Experts question safety of massive groundwater pumping for basements in Palo Alto

by Sarah Trauben and Georgia Wells

Day-in, day-out from April through October, residents of Old Palo Alto have noticed the incessant pumping of water — estimated at up to 13 million gallons taken from one property alone.

In the last two years, eight property owners have built basements in or near the pricey neighborhood, according to Mike Nafziger, a Public Works Department senior engineer.

The catch is that the high water table in the area forces “dewatering” of millions of gallons of groundwater before a basement can be built. Yet because the aquifers flowing under Palo Alto are billions of gallons the impact of pumping is relatively small, according to one city official. At most it would cause a temporary depression in the water table, he said.

Noise annoyance aside, some residents are concerned about what’s in the groundwater and whether pumping it out actually draws a toxic plume from the Stanford Research Park closer to their residential neighborhood.

The plume, which mainly stems from an underground tank that for years leaked trichloroethylene (TCE) as well as other chemicals, was first discovered in 1981 and was listed as a Superfund site in 1990. The most prevalent chemical, TCE, is a known carcinogen and solvent for cleaning metal equipment. It is already the subject of ongoing study and clean-up effort.

There are regulatory safeguards at various levels of government. But testing of pumped groundwater is optional and sporadic, and the multiple agencies involved create a potential for gaps.

City officials don’t appear to be worried.

The pumping is legal and approved by the city’s Public Works Department and Palo Alto’s Regional Water Quality Control Plant in the baylands.

But sucking water out of shallow wells to “dewater” a site so a basement excavation can occur ranges from 30 to 50 gallons per minute, 24 hours a day for between

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three and six months, according to a 2008 city staff report.
The volume of water removed ranges from 3.9 million to nearly 13 million gallons per property.
The eight permits over the past two years totaled just under 50 million gallons, according to city estimates — equivalent to approximately 75 Olympic-size swimming pools.
The latest pumping involves Google co-founder Larry Page’s large basement project in the 2100 block of Bryant Street.

‘With such uncertainty, I would worry about the effects of this pumping.’

— Yoram Rubin, hydrologist, UC Berkeley

In 2008, some residents questioned whether pumping from earlier projects in the area might be drawing the toxic-contaminated plume toward residential neighborhoods. The plume presently primarily underlies non-residential areas in the vicinity of Page Mill Road and El Camino Real — but it includes the Chesnut-Wilton-Ventura neighborhood of smaller homes as well as apartments along Sherman Avenue near the North County Courthouse, according to a Santa Clara Valley Water District map.
The Larry Page property is about 1,500 feet east of the contaminated plume, according to the map.

Five of the eight residences where the pumping is happening are aligned north and east of Page’s property, lying between Oregon Expressway and Embarcadero Road.

So far, no toxics have been found in water pumped from the projects, according to Ken Torke, environmental control programs manager at the city’s Regional Water Quality Control Plant.

But that’s because no one has looked. The treatment plant has not required a single property to test the water, Torke said.
The homeowners are not required under city, state or federal law to have the pumped groundwater tested. But the boundaries of the contaminated plume have not been precisely measured and need further study, according to a review of the Superfund site this year by the San Francisco Bay Regional Water Quality Control Board, a state agency.

Stephen Hill, who heads the toxics-cleanup division at the water board, said there are two ways his agency interacts with cities: “We copy the city on all correspondence about HP 640 and other cleanup sites as a matter of courtesy.” He said the agency also is available to provide expertise to help cities investigate vapor-intrusion concerns.

Yet some hydrologists express concern that large-scale pumping could accelerate the spread of the contaminated plume.

Yoram Rubin, a civil and environmental engineering professor at the University of California, Berkeley, who specializes in hydrology, said there could be reason for concern. The pumping and direction of flow of the aquifer “could have the combined and significant effect of accelerating the migration of contaminants further into the residential areas.

“It could be a significant risk and deserves careful study,” he said.

But the volume of residential pumping pales in comparison to longstanding pumping done to clean up the contaminated water.

“Multiple pumps in the center of these (Superfund clean-up) sites are pulling in an equal or greater amount of water every day. A small project, a half a mile away, is unlikely to change anything,” Torke said.

‘If it’s in the vicinity of known contamination plumes, then we require them to do tests for the contaminating substances in question.’

— Phil Babel, acting assistant director, Palo Alto Public Works

The regional water board’s 2010 review of the HP Superfund site recommended additional monitoring of the plume in order to ensure containment. (See Weekly story, Oct. 8, 2010).

“With such uncertainty, I would worry about the effects of this pumping,” Rubin said, speaking as a hydrologist but not as a specialist in Palo Alto groundwater.

Others have argued against the continued basement pumping because knowledge of the exact nature and extent of the toxic plume has been shaky for some years.

“Many containment plumes are mapped, but others are poorly characterized. Such risks additionally weigh against construction de-watering,” Palo Alto resident David Stonestrom wrote in an open letter to the Palo Alto City Council in 2008, when new regulations regarding basements were adopted.

Stonestrom, U.S. Geological Survey hydrologist, said he wrote out of concern as a resident and not in his professional capacity.

But city officials say there is little to be concerned about regarding these short-term pumping projects because of checks and balances relating to the regulatory agencies involved.

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three systems contain the TCE-bearing plume, according to Roger Papler, case manager for the Regional Water Board. The systems are (1) extraction wells on the HP property, (2) wells off the HP property and (3) a high-volume filtration system at the Oregon underpass, which can filter up to 600 gallons of contaminated water per minute.

The measures currently in place “effectively contain the plume,” Papler said.

“It would be very difficult for those operations to draw the ... plume into the local groundwater. Even if they did, the chances of the water exceeding maximum contaminant levels for drinking water are pretty low.”

But vapors are a concern.

It’s uncertain whether vapor from the contaminated plume could diffuse into basements. New technologies to measure such intrusion have not been used at the HP Superfund site, he said.

TCE intrusion was discovered in 2009 in the basement air of the Wilson Sonsini Goodrich & Rosati law firm near the eastern edge in the Research Park. Papler said a work plan is being developed to address...
Is pumping groundwater helping spread contaminated plume?

Eight permits for building basements, where groundwater pumping is required, were issued in the last two years. There is no evidence that the HP Superfund site plume is being drawn toward the homes by large-volume pumping of groundwater.

The Palo Alto wastewater-treatment plant operation reserves the right to test water before contractors discharge it into city storm drains, according to Torke. But no testing was required this year, he said.

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The vapor intrusion and monitoring questions.

The city’s Department of Public Works and the city’s Regional Water Quality Control Plant evaluate construction plans that involve dewatering. They can — but often don’t — require contractors to test water for contaminants before pumping it into storm drains, according to Phil Bobel, Public Works’ acting assistant director for engineering.

“If it’s in the vicinity of known contamination plumes, then we require them to do tests for the contaminating substances in question,” Bobel said.

In addition, the regional water board and Hewlett-Packard jointly supervise the plume’s clean-up and containment.

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They were not near enough to sites of known groundwater contamination,” Torke said.

All basement applications must have a soil-type and groundwater report, which he said help determine the volume and duration of pumping.

“The volume of water potentially involved depends on the soil type,” Richard Woodard, principal engineer at San Carlos-based Romig Engineering, said. Romig has done a number of the “geotechnical” reports in Palo Alto that relate to pumping.

“If it’s clay, water will come but at a reasonable rate. If the soil is more permeable, the dewatering will continue throughout the project,” he said. While no testing was required for Page’s basement project, it is less than 1,500 feet from the plume edge, as estimated by the regional water board’s 2010 report. Torke said previous nearby testing had shown no contamination.

Groundwater pumping is unlikely to pull the contamination beyond its existing known boundaries, Torke said.

“When you think of millions of gallons of water, it seems like an Olympic swimming pool, but the plume itself is probably on the order of billions of gallons of water,” he said.

Furthermore, the city officials said that pumping, which moves groundwater, doesn’t necessarily move contaminants at the same rate. Chlorinated solvents such as TCE are heavier than the groundwater that they’ve seeped into, so they tend to sit at the impermeable bottom of the shallow aquifer,” Torke said.

“These plumes tend to move more rate. If the soil is

She hopes her students leave her classroom every day with a sense of accomplishment, a desire to improve, and to develop a deep and lifelong love of making music.

When Tina isn’t teaching, she loves to sing, read, play piano, hike, and run. She also attends as many concerts and theater events as she can and loves to go dancing.

Tina’s ultimate goal as an educator is to let her students experience, create, and participate in as many “musical moments” as possible. She wants her students to learn that when many voices come together as one, it creates beauty that is transcendent.

TINA PAULSON

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In 2008, Torke said he grabbed three water samples at a Waverley Street site near Page’s property “out of curiosity, wondering if the plume had moved and nobody knew about it. There wasn’t any contamination in it,” he said.

The city has encountered contaminated groundwater near other plumes, as it did in 2008 under the then-planned Taube Koret Campus for Jewish Life on the former Ford Aerospace site in south Palo Alto. That discovery resulted in significant changes in design, including requiring all buildings to be raised a full story off the ground for air circulation.

When contaminated water is found, such as in the Taube Koret case, it can’t be discharged into city storm drains. The removed water is instead routed to the sewage-treatment plant, according to Torke. At the treatment plant, a three-step process lets chemicals settle, exposes the water to bacteria — which “essentially chomp away at large organic compounds to make smaller ones” — and filters it, Bobel said.

If water contamination exceeds sewage-treatment-plant limits, it needs to be brought to a hazardous-waste site in barrels or tank trucks, Bobel said.

Some city officials suggest that older construction styles might have greater consequences for groundwater flow than the new short-term projects.

The city used to allow permanent groundwater pumping out of basements prior to 2006, which an official said could have a greater overall impact on the movement of contaminated-plume water. While there is currently no “mandatory phase-out” of existing permanent drainage systems, the city considers such installations worrisome.

However, city officials said that public health concerns associated with standing water, not concerns about the potential movement of groundwater, motivated the city’s decision to outlaw new permanent drainage constructions. The city now only allows groundwater pumping during construction and only during the dry season, between April 1 and Nov. 1, so as not to overload the city’s storm-drain system.

Prior to 2006, the draining method was a combination of perforated drain pipe flowing into a sub-base- ment catch basin and being pumped to the surface via garden-hose-size pipe. The water is not tested.

Both permanent pumping systems, such as the catch basin, and one-time pumping during construction address a central problem of building in areas with high water tables: the pressure groundwater exerts on basements, causing poorly constructed basements to try to float upward.

**Going down the drain?**

Citizens concerned about what happens to extracted groundwater

Old Palo Alto resident Sue Kemp saves water by the cup in her kitchen to use in her garden. When she noticed a fire-hose-sized pipe from Google co-founder Larry Page’s construction of a new home with basement continuously pouring water into a storm drain, she was concerned.

Such pumping worries other residents as well. “Waste on this scale is unconscionable,” resident David Stonestrom wrote in an open letter to the City Council in 2008, responding to earlier basement-pumping operations. Stonestrom said he was acting as a concerned resident and not in his professional capacity as a hydrologist with the U.S. Geological Survey in Menlo Park.

 Resident Steve Broadbent observed that occasionally the city names such basement-construction projects “green.” In a 2008 letter to City Council, he claims such labels are disingenuous given the sizeable waste of water.

City Planning Director Curtis Williams noted that the groundwater isn’t tied to Palo Alto’s Hetch Hetchy Reservoir drinking-water supply but is from a natural aquifer flowing beneath Palo Alto from the hills to the bay.

A 2008 city manager’s report claimed that not all of the water is actually wasted, since much of it is later reabsorbed in regional creek beds. But Broadbent pointed out that Adobe, Matadero and Barron creeks all have concrete bottoms and sides for most of their length — which prevent water absorption.

Such water waste isn’t easily avoided, however, because it’s “too large a volume for individual use, and too impractical to capture and reuse for other use,” according to the 2008 manager’s report.

Civil and Environmental Engineering Professor Yoram Rubin of the University of California, Berkeley, agreed, adding that occasionally such pumped water can be injected back into the ground somewhere else to recharge the aquifer. Yet that has its own danger: It can contribute to flooding in some low-lying areas, he said.

The new regulations mean that the waterproofing materials must be installed in such a way as to withstand the extra hydrostatic pressure, “said Brig Ord, a local contractor who has installed basements before and after the change in regulation.

Ord estimates that the ban on permanent pumping systems has increased the cost of building a basement in a high-water-zone area by about $20,000.

Older basements currently escape city oversight. When originally installed, the projects didn’t require city approval, and so the city doesn’t have a complete record.

“When we discover a permanent-pump system, we try to discourage the owner,” Bobel said, adding that many still exist undetected.

“The short-term pumping associated with the construction regulation is less concerning than those long-term projects that do influence the water table.”

— Phil Bobel, acting assistant director, Palo Alto Public Works

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—— Georgia Wells and Sarah Trauben

Editorial Intern Sarah Trauben can be e-mailed at strauben@paweeekly.com and Editorial Intern Georgia Wells can be e-mailed at gwells@paweeekly.com.