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**Title:** FTWC Dose Calculation Locations & Regional Air Monitoring Sites

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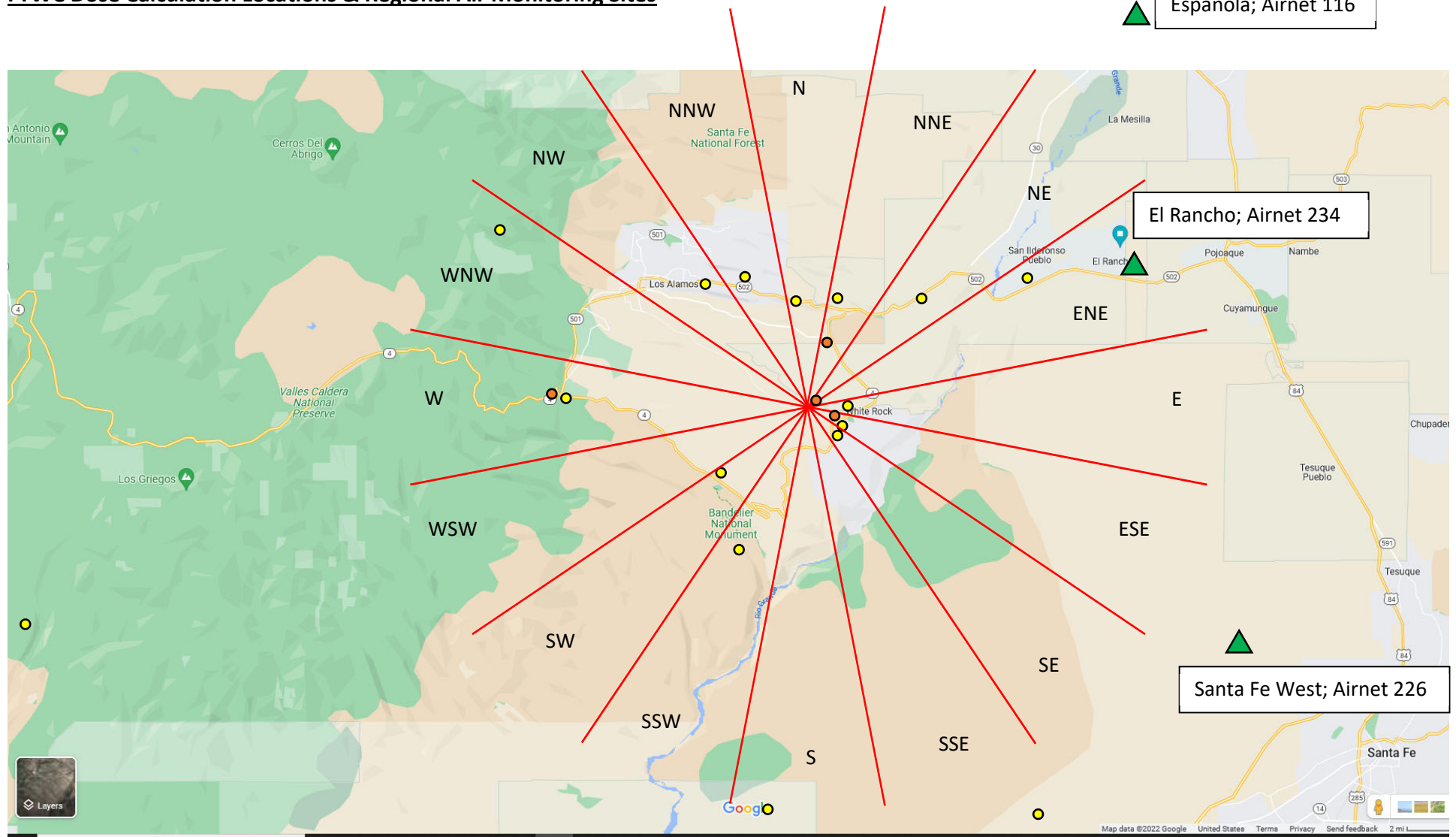
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## FTWC Dose Calculation Locations & Regional Air Monitoring Sites



-  Red: TA-54 Building 1028, FTWC Vent Location; 16-sector grid centered on that location. Vent stack is monitored for tritium releases.
-  Yellow dots: CAP88 dose calculation locations, closest public receptor in each sector. Options for Maximum Exposed Individual (MEI) locations.
-  Orange dots: Field bubblers, used to monitor for tritium in both water vapor and elemental gas form.
-  Green Triangles: Regional Airnet stations, CAP88 dose is also calculated at these locations. All Airnet stations measure tritium in water vapor form.

**CAP88 Evaluation Locations, Sorted by Direction**
**CAP88 Dose Calcs: Predicted Daytime Winds**

Location	Distance	Direction	Sector#	Dose if 100% release 93,000 Ci (2023 Decay)	Dose with "bad case" release of 40,000 Ci
Airnet 395 (East Gate Tank)	4858 m	N	1	1.86 mrem	0.80 mrem
Holiday Inn Express	5240 m	NNW	2	0.64 mrem	0.28 mrem
Airnet 328 (DP Road - Monitor)	6560 m	NW	3	0.33 mrem	0.14 mrem
Pajarito Ski Area	15050 m	WNW	4	0.13 mrem	0.06 mrem
Ponderosa Campground	10800 m	W	5	0.41 mrem	0.18 mrem
Ponderosa Post Office	40920 m	WSW	6	0.07 mrem	0.03 mrem
Airnet 391 (Bandelier Gate)	4820 m	SW	7	2.33 mrem	1.00 mrem
Bandelier Visitor's Center	6270 m	SSW	8	1.21 mrem	0.52 mrem
La Bajada Village	30140 m	S	9	0.07 mrem	0.03 mrem
Santa Fe Riders	25685 m	SSE	10	0.07 mrem	0.03 mrem
Residence on Karen Circle	2308 m	SE	11	3.63 mrem	1.56 mrem
La Vista Nazarene Church	2195 m	ESE	12	3.44 mrem	1.48 mrem
Regional Airnet 226 (Santa Fe West)	24380 m	ESE	12	0.08 mrem	0.04 mrem
White Rock Visitor's Center	3050 m	E	13	2.33 mrem	1.00 mrem
Airnet 294 (San Ildefonso Village)	12000 m	ENE	14	0.30 mrem	0.13 mrem
Regional Airnet 234 (El Rancho)	16660 m	ENE	14	0.18 mrem	0.08 mrem
Totavi Gas Station	7622 m	NE	15	1.02 mrem	0.44 mrem
Regional Airnet 116 (Espanola)	24060 m	NE	15	0.17 mrem	0.07 mrem
LA County Water - South	4759 m	NNE	16	3.26 mrem	1.40 mrem

**Downwind Advanced Tritium Monitoring**

Field Bubbler: Area G North	400 m	NNE	
Field Bubbler: Airnet 392, WR Pajarito Road	2034 m	ESE	
Field Bubbler; Airnet 137 Well PM-1	3533 m	NNE	
Field Bubbler; Airnet 390 West Gate	225 m	SW of tritium facility (WETF); operated during transportation events only	

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# Commentary: FTWC Operations & Public Dose

## **Regulatory Limits**

The limits established in the Clean Air Act by the Environmental Protection Agency are protective of even the most vulnerable members of the public, including pregnant women, children, and the elderly. By keeping emissions within these limits, we are ensuring that LANL operations will cause no harm to any member of the public in the surrounding communities or tribal nations.

## **ALARA principles for FTWC operations**

- Only one drum is processed at a time to reduce the emissions potential.
- Pressure relief operations will take place in small 10 psi increments to allow better tracking of emissions and time for system equilibration.
- The exhaust system is equipped with a molecular sieve bed (AL-M1) to capture tritium in water vapor form.
- Emissions will be monitored in real time with multiple systems.
- Emissions will be tracked throughout the operation and compared to established daily limits.
- Pause points have been established at 3 millirem and 6 millirem, where we will temporarily pause operations to evaluate the completeness of the project & remaining work.
- A “hard stop” of 8 millirem is established; no further venting will be performed if this threshold is reached.
- We use worst-case wind conditions to determine emitted activity thresholds based on these pause points & stop point.
- After each day of operation, we will evaluate the actual off-site doses based on actual wind conditions & that day’s emissions.
- The next day’s pause & stop points will be recalculated based on releases to-date, again using worst-case wind conditions to calculate these corresponding emissions levels.
- Enhanced tritium monitoring at multiple downwind locations, developed in conjunction with EPA Region 6 staff.

## Operational Philosophy of the TA-54 Area G FTWC Remediation Project

LANL's FTWC remediation plan is designed to eliminate the chance of an **Uncontrolled**, **Unmitigated**, or **Unmonitored** release of radioactive material from the FTWCs stored at TA-54, Area G.



Controls	<ul style="list-style-type: none"><li>• Operational work flow treats one FTWC at a time to reduce the amount of “material at risk” at any point.</li><li>• Slow step-down of pressure levels allows system equilibration and minimizes the chance of a runaway reaction.</li><li>• Process steps use continuous system checks to ensure worker and public safety.</li><li>• Emissions management plan incorporates hold points and a hard stop limit to ensure regulatory limits are not exceeded.</li></ul>
Mitigation	<ul style="list-style-type: none"><li>• The FTWC exhaust system is equipped with a molecular sieve which will capture tritium in water vapor phase. Tritiated water vapor is the most hazardous chemical form of tritium, and its removal from the exhaust air stream minimizes downwind dose consequences.</li></ul>
Monitoring	<ul style="list-style-type: none"><li>• Real-time monitoring of FTWC emissions.</li><li>• Regulatory compliance emissions “measurements of record” will identify the chemical form of emissions.</li><li>• Expanded downwind air sampling at public receptor locations.</li><li>• Daily dose calculations to public receptor locations in every wind sector and to additional selected points of interest.</li><li>• Periodic updates to public reading room of emissions and dose status.</li></ul>



### Dose calculation processes

Questions have been raised about the dose conversion factors for children, pregnant women, etc. Can LANL claim compliance with the EPA 10 millirem standard (in 40 CFR 61.92) when considering these other possible dose conversion factors? There are two perspectives for consideration:

Regulatory perspective. The Radionuclide NESHAP (40 CFR 61.92) establishes a limit on airborne emissions to those which “would cause any member of the public to receive in any year an effective dose equivalent of 10 millirem/yr.” This regulation also prescribes the methods by which this dose shall be calculated, including various computer models. At the time of this regulation’s issuance, the models called out (“CAP-88 or AIRDOSE-PC”) did not have age-dependent dose conversion factors, so the 10 millirem limit is de facto applied to an adult. Later versions of CAP88-PC do have these capabilities, but the EPA has not promulgated requirements to use such age-dependent dose factors when determining public dose consequence from DOE operations.

Scientific perspective. The 10 millirem limit is extremely low when compared to levels of radiation exposure that have detrimental effects to human health. Natural background radiation in Northern New Mexico averages around 400 millirem per year, dominated by cosmic rays from living at high elevations and terrestrial dose from the area's geology. Compared to the typical year-to-year variation in background radiation exposure levels, the regulatory limit of 10 millirem is essentially lost in the noise. Furthermore, the radiological dose required to have any observable biological effects (marked by a deviation in white blood cell count) is over 10,000 millirem. **The EPA limits are more than a thousand times lower than dose levels at which any biological effects have been observed.** Certainly, one can discuss different dose conversion factors for various population groups, including children, women, and different races and ethnicities. However, the difference in these dose factors is sometimes in the order of a factor of five, a factor of ten, etc. The emissions from LANL, regardless of specific factors used to calculate the public dose, are still well below any levels that could possibly result in human health effects.