

# HARRIS MILLER MILLER & HANSON INC.

945 University Ave., Suite 201  
Sacramento, California 95825  
Tel. (916) 568-1116  
Fax (916) 568-1201

## PRELIMINARY TECHNICAL MEMORANDUM

---

To: Mr. Glen Rickelton  
Airport Noise Officer  
Sacramento International Airport  
6900 Airport Boulevard  
Sacramento, CA 95837

From: Gene Reindel  
Robert Behr

Date: May 24, 2005

Subject: Noise Measurements and Preliminary Analysis of UPS Flights Along the ILS  
Approach Corridor to Mather Airport

Reference: HMMH Job Number 297880.006

---



### Introduction

The Sacramento County Airports System (SCAS) requested that Harris Miller Miller & Hanson Inc. (HMMH) correlate and review noise measurement data with Aircraft Noise and Operations Monitoring System (ANOMS) flight track data for all UPS aircraft arriving at Mather Airport from February 14, 2005 through March 5, 2005 and from April 25, 2005 through 30 April 2005.

The objective was to measure baseline arrival noise levels for United Parcel Service (UPS) Boeing 757 aircraft on standard approaches and to compare these baseline levels with the measured noise levels produced by UPS Boeing 757 aircraft on Continuous Descent Approaches (CDA). UPS reported three “successful” CDA and one “nearly successful” CDA attempts during the February-March measurement period. Analysis is continuing on arrivals during the April measurement period with a few initially identified as being “successful” CDA flights. Additional noise measurements of UPS Boeing 757 aircraft arriving at night in 2004 were also included to add to the baseline levels for non-CDA operations.

This memorandum briefly reviews the noise data collected for the UPS Boeing 757 aircraft arrivals and compares the initially identified CDA operations noise data with the non-CDA operations noise data. The analysis is preliminary in nature as efforts to further define aircraft configuration (flaps, landing gear, engine thrust settings, etc.) are underway.

### Noise Measurements and Data Correlation

SCAS collected noise measurement data at four sites along the approach corridor. Table 1 lists the approximate locations of the measurement sites and Figure 1 shows the sites’ relationships to the Instrument Landing System (ILS) approach.

The SCAS ANOMS data provided the aircraft altitudes, flight paths flown, and perpendicular distance (slant distance) to each aircraft flight track for each noise measurement site. These data were then correlated in time with the measured noise data at each site. Table 2 shows, by measurement site, the number of noise events detected and correlated with UPS aircraft arrivals for the April-May 2004 (nighttime only), February-March 2005, and April 2005 measurement periods.

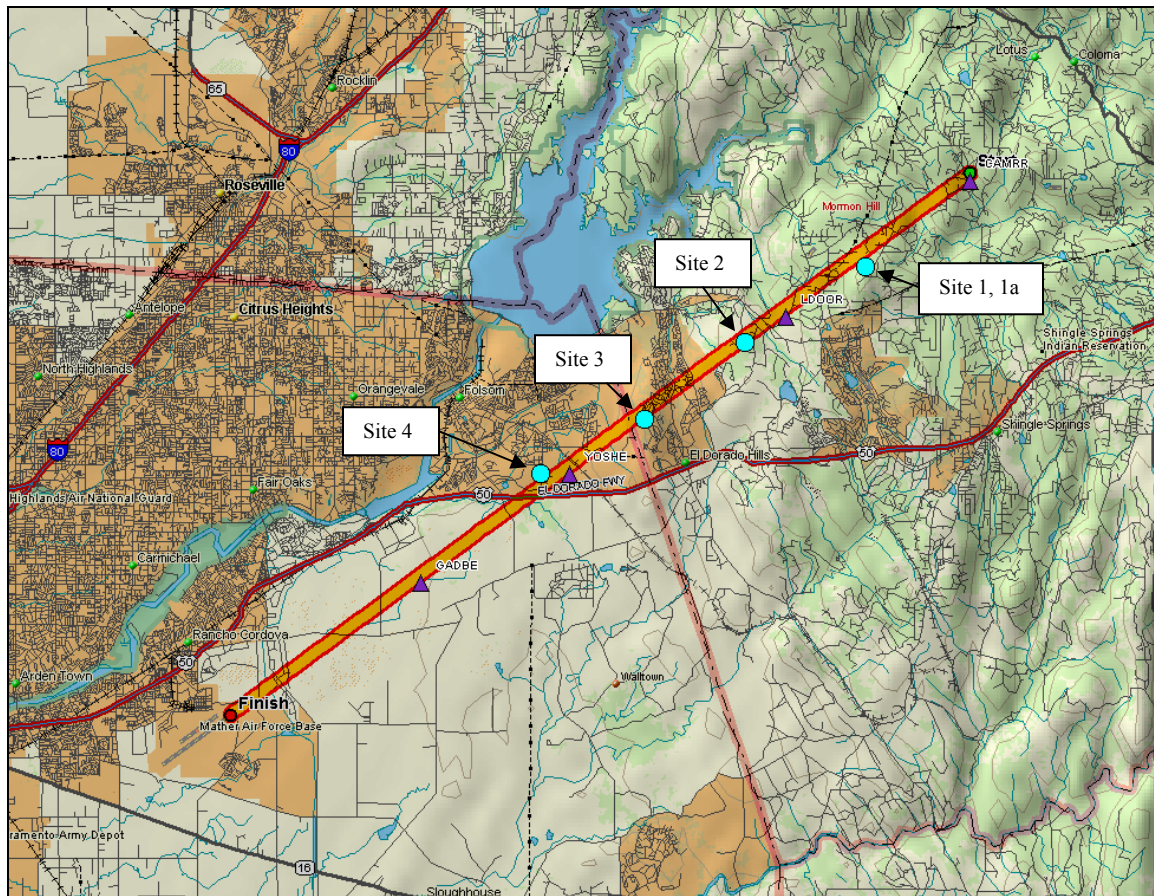
**Table 1: Mather Airport Approach Corridor Measurement Site Data**

Site	Address	Approx. Coordinates	Approx. Elevation Above Mean Sea Level (feet)	Approx. Distance to Threshold Rwy 22L (nautical miles)	Approx. 3-Degree Glide Slope Altitude (feet)
1	3701 Lazy Knoll Ct Rescue, CA	N38-43.549 W120-58.744	1,510	17.30	5,600
1a	Adjacent to 3701 Lazy Knoll Ct Rescue, CA	N38-43.543 W120.58.744	1,510	17.30	5,600
2	2280 Ethel Dr El Dorado County, CA	N38-41.868 W121-02.586	1,260	13.87	4,417
3	354 Glen Ridge Ct El Dorado Hills, CA	N38-40.198 W121-05.381	1,010	11.17	3,557
4	2305 Farndon Ct Folsom, CA	N38-39.016 W121-08.291	336	8.55	2,722



Note: Site 1a used for April 2005 noise measurements due to change in ownership of Site 1. Noise monitor moved approximately 36 feet with no effective change in measured noise levels due to new site.

**Figure 1: Noise Measurement Locations along the ILS Approach Corridor**



**Table 2: Number of Correlated UPS Boeing 757 Aircraft Arrivals**

Site	B757 Arrival		B757 Arrival		B757 Arrival		Total Arrivals
	April-May 2004		February-March 2005		April 2005		
	Standard	Standard	CDA	Standard	CDA		
1/1a	27	28	4	12	4	75	
2	26	40	4	14	4	88	
3	31	42	4	15	4	96	
4	32	45	4	16	4	101	



### Single Event Data

Using the ANOMS aircraft operations data, the noise monitor event and one-second equivalent sound level (Leq) data, SCAS and HMMH correlated the noise and operations data to derive the Maximum Sound Level (Lmax) and Single Event Noise Exposure Level (SENEL) for each aircraft operation. Lmax is the maximum sound level of a particular noise event and corresponds to the loudest sound measured for that event. SENEL, on the other hand, is a computed value that incorporates the duration of the noise event above a set threshold level. SENEL is not heard, but calculated to determine the total sound energy of an event. For each measurement site, Table 3 shows the maximum, minimum, and median SENEL and Lmax for each measurement period with “good” CDA data (based on UPS information and flight data recorder data) broken out separately.

**Table 3: Ranges of Measured SENEL and Lmax Levels for UPS Boeing 757 Approaches to Mather Airport**

Site	Measure	Apr-May 04	Feb-Mar 05	Apr 05	CDA*
		SENEL/Lmax (dB)	SENEL/Lmax (dB)	SENEL/Lmax (dB)	Feb-Mar 05 Apr 05 SENEL/Lmax (dB)
1	Maximum	75.4/66.2	80.9/70.7	75.8/63.5	68.9/57.5
	Minimum	57.7/50.6	65.1/54.9	65.5/51.0	64.7/51.8
	Median	70.0/58.8	71.5/59.2	72.0/58.0	67.5/53.2
2	Maximum	79.7/68.7	85.7/74.7	78.9/68.1	75.6/62.9
	Minimum	63.1/51.3	62.6/52.7	71.8/58.0	66.0/54.3
	Median	74.0/62.2	73.2/61.4	74.2/61.4	70.7/58.1
3	Maximum	83.6/73.4	82.3/73.4	82.1/70.9	77.4/67.1
	Minimum	67.4/57.3	69.1/59.5	67.1/56.0	67.8/58.4
	Median	75.2/64.7	74.6/63.4	75.4/64.0	72.5/60.5
4	Maximum	85.5/75.3	84.8/76.8	82.8/71.6	74.3(84.6)/62.5(74.6)**
	Minimum	69.5/58.5	65.9/56.2	69.2/57.8	71.6(83.3)/58.8(73.5)**
	Median	76.4/65.3	78.8/67.5	75.9/64.3	72.8(84.2)/60.6(74.1)**

\* - Initially identified as fairly successful CDA's; analysis continues.

\*\* - Due to significant measurement differences for time periods, values in parentheses are for Feb-Mar 05 period.

At Site 4 for the February-March 2005 measurement period, further investigation of available flight data recorder information indicated the landing gear was down for these flights and the aircraft may have been changing aircraft configuration after passing YOSHE navigation fix and as the aircraft flew over the site, which potentially caused the higher measured noise levels. The noise measurements for that period were approximately 10 dB higher in noise level as compared to the April 2005 CDA noise measurements and were subsequently not used in the final comparison of CDA and non-CDA measurements.

### *Comparison of non-CDA and CDA Event Measurements*



Figures 2-9 show the Lmax and SENEL for the UPS flights as a function of the slant range distance for the three measurement periods. As the aircraft approach closer to the airport (Sites 3 and 4) the variations in slant range distance become less except for some aircraft that are not flying a CDA and not on the ILS approach at the sites. The four CDA flights for February-March 2005 are annotated separately and, along with the April 2005 flights, show consistency at each site with a few exceptions. For those flights at nearly the same slant ranges, preliminary analysis indicates that the variations in noise levels are due primarily to the aircrafts' airspeeds and, in some cases, the deployment of speed brakes or use of engine anti-ice, which increases the engine idle speed.

Tables 4 and 5, which list the median measured SENEL and Lmax values, respectively, provide an initial basis for comparing CDA noise levels with standard (non-CDA) approach noise levels at the four measurement sites for UPS Boeing 757 aircraft. A preliminary comparison shows CDA's to be approximately 2-4 dB SENEL and 3-6 dB Lmax quieter than standard approaches.

**Table 4: Comparison of Median Measured SENEL Levels for UPS Boeing 757 Approaches to Mather Airport**

Site	CDA Feb – Mar 05 Apr 05 SENEL (dB)		Apr-May 04 SENEL (dB)		Feb-Mar 05 SENEL (dB)		Apr 05 SENEL (dB)	
	Median	Δ	Median	Δ	Median	Δ	Median	Δ
1	68.2	-1.8	70.0	-1.8	71.5	-3.3	72.0	-3.8
2	72.3	-1.7	74.0	-1.7	73.2	-1.9	74.2	-1.9
3	72.9	-2.3	75.2	-2.3	74.6	-1.7	75.4	-2.5
4	72.8*	-3.6	76.4	-3.6	78.8	-6.0	75.9	-3.1

\* - Does not include Feb-Mar 05 data when preliminary analysis indicates that aircraft at Site 4 had landing gear down and may have been changing aircraft configuration after passing YOSHE navigation fix.

**Table 5: Comparison of Median Measured Lmax Levels for UPS Boeing 757 Approaches to Mather Airport**

Site	CDA Apr 05 SENEL (dB)	Apr-May 04 SENEL (dB)		Feb-Mar 05 SENEL (dB)		Apr 05 SENEL (dB)	
	Median	Median	Δ	Median	Δ	Median	Δ
1	53.2	58.8	-5.6	59.2	-6.0	58.0	-4.8
2	58.8	62.2	-3.4	61.4	-2.6	61.4	-2.6
3	61.0	64.7	-3.7	63.4	-2.4	64.0	-3.0
4	60.6*	65.3	-4.7	67.5	-6.9	64.3	-3.7

\* - Does not include Feb-Mar 05 data when preliminary analysis indicates that aircraft at Site 4 had landing gear down and may have been changing aircraft configuration after passing YOSHE navigation fix.



Figure 2

**PRELIMINARY**  
**Site 1 Comparison of Lmax and Slant Distance for UPS Flights for**  
**the Measurement Periods April-May 2004, February-March 2005, and April 2005**

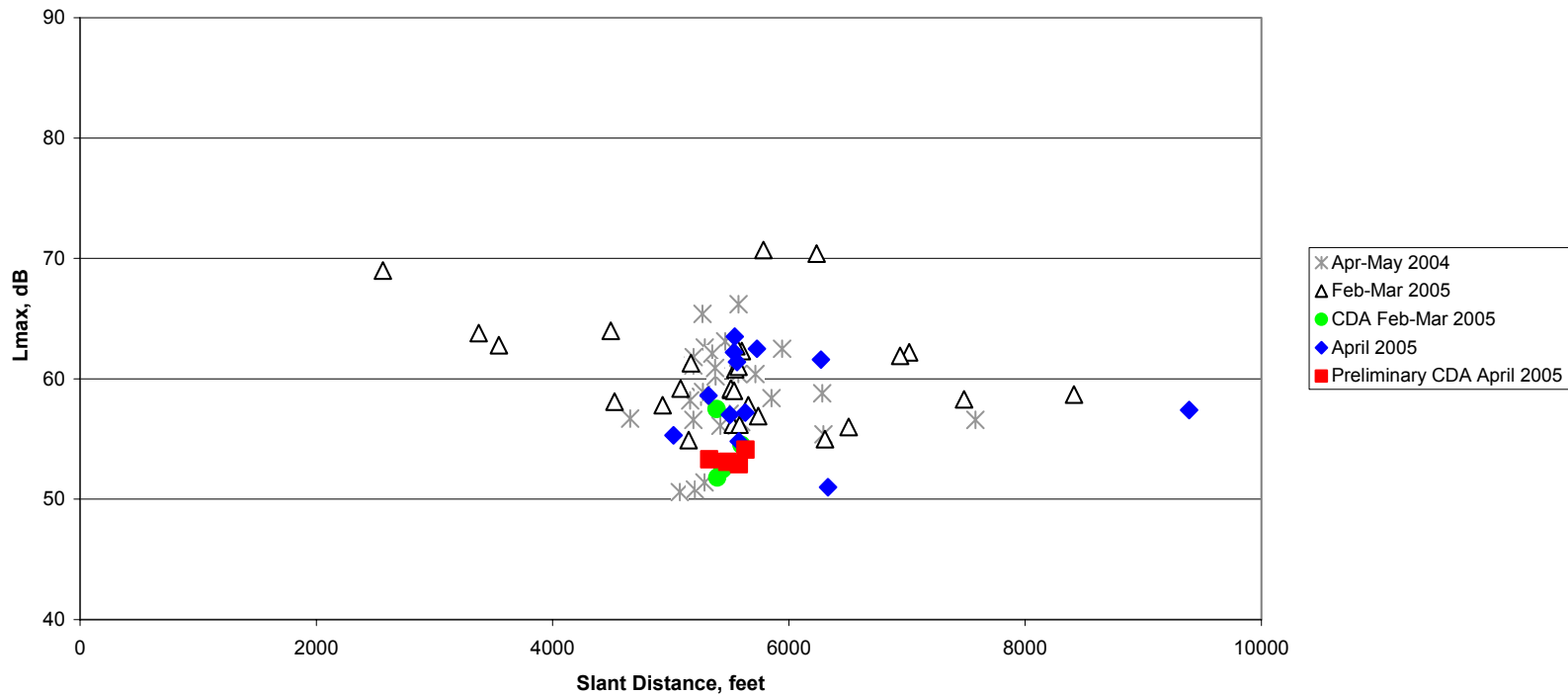


Figure 3

**PRELIMINARY**  
**Site 1 Comparison of SENEL and Slant Distance for UPS Flights for**  
**the Measurement Periods April-May 2004, February-March 2005, and April 2005**

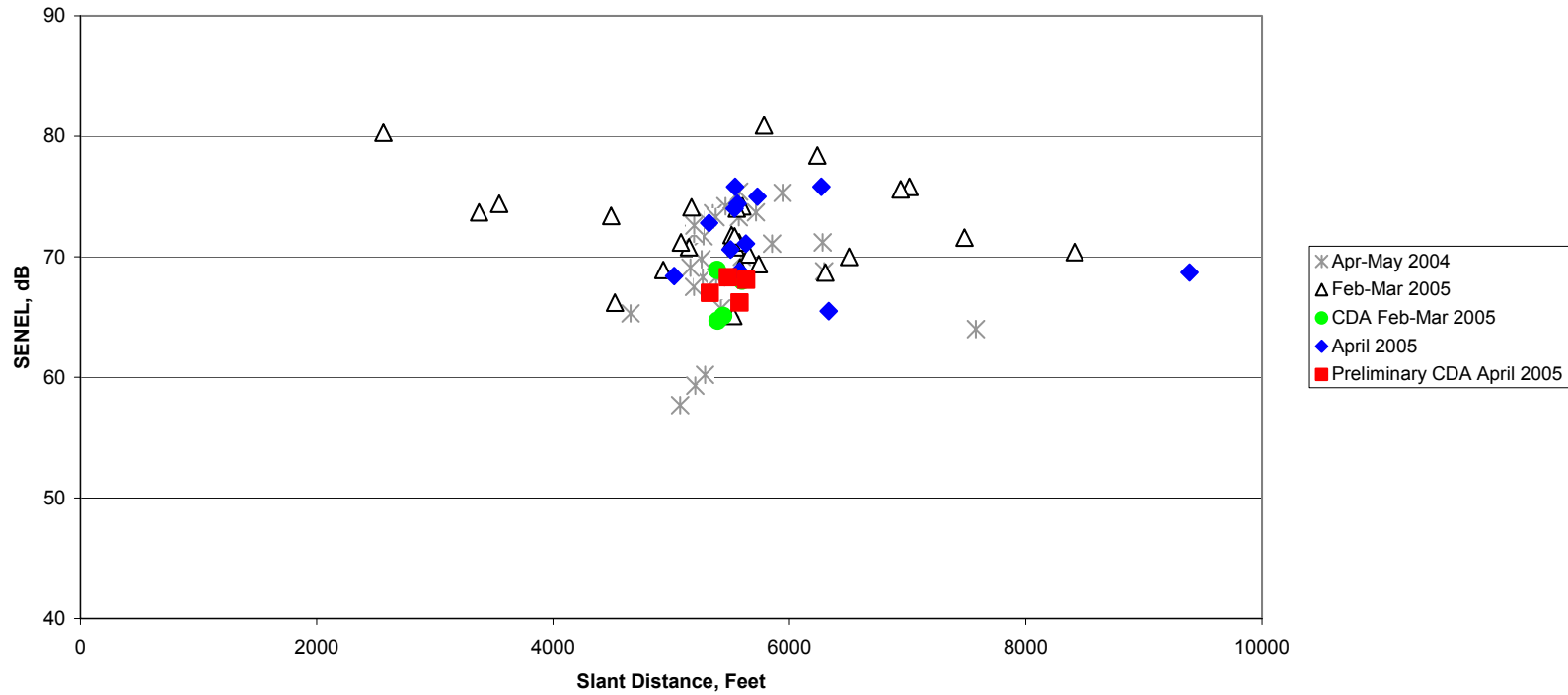


Figure 4

**PRELIMINARY**  
**Site 2 Comparison of Lmax and Slant Distance for UPS Flights for**  
**the Measurement Periods April-May 2004, February-March 2005, and April 2005**

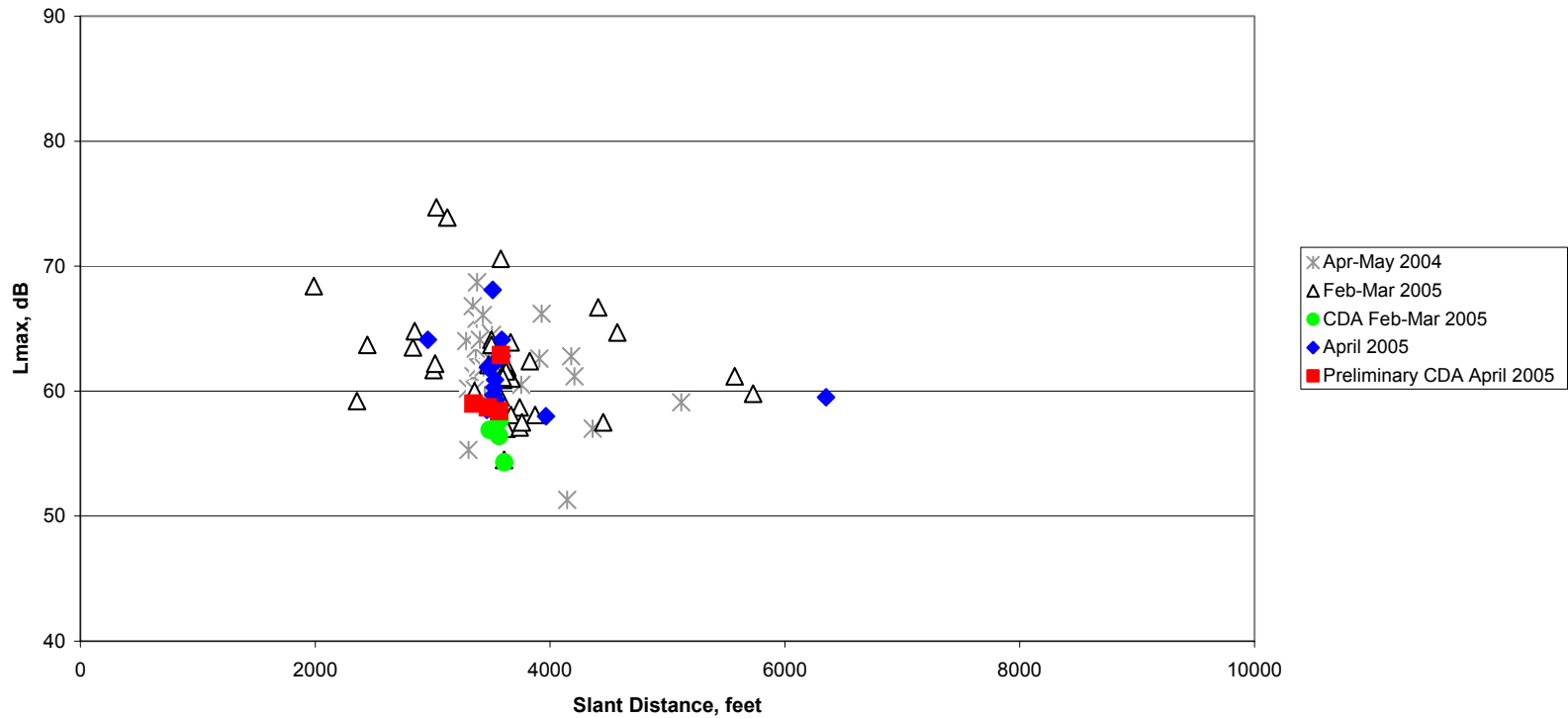




Figure 5

**PRELIMINARY**  
**Site 2 Comparison of SENEL and Slant Distance for UPS Flights for**  
**the Measurement Periods April-May 2004, February-March 2005, and April 2005**

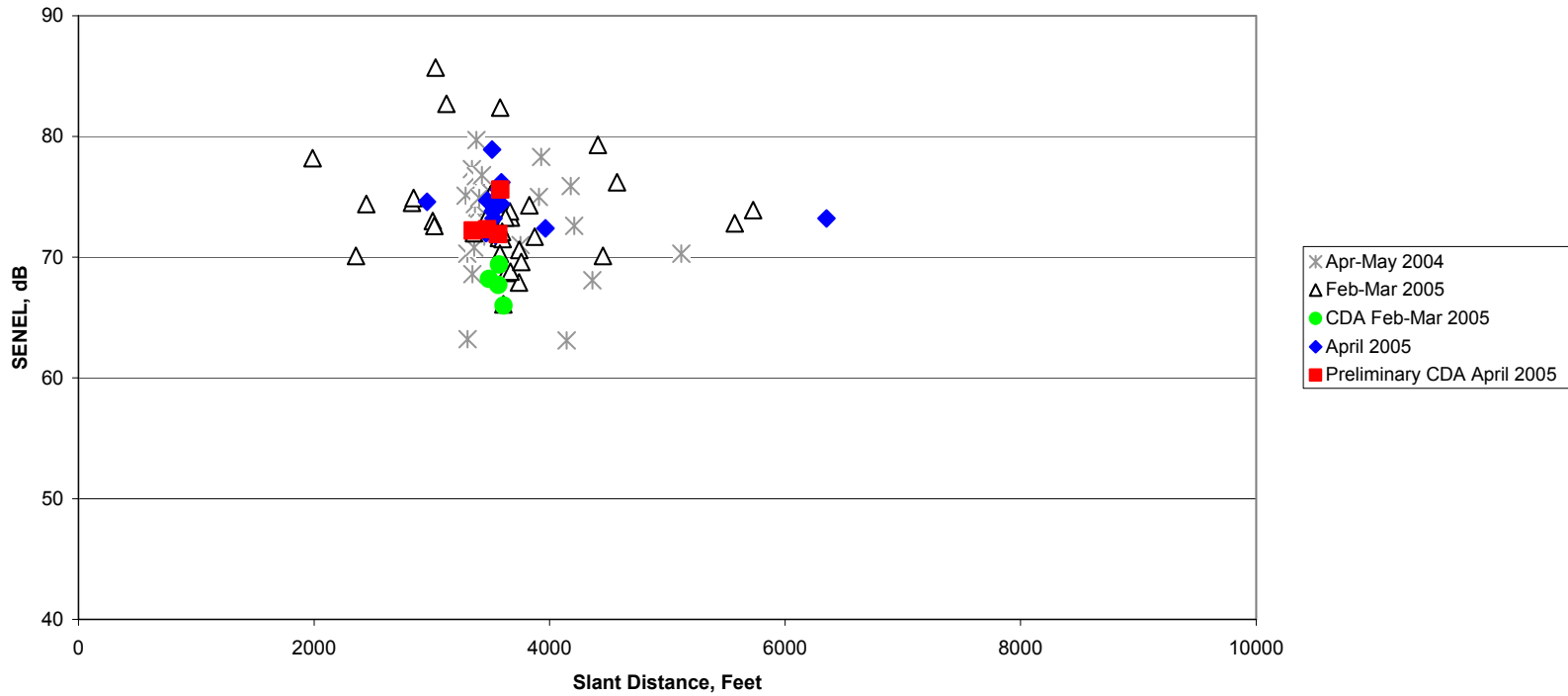


Figure 6

**PRELIMINARY**  
**Site 3 Comparison of Lmax and Slant Distance for UPS Flights for**  
**the Measurement Periods April-May 2004, February-March 2005, and April 2005**

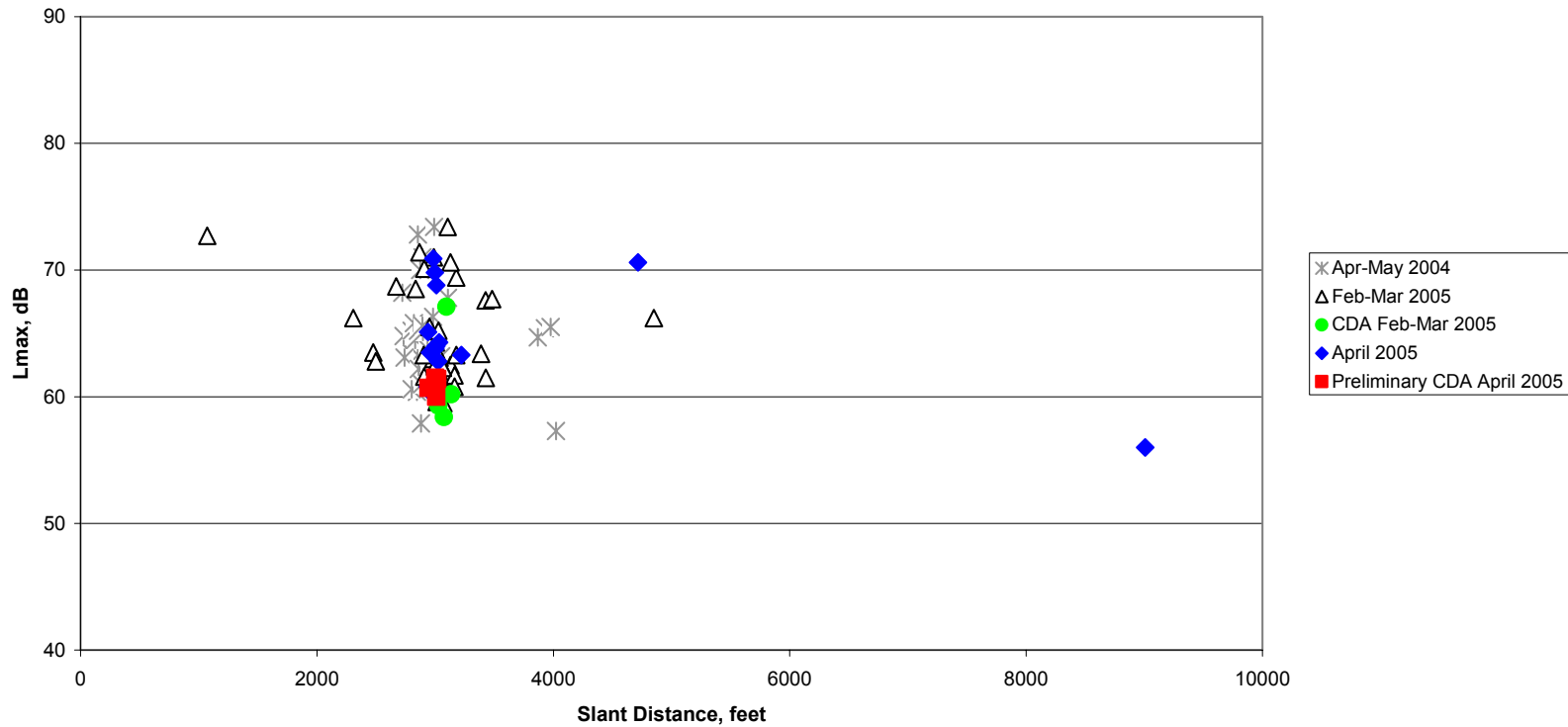


Figure 7

**PRELIMINARY**  
**Site 3 Comparison of SENEL and Slant Distance for UPS Flights for**  
**the Measurement Periods April-May 2004, February-March 2005, and April 2005**

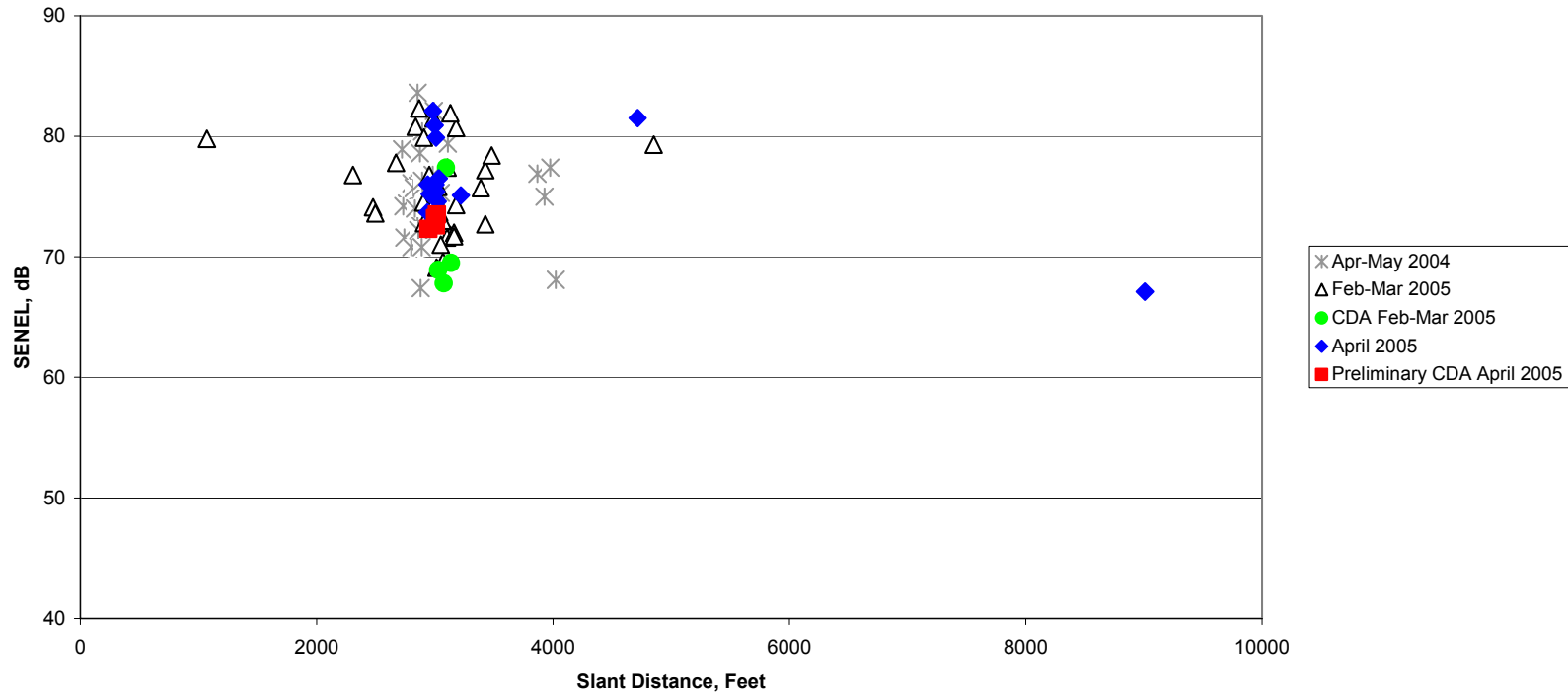


Figure 8

**PRELIMINARY**  
**Site 4 Comparison of Lmax and Slant Distance for UPS Flights for**  
**the Measurement Periods April-May 2004, February-March 2005, and April 2005**

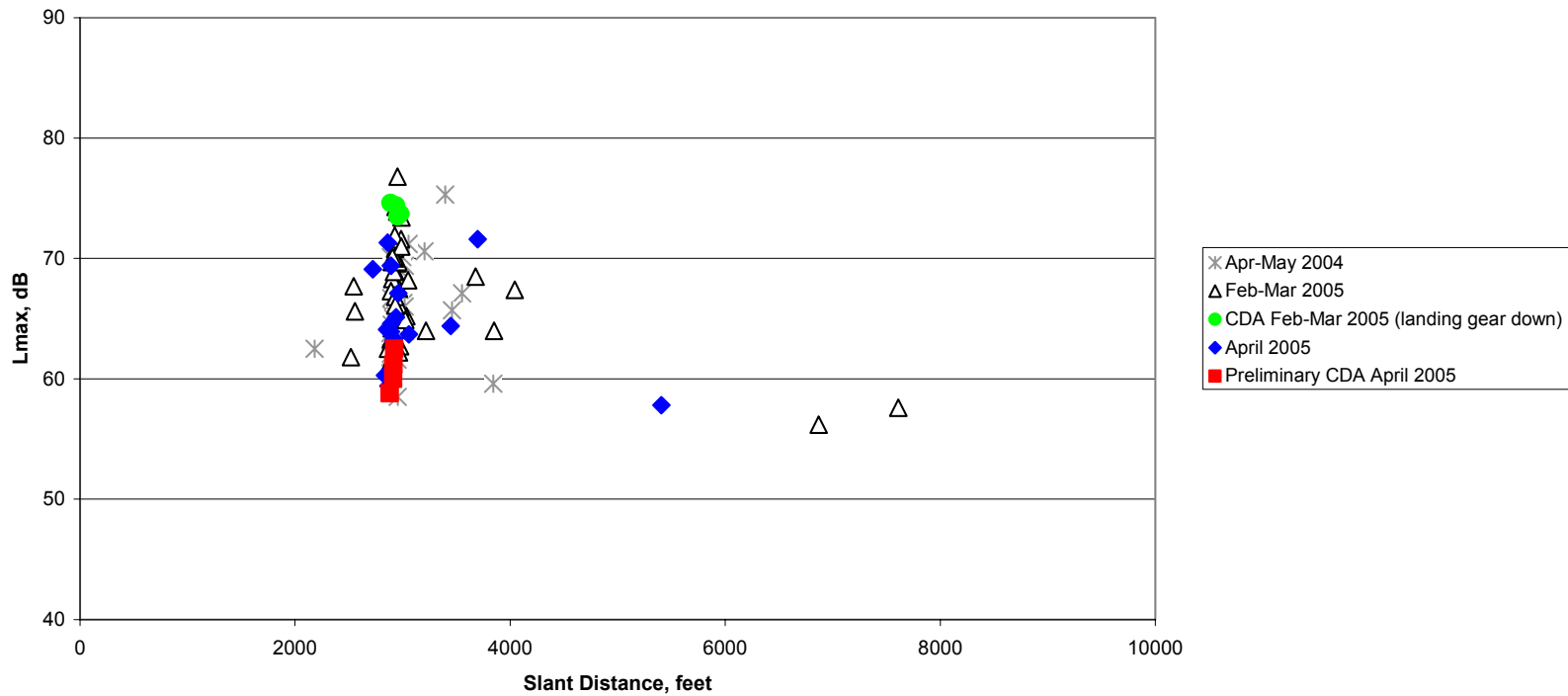


Figure 9

**PRELIMINARY**  
**Site 4 Comparison of SENEL and Slant Distance for UPS Flights for the Measurement Periods April-May 2004, February-March 2005, and April 2005**

