

Can Housing Be Built Safely above Mountain View's TCE-Contaminated Groundwater

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Mountain View, California, like several other Silicon Valley communities, suffers from a chronic housing shortage, making it one of the most expensive places in the country to live. Since the great recession of 2008-2009, employment growth, especially at high-tech businesses such as Mountain View-based Google and its affiliates, has far outstripped housing construction. In 2016, the most recent year for which I have found data, Mountain View, a suburb with 81,000 residents, had 44,000 more jobs than employed residents, or nearly two jobs per employed resident.

The 2020 COVID-19 outbreak hit Silicon Valley before it exploded across the United States, and Bay Area health officials responded earlier than other regions, issuing a shelter-in-place order in mid-March. While many workers are able to work from home, and some continue working in essential occupations, many others were furloughed. If this condition continues, the local demand for housing may grow more slowly. But given the number of people who have been commuting great distances to work in Silicon Valley, the need for additional housing is unlikely to disappear.

In fact, based on previous downturns, it's likely the economic recovery will be quick and substantial, whenever the virus outbreak is controlled. To the degree possible, Mountain View and its neighbors should be using this period to prepare for another round of housing development.

Starting around 2014, and accelerating in 2015 with the election of pro-housing councilmembers, Mountain View has been leading the region in planning for and approving new housing development. Mountain View's strategy is simple: build mixed-use, medium-density



South of 101 Regional Groundwater Treatment System

neighborhoods, complete with homes, retail, schools, parks, habitat, trails, and jobs, on property that previously hosted commercial activity. This not only addresses the housing shortage. It reduces commuting and greenhouse gas emissions.

In perhaps a majority of projects, Mountain View's strategy for adding housing on previously commercial property means constructing apartments and other homes on property with underlying groundwater contamination. The largest, most contaminated toxic groundwater plume in the city is known as the Middlefield-Ellis-Whisman (MEW) Superfund Study Area. Named for three city streets that approximate its original boundaries, the plume primarily consists of trichloroethylene (TCE) and other compounds that were released by electronics manufacturers and the Navy prior to the 1980s, when the contamination was discovered. The study area is comprised of four federal National Priorities List (Superfund) sites—Raytheon Corporation, Intel Corporation, Fairchild Semiconductor Corporation, and portions of the former Moffett Field Naval Air Station. Recently, U.S. EPA extended the MEW area after it discovered subsurface contamination to the west of Whisman Road, all the way to Stevens Creek. This area is known as Operable Unit (OU) 3.



Investigating Operable Unit 3

No one ingests contaminated water from the plume, but local groundwater is still considered a potential drinking water source that requires protection. So early on EPA required the polluters—over a dozen companies and two federal agencies, also known as “responsible parties”—to remediate groundwater, primarily through groundwater extraction and treatment. Some of the responsible parties also installed subsurface “slurry walls” to slow the horizontal movement of contaminated groundwater. That massive cleanup limited the outward migration of the plume and reduced the quantity of TCE found underground. The cleanup strategy was documented in a 1989 Record of Decision (ROD). It originally applied to the private companies responsible for pollution south of 101, but it was later extended to the Navy and NASA, responsible for toxic releases north of 101.

While contact with contaminated surface soils at first represented a health risk, the responsible parties quickly removed soil with TCE above 5 parts per million, as well as other contamination.

Vapor Intrusion

More important, fumes from shallow contaminated groundwater and soil gas can migrate into overlying buildings, exposing occupants to low, but sometimes unacceptable levels of TCE, which can cause cancer, birth defects, and neurological disease even at very low concentrations. This phenomenon is aptly called “vapor intrusion.” The MEW Study Area, along with the nearby former GTE property, became one of U.S. EPA’s first and largest vapor intrusion projects in late 2002.

Over the years, EPA and the responsible parties detected elevated levels of TCE in indoor air in older commercial buildings, new office buildings that replaced the polluting manufacturing plants, and a small number of homes. Fortunately, the main body of the plume flowed away from existing residential areas, toward the San Francisco Bay. In late 2012 EPA sampling detected high levels of TCE in shallow groundwater in limited portions of the residential area west of Whisman Road. EPA later concluded that those chemicals leaked from a city sewer line that had collected waste from MEW companies between 1961 and 1966. This became OU 3 in 2015.

In 2002 U.S. EPA began a process that culminated in the 2010 amendment to the 1989 cleanup ROD. The Vapor Intrusion ROD Amendment addresses the potential for vapor intrusion in both existing and new residential and commercial buildings.¹ If projections of concentrations of TCE in indoor air exceed EPA’s site-specific action level of 1 microgram per cubic meter ($\mu\text{g}/\text{m}^3$) in new residential buildings, it requires that new housing within the Vapor Intrusion (VI) Study Area² be constructed with vapor barriers and passive mitigation systems designed to be made active if monitoring shows unacceptable vapor intrusion. Large buildings, such as apartments or condominiums may be placed above well-ventilated parking garages. Passive systems must be designed to be made active if sampling shows unacceptable vapor intrusion. The ROD Amendment requires that such systems be monitored and maintained, and floors and slabs must be periodically checked (and repaired if necessary) for deterioration.

The Vapor Intrusion ROD Amendment also established a Remedial Action Objective (RAO) to accelerate reduction of the source of vapor intrusion (i.e., contaminants in shallow groundwater) to levels that would be protective of current and future building occupants. That is, over time groundwater must be cleaned so the need for vapor intrusion mitigation will be minimized or no longer necessary. EPA’s July, 2009 Vapor Intrusion Pathway Proposed Plan stated that the RAO would not be addressed by this proposed vapor intrusion remedy; rather it

¹ *Record of Decision Amendment for the Vapor Intrusion Pathway, Middlefield-Ellis-Whisman (MEW) Superfund Study Area*, U.S. Environmental Protection Agency, August, 2010, available on line at <https://semspub.epa.gov/work/09/1163792.pdf>

² The Vapor Intrusion Study Area generally comprises the area above the upper-most aquifer of the MEW Study Area, except in the area known as OU-3, where contours of the plume have not yet been fully mapped.

would be addressed by a groundwater remedy devised in “a separate Supplemental Site-wide Groundwater Feasibility Study for the Site.”³ EPA hopes to complete that study in 2020.

EPA’s 2019 Five-Year Review for the MEW Site, required by law to evaluate the protective of the Superfund cleanup, emphasized the need for additional subsurface cleanup. It reported:

The groundwater and vapor intrusion remedy at the Middlefield-Ellis-Whisman (MEW) Superfund Area is currently protective of human health and the environment because there is no direct exposure to contamination. Governmental controls are in place to prevent access to contaminated groundwater. The vapor intrusion control systems, monitoring program, and institutional controls are in place to minimize exposure risk from vapor intrusion. However, in order for the remedy to be protective in the long-term, alternative groundwater cleanup technologies should be selected in order to accelerate the reduction of the source of vapor intrusion in the Shallow Zone.⁴

New Residential Development

In November, 2019 the Mountain View City Council adopted the East Whisman Precise Plan, blueprint for the evolution of the one of the city’s largest industrial/commercial areas, covering 412-acres. The plan calls for the creation of 4,800 to 5,000 housing units, 20% of which are supposed to be rented or sold at below market rents or prices, and it contains a strategy that requires the developers of new office buildings to facilitate residential development.⁵

It’s not clear yet how much of that housing will be built above the MEW plume or the nearby, smaller Hewlett-Packard Plume on East Middlefield. SummerHill Homes’ proposal to build 463 residential units on East Middlefield is along the southern edge of the plume while Miramar Property’s 367-unit project on Logue Avenue is sandwiched between the two plumes. Google is expected to propose substantial amounts of housing on property it already owns or is expected to buy above the plume.

Meanwhile, NASA now owns most of the former Moffett Field Naval Air Station. Facing a shortage of housing for its employees, in 2017 it proposed to build about 2,000 housing units on a 46.5-acre parcel just north of 101, above some of the highest concentrations of TCE in the shallow regional groundwater plume. Its private partner, Clark Realty Capital (CRC), is supposed to build 400 units by 2025. Preference will be given to employees of NASA and its lessees.

EPA and building owners will continue to monitor and respond to TCE contamination inside commercial buildings, but there is public concern over plans to locate 7,000 homes on or near the MEW groundwater plume. In addition, several thousand more homes are planned for the city’s North Bayshore area, a little more than a mile away. Much of North Bayshore lies over the distal portion of the Teledyne-Spectra Physics plume. TCE concentrations in this expansive groundwater plume are lower than those found at MEW.

³ *Proposed Plan for the Vapor Intrusion Pathway, Middlefield-Ellis-Whisman (MEW) Superfund Study Area*, U.S. Environmental Protection Agency, July, 2009. Page 9 (page 11 of PDF), available on line at <https://semspub.epa.gov/work/09/1121394.pdf>.

⁴ *Fourth Five-Year Review Report for Middlefield-Ellis-Whisman (MEW) Superfund Study Area*, U.S. Environmental Protection Agency, September 2019, available at <https://semspub.epa.gov/work/09/100018492.pdf>

⁵ *East Whisman Precise Plan*, City of Mountain View, November 2019, available at <https://www.mountainview.gov/civicax/filebank/blobdload.aspx?BlobID=32005> . Page ii (page 4 of PDF)



Developer-conducted remediation at 277 Fairchild

Fortunately, Mountain View has a decades-long history of cooperation with EPA, the Regional Water Board, and the state of California's Department of Toxic Substances Control. In 2009 Mountain View adopted permitting procedures that:

oblige those proposing new building construction within the MEW Study Area to obtain EPA approval of construction plans to ensure that, where necessary, the appropriate vapor intrusion control system is integrated into building construction.⁶

The city also uses the California Environmental Quality Act to reinforce regulatory requirements to mitigate vapor intrusion in new construction. NASA, which has a signed Federal Facilities Agreement with EPA to implement the Superfund response at Moffett Field and Ames Research Center, promises similar cooperation.

⁶ This policy was highlighted by EPA in its 2015 Vapor Intrusion Technical Guide. U.S. Environmental Protection Agency Office of Solid Waste and Emergency Response, *OSWER Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air*, OSWER Publication 9200.2-154, June, 2015 at <https://www.epa.gov/sites/production/files/2015-09/documents/oswer-vapor-intrusion-technical-guide-final.pdf>. See page 186 of PDF.

What More Can Be Done?

Nevertheless, more can be done to ensure that residents and other occupants of new buildings are protected and informed. While vapor intrusion has been measured at unacceptable levels in some existing commercial buildings, there is greater public concern that future residential structures, designed to include vulnerable populations such as children and older seniors, could lead to unacceptable exposures to TCE and other hazardous substances.

Therefore, I asked CPEO's Technical Advisor, Peter Strauss, to take a look at future housing development issues. Specifically, I asked that he consider what else our community could do to protect residents and other occupants of buildings above or near the Regional Plume? What should be done to make our community aware of potential risks, as well as what has been done to address them? Should investigation, remediation, mitigation, and long-term management be strengthened?

Strauss' technical memo accompanies this report, and it can be found on-line at <http://www.cpeo.org/pubs/MEWHousing.pdf>. Strauss took a detailed look at the issue of future homes on or near the large, "regional" TCE groundwater plume. In his analysis, he has tried to answer the following questions:

- Will the long-delayed upper aquifer groundwater ROD include soil vapor and other lines of evidence to help guide new construction and mitigation strategies?
- Can passive mitigation systems provide an adequate margin of safety, given that they are less predictable in their ability to prevent vapor intrusion?
- Are regulatory standards and protocols sufficient to guide safe development of future construction in areas above the plume that have of high concentrations of TCE?
- Are long-term operations, maintenance, and monitoring (OMM) plans adequate?
- Are the Institutional Controls adequate to ensure that long-term management plans are properly implemented?
- Can the City of Mountain View impose vapor intrusion remedies in areas that are not within the boundaries of the MEW Vapor Intrusion Study Area?
- Should the NASA Environmental Issues Management Plan's (EIMP) requirements regarding preferential subsurface pathways be replicated to other areas of the VI Study Area?

Strauss has also made the following recommendations to the regulatory agencies, the City of Mountain View, and NASA:

1. EPA should complete the Record of Decision (ROD) Amendment for accelerating groundwater cleanup as soon as possible. Preliminary standards regarding soil vapor and groundwater lines of evidence need further discussion and documentation.
2. The ROD Amendment should resolve the questions regarding the adequacy of passive systems. EPA should establish criteria to guide property owners when to transform these systems to active mitigation.

3. EPA should err on the side of caution and require active mitigation in new construction above areas of the plume with particularly high TCE concentrations. It should establish a bright line to guide where active systems are mandatory.
4. The parties responsible for cleanup, in consultation with building owners and operators as well as EPA, should develop a regional long-term management framework to guide building-specific Operations, Maintenance and Monitoring (OM&M) Plans.
5. The Responsible Parties should fund development-related monitoring and mitigation activities within OU 3. When the area along Evandale was first identified, the MEW PRPs paid for additional investigation, including indoor air monitoring in circumscribed areas, and they funded a pilot study using in-situ chemical oxidation. However, the RPs have since refused to fund additional investigations and implementation of mitigation systems for properties within OU 3. EPA itself does not have funds for additional investigation or mitigation.⁷
6. EPA should continue to hold community outreach sessions. EPA and/or NASA should consider placing placards on buildings, other than single-family homes, that lie above the regional plume. The placards should explain the historic contamination, what has been done to protect occupants, and provide contact information. Additionally, EPA should provide guidance on how to notify owners and occupants in addition to the normal real estate disclosure process.
7. The City of Mountain View should amend its policy in areas with known VOC contamination to require that developers take steps to reduce the potential for lateral migration of VOCs in utility corridors.
8. The City of Mountain View should require developers of properties outside the VI Study Area to conduct soil vapor screening if the properties are located adjacent to or downgradient from known TCE or similar plumes. Adjacency distances may vary with plume containment, depth, and annual movement, but at a minimum, properties within 200 feet of a known plume should be evaluated.
9. NASA should develop strong notification requirements for newly constructed homes and buildings on leased lands in its upcoming Environmental Issues Management Plan. These will need to be monitored by NASA staff. Various federal and state agencies (the US Army, NASA, UC Berkeley) that have properties on Moffett Field should coordinate with NASA.

⁷ Based on conversation with Alana Lee, EPA Project Manager, February 13, 2020

Spill Incidents and Contaminated Groundwater—East Whisman Precise Plan

