories ending at 8 PM, November 27, 2002 at Livermore. The height levels of the trajectories are 50, 100 and 300 m.

NATIONAL OCEANIC ATMOSPHERIC ADMINISTRATION  
 Backward trajectories ending at 04 UTC 09 Dec 02  
 EDAS Meteorological Data

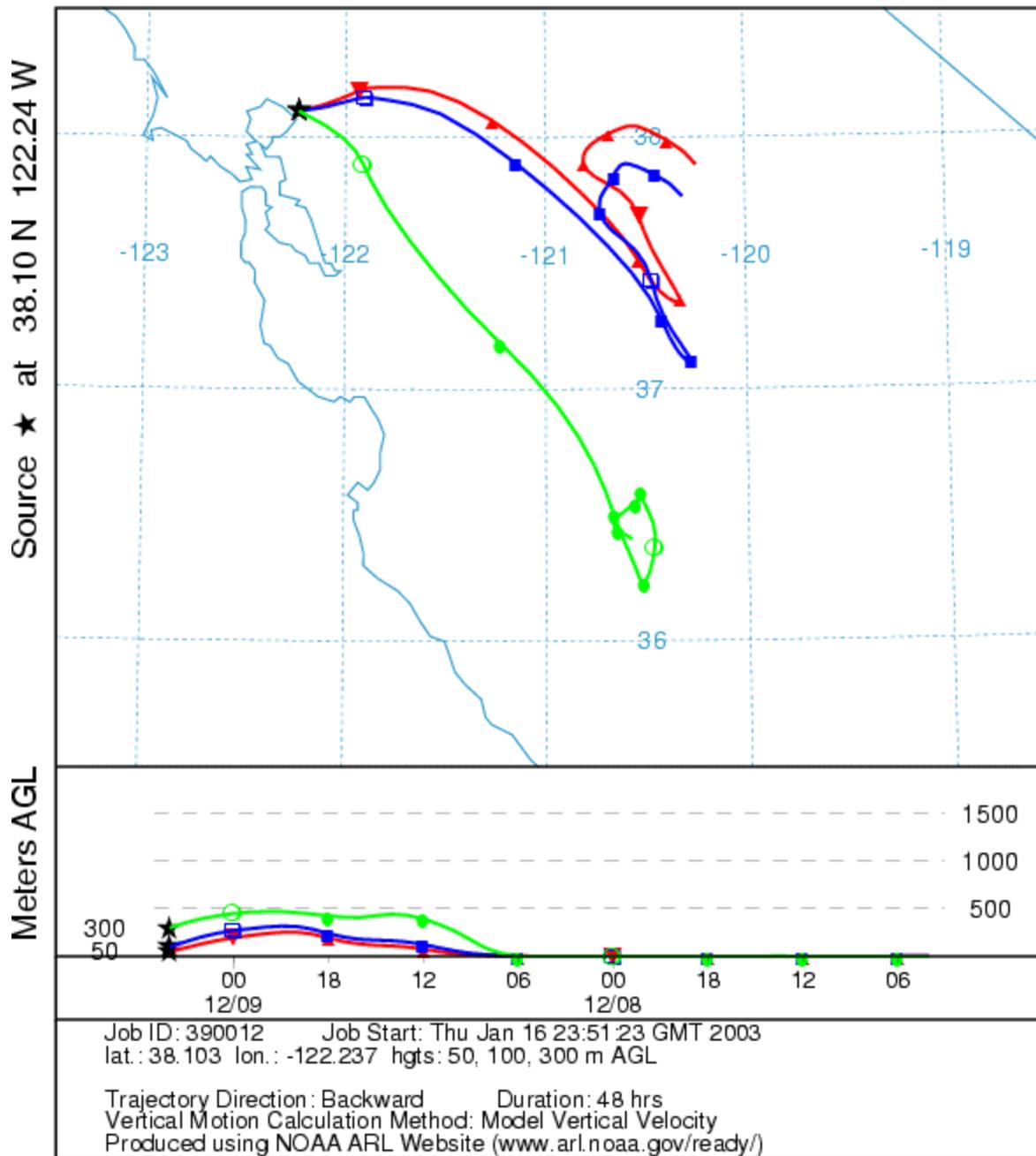


Figure 3. Backward trajectories ending at 8 PM, December 8, 2002 at Vallejo. The height levels of the trajectories are 50, 100 and 300 m.

NATIONAL OCEANIC ATMOSPHERIC ADMINISTRATION  
 Backward trajectories ending at 04 UTC 09 Dec 02  
 EDAS Meteorological Data

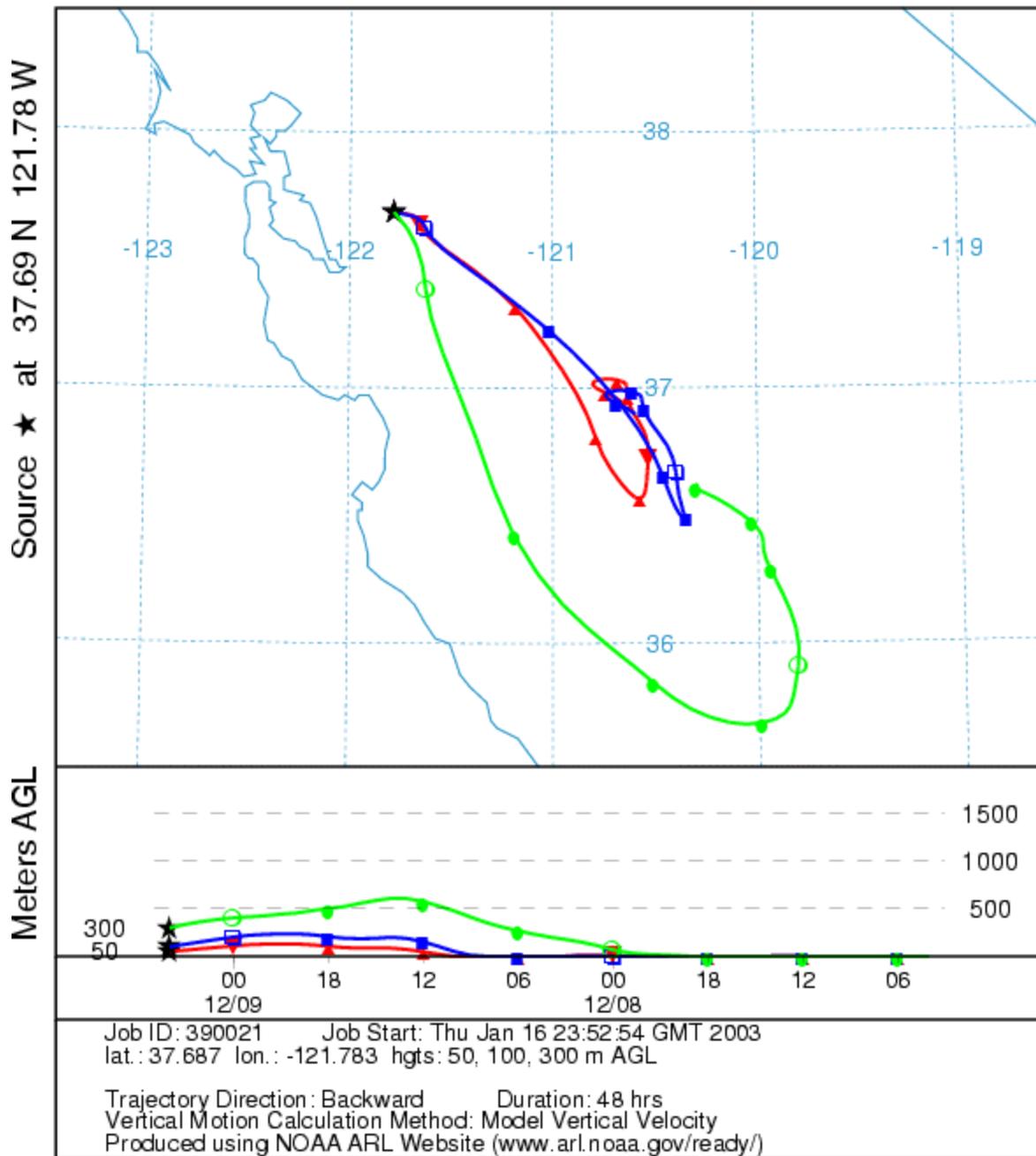


Figure 4. Backward trajectories ending at 8 PM, December 8, 2002 at Livermore. The height levels of the trajectories are 50, 100 and 300 m.