

# Santa Susana









Protecting human health and restoring the environment

# Boeing's Plans for Santa Susana

- Boeing will cleanup it's site to a risk-based suburban residential standard, protective of human health and the environment
- Boeing plans to preserve Santa Susana as open space for future generations

# Santa Susana – Future Open Space

- The cleanup is directed by the 2007 Consent Order with the DTSC
  - The 2007 Consent Order is fully protective of human health and the environment
- The site is safe for public access today
  - Access is controlled, and visitors are briefed on safety, environmental contamination and natural hazards
  - Contaminated areas are limited in extent, and chemical and radiological concentrations are not hazardous to visitors

# **Soil Investigation Areas**



# 2007 Consent Order

#### STATE OF CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY DEPARTMENT OF TOXIC SUBSTANCES CONTROL

In the Matter of: Santa Susana Field Laboratory Simi Hills Ventura County, California CAD093365435 (Boeing) CA1800090010 (NASA) CAD000629972 (Boeing/DOE) CA3890090001 (Boeing/DOE)

The Boeing Company, The National Aeronautics & Space Administration and The U.S. Department of Energy, (Respondents) Docket No. P3-07/08-003 CONSENT ORDER FOR CORRECTIVE ACTION

Health and Safety Code Section 25187

# 2007 Consent Order

- 3.5.2. The CMS [Corrective Measures Study] work plans shall detail the methodology for developing and evaluating potential corrective measures to remedy chemical contamination at the Facility utilizing the Standardized Risk Assessment Methodology (SRAM) Workplan.\*
- 3.6.1. At a minimum, DTSC shall provide the public with an opportunity to review and comment on the final draft of the CMS Reports, DTSC's proposed corrective measures for the Facility, and DTSC's justification for selection of such corrective measures.

#### STANDARDIZED RISK ASSESSMENT METHODOLOGY (SRAM) WORK PLAN SANTA SUSANA FIELD LABORATORY VENTURA COUNTY, CALIFORNIA REVISION 2 - FINAL

Prepared for:

THE BOEING COMPANY

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

U.S. DEPARTMENT OF ENERGY

Prepared by:

• :

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# Standardized Risk Assessment Methodology (SRAM) Workplan

"The purpose of the SRAM is to establish a standardized, regulatoryapproved approach to assess the human health and ecological risk of chemicals that are present in the various environmental media (e.g., air, soil, water) at the SSFL." \*

The scope of the SRAM includes both human and ecological risk assessments and describes the following:

- establish the requirements for data to be used for the risk assessment
- identify the criteria for selection of chemicals of potential concern for the human health and ecological risk assessments
- establish a conceptual model to identify human health and ecological receptors, exposure pathways, exposure points, and exposure mechanisms
- establish the procedure for human health and ecological toxicity assessments
- develop the procedure to characterize human and ecological risk

\*Similar methodology will be used for radionuclides if identified

# Standardized Risk Assessment Methodology (SRAM) Workplan

The primary source of guidance for this work plan comes from DTSC:

- In the case of human health risk assessment, this guidance is the Supplemental Guidance for Human Health Multimedia Risk Assessment of Hazardous Waste Sites and Permitted Facilities, 1992
- For ecological risk assessment, DTSC guidance is contained in Guidance for Ecological Risk Assessment of Hazardous Waste Sites and Permitted Facilities, 1996
- In each of these documents, DTSC references specific guidance documents from USEPA -
  - Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A), 1989
  - Exposure Factors Handbook, Volume I, General Factors, 1997
  - Guidelines for Ecological Risk Assessment, 1998

## **Risk Assessment Methodology - Generic**

#### **The 4 Step Risk Assessment Process**



## **Risk Assessment Methodology - Generic**

- Toxicity
- Dose Response
- Exposure vs. Dose
- Risk Characterization (excess cancer risk)

# **Exposure Scenario with Hot Spots**

100 rooms

Concentration 0 in 50 rooms

Concentration 1 to 50 in the other 50 rooms

Average exposure 12.75

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50

Consider, for example, a hypothetical set of 100 rooms (microenvironments) where the concentration of a particular pollutant is zero in 50 of them, and ranges stepwise from 1 to 50 (nominal concentration units) in the remainder. If one person were in each room, short-term "snapshot" monitoring would show that 50 people were unexposed and the others were exposed to concentrations ranging from 1 to 50. If the concentration in each room remained constant and people were allowed to visit any room at random, **long-term monitoring would indicate that all 100 were exposed to a mean concentration of 12.75**. The short-term data would tend to overestimate concentration and underestimate the number of persons exposed if applied to long-term exposures. If only average values were available, the long-term data would tend to underestimate concentration and overestimate the number exposure assessor should determine what effect this has on the exposure estimate.

# Standardized Risk Assessment Methodology (SRAM) Workplan

### $Dosage = \underline{C \times IR \times EF \times ED \times B}$

### BW x AT

where:

Dosage = ADD (mg/kg-day) for non-carcinogens;

LADD (mg/kg-day) for carcinogens

- C = chemical concentration in environmental medium (mg/kg soil; mg/L water; or, mg/m3 air)
- IR = intake rate (mg soil/day; L water/day; or, m3 air/day)
- EF = exposure frequency (days/year)
- ED = exposure duration (years)
- -B = bioavailability (fraction)
- -BW = body weight (kg)
- -AT = averaging time (days)

### Risk and Santa Susana Exposure Scenarios

### $Risk = LADD^1 \times CSF^2$

Adult/Child Resident - 24 hours/day, 350 days/year, for 24 years

24 x 350 = 8,400 hours per year

Worker - 8 hrs/day, 250 days/year, for 25 years

8 x 250 = 2,000 hours per year

Recreational User - 8 hours/day, 1 days/week, for 24 years

 $8 \times 50 = 400$  hours per year

<sup>1</sup> Lifetime Average Daily Dose

<sup>2</sup> Cancer Slope Factor (measure of toxicity)



- Risk Assessment is an established, science-based process that can be used to evaluate the human health and ecological consequences of exposure to chemicals and radionuclides, and inform remedy decisions
- Excess cancer risk is calculated and compared to an acceptable range considered to be 10<sup>-6</sup> to 10<sup>-4</sup>
- Risk-based Cleanup is Protective
  - Recreational users will be 10 times safer after a suburban residential cleanup than is normally acceptable for open space use
  - Ecological receptors are also protected under the 2007 Consent Order



# Santa Susana Site Map



# **Cultural Resources**

#### **Burro Flats Pictographs**



Historic Aerospace Site American Institute of Aeronautics and Astronautics (AIAA)



# **Natural Resources**



Santa Susana Tar Plant California Species of Concern



Braunton's Milkvetch Federally-endangered species



Coast Horned Lizard Federal/State Species of Concern



California Legless Lizard California Species of Concern

# **Groundwater Investigation and Cleanup**



# **Demo – Overall Progress**







# California Senate Bill (SB) 990

- 2007 California legislature enacted SB 990
- Unique cleanup requirements both radiological and chemical contamination applicable to Santa Susana only
- Required
  - ✓ soil clean-up as much as 4 times the suburban residential level
  - ✓ significantly extend the project completion date,
  - ✓ added traffic disruption,
  - ✓ increased air pollution
  - destruction of habitat, all with minimal increased protectiveness.
- 2009 Boeing filed a lawsuit in Federal Court challenging SB 990 on Constitutional grounds.
- Under oath, the State's expert witnesses admitted that:
  - ✓ the pre-SB 990 cleanup process under the 2007 Consent Order fully protected human health and the environment, and
  - the State could not identify any technical or public-safety reason to single out Santa Susana for more onerous cleanup requirements than are being applied to other California sites containing similar radiological and chemical contamination.
- 2011 U.S. District Judge John F. Walter invalidated SB 990
- The State has appealed the decision to the U.S. Court of Appeals for the Ninth Circuit.

## **EPA Radiological Survey Conclusions**

- "EPA received \$41.5 million of DOE and Recovery Act Funds from the Federal government to conduct one of the most robust technical investigations ever undertaken for low-level radioactive contamination"
- "In general, EPA found elevated radiation levels in the areas where we expected to find them, isolated to a number of former process or disposal areas"
- "Level of radiation throughout most of the Area IV study area was lower than the offsite background locations"
- "This survey resulted in the discovery of several areas of elevated radiation levels, but none posed a health risk to personnel"

## Summary of EPA Survey Data

• Out of 3,542 soil samples and 128,020 separate analyses ...

- Only 487 (0.38%) results exceed the EPA background levels
- Only 11 (<0.01%) results exceed the EPA acceptable risk range for conservative residential land use
- Only 8 (<0.01%) results exceed the former cleanup standard for conservative residential land use
- No results exceed the EPA acceptable risk range for open space land use
- Demonstrates that alleged massive, widespread contamination does not exist, and that past remediation has been effective in eliminating the majority of contamination that did exist