NORTHROP GRUMMAN

Transmittal

Date: April 15, 2022

To: Lilian Abreu
Remedial Project Manager, Superfund Division
U.S Environmental Protection Agency Region 9
75 Hawthorne Street
San Francisco, CA 94105

From: Joshua Nandi, Environmental Project Manager
Northrop Grumman
One Space Park
Mail Stop: NGC CER-XE6D21
Redondo Beach, CA 90278

Subject/Title: Evaluation of Passive Sub-Slab Depressurization System
Former TRW Microwave Site, 825 Stewart Drive, Sunnyvale, CA

CC: Holly Holbrook, AECOM
Mark Riley, AECOM

Northrop Grumman is submitting the above-referenced

X	For your review and comment
	For your information and file
	For your approval
	For your signature

Total number of copies sent: 1

Remarks:

If you have any questions or comments regarding the enclosed report, please feel free to contact Joshua Nandi at Joshua.Nandi@ngc.com.

AECOM
999 Town and Country Road
Orange, CA 92868
aecom.com

April 15, 2022

Lilian Abreu
Remedial Project Manager
Superfund & Emergency Response
Division
United States Environmental Protection
Agency, Region IX
75 Hawthorne Street
San Francisco, CA 94105

Re: Evaluation of Passive Sub-Slab Depressurization System, Former TRW Microwave Site, 825 Stewart Drive, Sunnyvale, California (CERCLIS ID#CAD00915988)

Dear Ms. Abreu,

At the request of the United States Environmental Protection Agency (USEPA), AECOM, on behalf of Northrop Grumman Systems Corporation (Northrop Grumman), evaluated the current configuration and status of the rooftop vents associated with the Passive Sub-Slab Depressurization (SSD) System, installed at the site in 2014. In their letter dated October 7, 2021, USEPA noted that several of the vents were reconfigured by the current building tenant after initial installation of the SSD System was completed in 2014.

Seven vents were originally installed as part of the SSD System in 2014 prior to the installation of the existing heating, ventilation, and air conditioning (HVAC) system (three on the Main Building, two on the West Lobby Building and two on the North Building, as shown on **Figure 1**). The existing HVAC system was subsequently installed by the current building tenant between May and December of 2015 without consideration for the location of the SSD System vents and their function. As result, the three vents on the Main Building Roof and two vents on the West Lobby Building Roof were put in close proximity to the HVAC intakes. The two vents on the North Building are not located near HVAC intakes and not of concern.

The objective of the evaluation is to relocate the vents on the affected buildings outside the assumed sphere of influence of the HVAC intakes. As stated in the Engineering Issues: Indoor Air Vapor Intrusion Mitigation Approaches (USEPA, 2008), the recommended distance from the riser vents to the HVAC intakes is 10 feet. A conservative safety factor of 2.5 was applied to the 10-foot recommendation, resulting relocation of the vents to a minimum of 25 feet away from HVAC intakes.

Figure 1 shows an aerial view of the three vents on the Main Building Roof and the two vents on the West Building roof and their proposed relocation outside the 25-foot spheres drawn around each intake.

The Main Building vent risers are proposed to be relocated approximately 27 feet to the south of the existing vents and approximately 42 feet from the nearest HVAC intake (**Figure 1**). The West Lobby Building vent risers are proposed to be relocated approximately 15 feet to the northeast, placing them approximately 37 feet away from the nearest HVAC intake (**Figure 2**). The height of the risers is designed to allow for airflow across the turbines while maintaining the overall building profile with all equipment located below the top of the windscreen at the edge of the building. The proposed piping schematic is shown on **Figure 3**. The scope of work will involve removing the existing turbines, trimming the vent to height, placing a 90-degree elbow, and routing the pipe horizontally to the new vent riser location as shown on **Figure 3**. The piping will be supported on the roof using Dura-blocks consistent with the existing supports for piping and conduit. The risers will be secured to existing structures as shown on **Figure 2** and **Figure 3**.

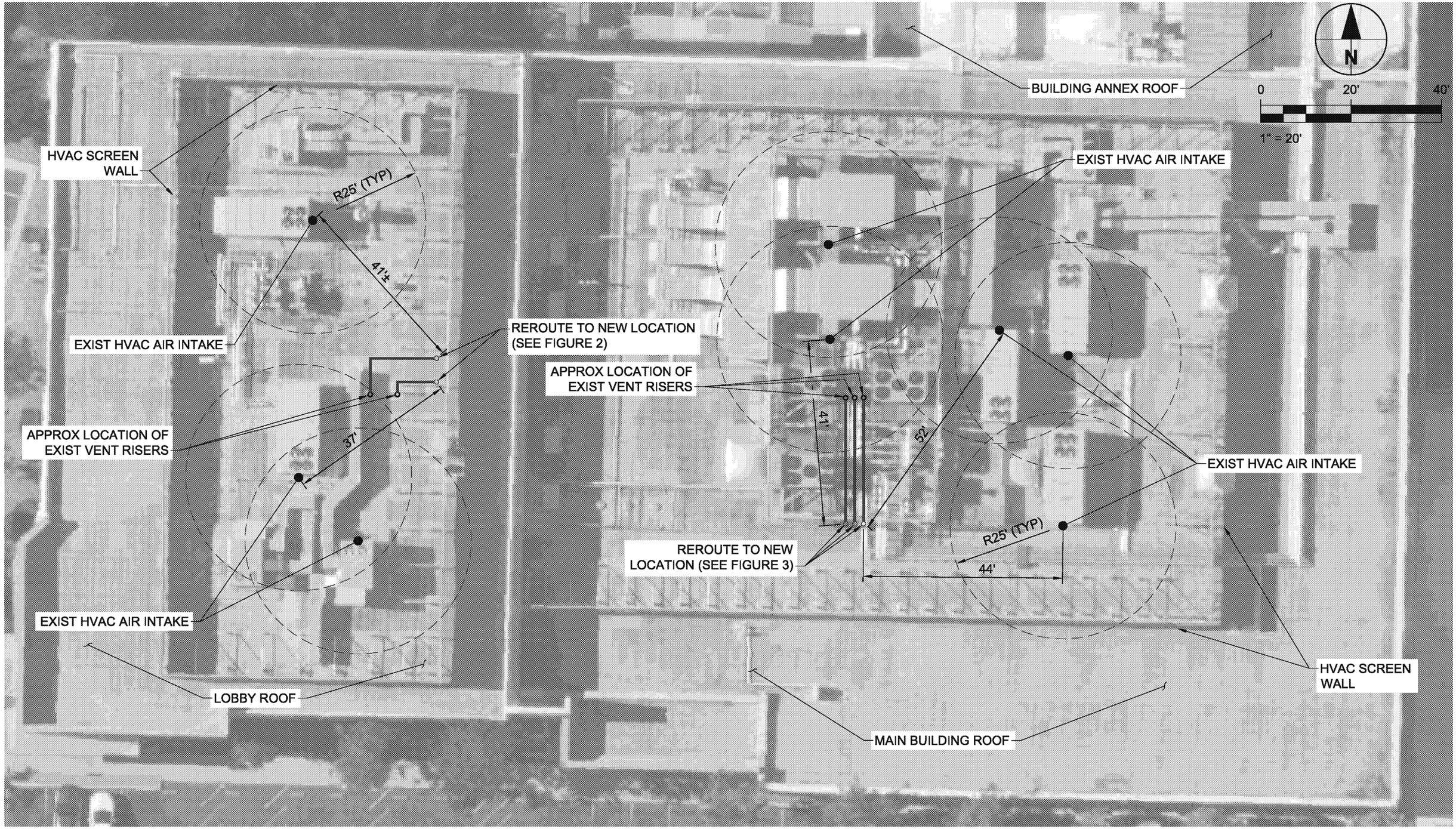
With USEPA approval, Northrop Grumman will proceed with the final design and implementation of these modifications. If you have any questions or would like to discuss, please contact Joshua Nandi, the Northrop Grumman Project Manager for this site, at 310-912-8307 or joshua.nandi@ngc.com.

Thank you,

Holly Holbrook
AECOM Project Manager
AECOM
T: 714-689-7215
M: 562-577-6058
E: Holly.Holbrook@aecom.com

cc: Joshua Nandi, Northrop Grumman
Mark Riley, AECOM

Attachment: Proposed SSD Modification Drawings

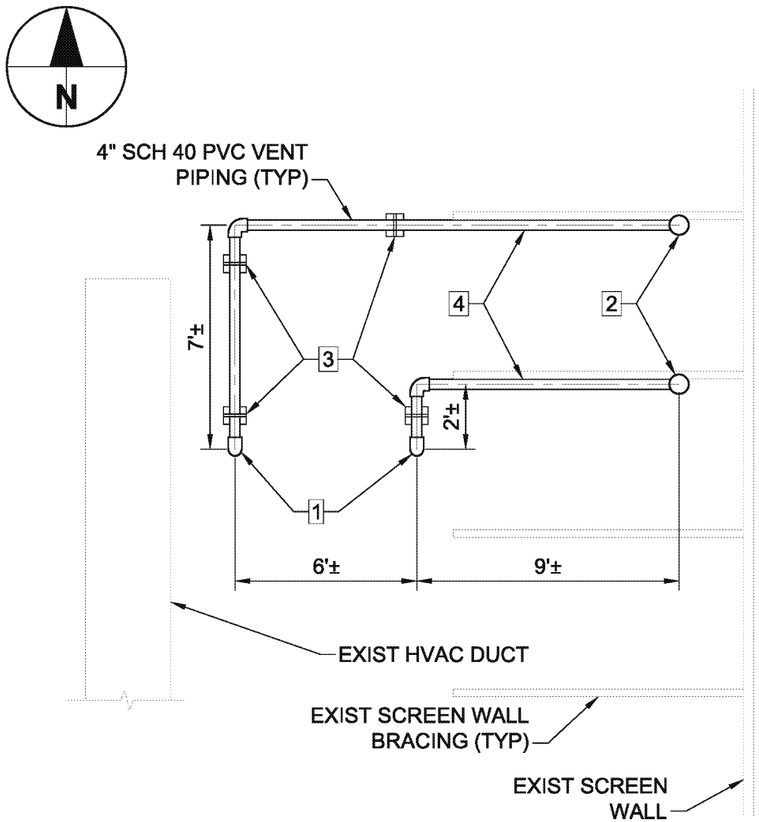


Former TRW Microwave Facility
Vapor Collection System - Roof Venting Compliance
825 Stewart Dr, Sunnyvale, CA
Project No: 60680270 Date: March 2022

ROOF PLAN

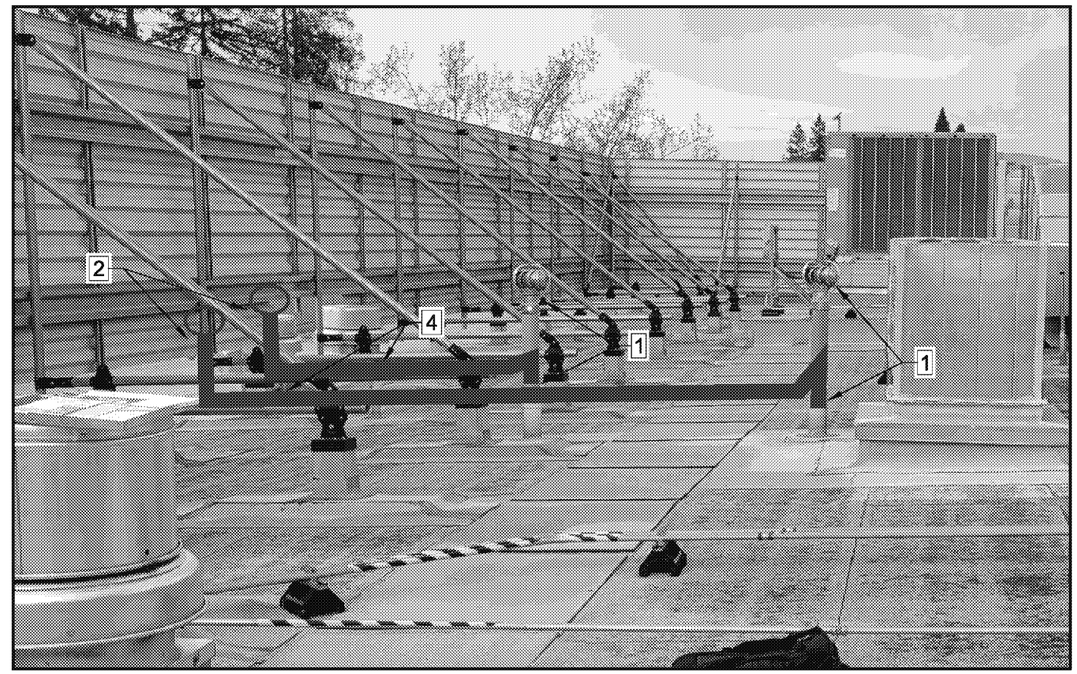
AECOM

Figure: 1



LOBBY ROOF VENT RELOCATION PLAN

SCALE: 1"= 5'



LOBBY ROOF VENTS LOOKING NORTH

CONSTRUCTION NOTES

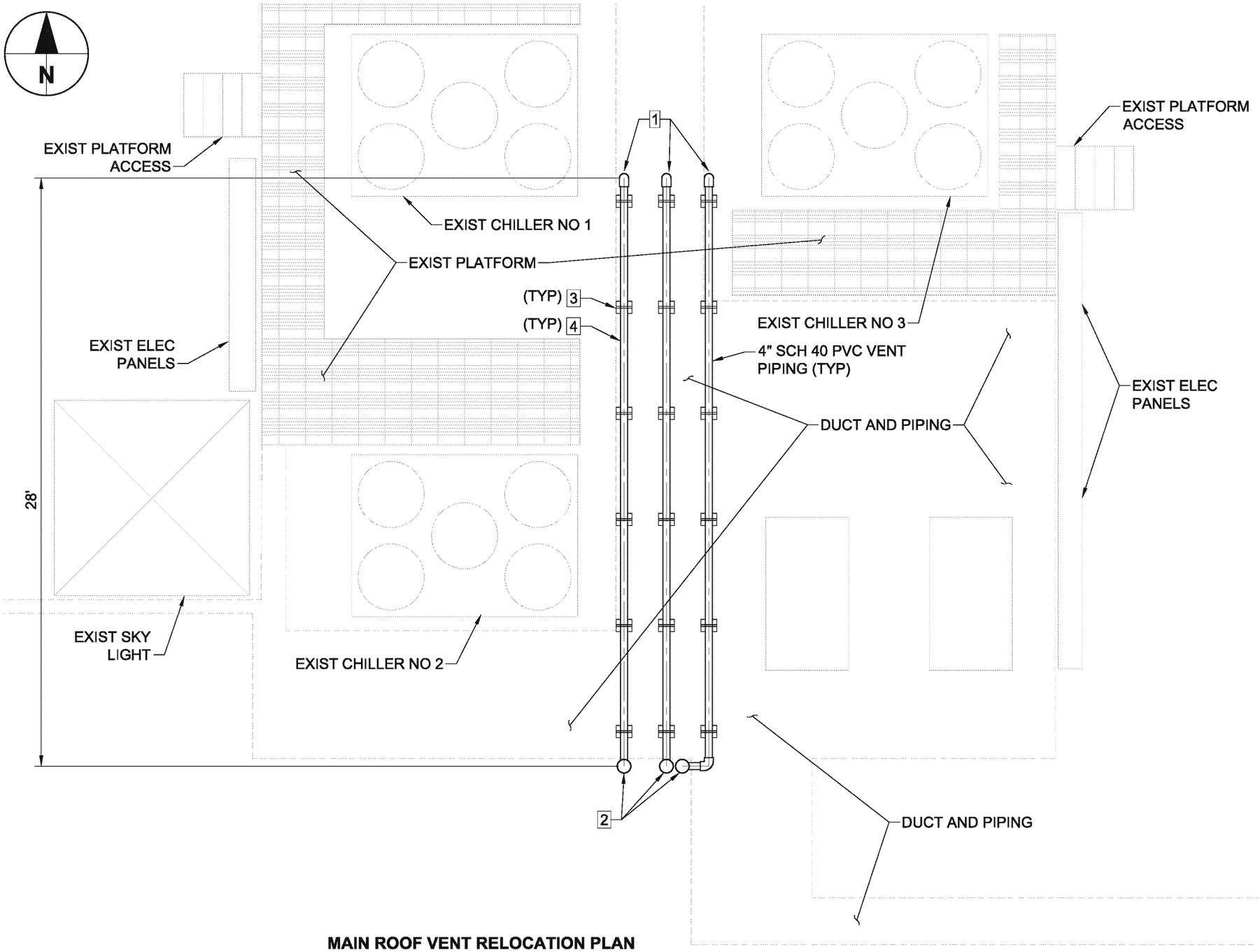
1. REMOVE EXISTING VENT TURBINE, CUT PVC RISER AND INSTALL 90° BEND.
2. INSTALL NEW 4" SCHEDULE 40 PVC RISER AND ATTACH SALVAGED VENT TURBINE.
3. INSTALL PIPE SUPPORT AT 5' MAX SPACING (DURABLOK SERIES DB-20 ROOFTOP SUPPORT SYSTEM OR EQUAL).
4. MOUNT NEW 4" SCH 40 PVC PIPE TO EXIST SCREEN WALL HORIZONTAL BRACING.

Former TRW Microwave Facility
Vapor Collection System - Roof Venting Compliance
825 Stewart Dr, Sunnyvale, CA
Project No: 60680270 Date: March 2022

LOBBY ROOF VENT RELOCATION

AECOM

Figure: 2



CONSTRUCTION NOTES

1. REMOVE EXISTING VENT TURBINE, CUT PVC RISER AND INSTALL 90° BEND.
2. INSTALL NEW 4" SCHEDULE 40 PVC RISER AND ATTACH SALVAGED VENT TURBINE. ATTACH RISER TO EXISTING HVAC EQUIPMENT FRAMING.
3. INSTALL PIPE SUPPORT AT 5' MAX SPACING (DURABLOK SERIES DB-20 ROOFTOP SUPPORT SYSTEM OR EQUAL).
4. ROUTE 4" SCHEDULE 40 PVC VENT PIPING BEST WAY UNDER AND AROUND EXISTING HVAC EQUIPMENT AND FRAMING.

MAIN ROOF VENT RELOCATION PLAN

SCALE: 1"= 5'

Former TRW Microwave Facility
Vapor Collection System - Roof Venting Compliance
825 Stewart Dr, Sunnyvale, CA
Project No: 60680270 Date: March 2022

MAIN ROOF VENT RELOCATION

AECOM

Figure: 3

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 9

75 Hawthorne Street
San Francisco, CA 94105-3901

April 25, 2022

MEMORANDUM (sent via email only)

SUBJECT: Passive Sub Slab Depressurization (SSD) System Operation and Maintenance Plan (Document Control Number [DCN] FY22SEMD_161) and Evaluation of Passive SSD System, Former TRW Microwave Site, Sunnyvale, California

FROM: Mathew Plate, Environmental Scientist
Quality Assurance Branch

MATHEW PLATE
Digitally signed by MATHEW PLATE
Date: 2022.04.25 12:43:12 -07'00'

THROUGH: Audrey L Johnson, Manager
Quality Assurance Branch

Audrey L Johnson
Digitally signed by Audrey L Johnson
Date: 2022.04.25 12:35:04 -07'00'

TO: Lilian Abreu, Remedial Project Manager
Superfund Division California Sites

Michael Schulman, Remedial Project Manager
Superfund Division California Sites

These documents provided by Northrop Grumman for the Former TRW Microwave Site, dated March 31 and April 15, 2022, were reviewed based on guidance provided in the following documents:

- *OSWER Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air* (USEPA OSWER, June 2015)
- *Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air, Final*, (California Department of Toxic Substances Control, October 2011)
- *Vapor Intrusion Mitigation Advisory, Final*, (California Department of Toxic Substances Control, October 2011)

The O&M Plan and SSD Evaluation would benefit from a more thoughtful evaluation of SSD system engineering.

Questions or comments regarding this review should be referred to me at (415) 972-3799.

Lilian Abreu, Michael Schulman
April 25, 2022

Concerns

1. [O&M Plan; Annual Inspection Protocol] This section notes that inspections are limited to the roof components. Elements of inspection should also include:
    - Verification that the floor slab and barrier system have not been breached or otherwise compromised.
    - Evaluation to confirm that the building has not been modified in a manner that could compromise the system.
    - Evaluation of changes to building use. (this could be changes in mechanical operations or changes in exposure scenarios that we not envisioned when the system was designed).

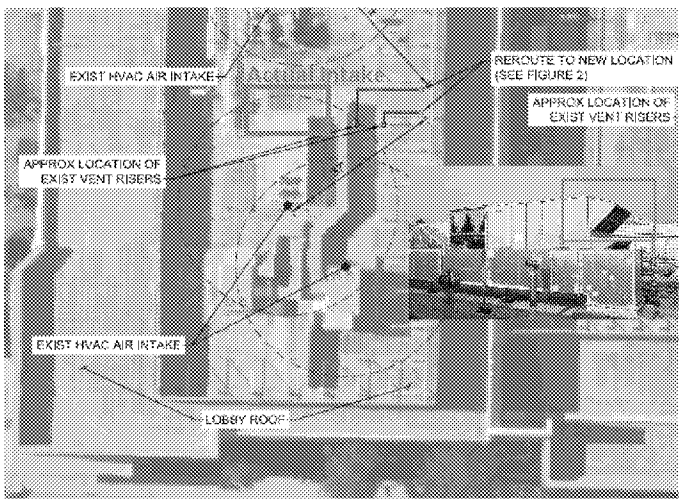
2. [O&M Plan; General] A building-specific inspection checklist should be developed and included with this plan.

3. [O&M Plan; Appendix A, Passive SSD System Design Drawings] The design drawing should be updated to reflect the current building configuration.

4. [SSD Evaluation; Duct] The design selected introduces long horizonal duct runs and several duct bends on the roof. These features will reduce the effectiveness of the system by causing resistance to air flow.

5. [SSD Evaluation; Vent height] The current height proposed does not appear to be sufficient to clear obstructions. Clearing obstructions is important for dispersion of pollutants and to provide sufficient exposure to wind (which provides part of the driving force for proper passive SSD operation).

6. [SSD Evaluation; Location of HVAC intakes] The HVAC intake location is mislabeled. Please correct this and verify that the other HVAC intakes were properly located.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 9

75 Hawthorne Street
San Francisco, CA 94105-3901

December 28, 2021

MEMORANDUM (sent via email only)

SUBJECT: TRW Microwave Response to Comments, 825 Stewart Drive, Sunnyvale, California

FROM: Mathew Plate, Environmental Scientist
Quality Assurance Branch

THROUGH: Audrey L Johnson, Manager
Quality Assurance Branch

TO: Michael Schulman, Remedial Project Manager
Superfund Division California Sites

Responses to EPA comments provide by AECOM on November 5, 2021 was reviewed.

The QA Brach reviewed the response to comments and was not able to verify proper HVAC operations with the test and balance report provided. It is recommended that the HVAC system be further evaluated to confirm that it is not contributing to potential vapor intrusion.

Specific evaluations follow.

Questions or comments regarding this review should be referred to me at (415) 972-3799.

Evaluation

1. [SSD System Vent Pipes] The previous comment stands, it is recommended that vent pipe be relocated and or raised to avoid the potential for subsurface vapors to be pulled into the ventilation system and to improve SSD operations.

2. [HVAC Operation] The HVAC test and balance report provided is from October 2015 and may not reflect current building configuration and operations. Additionally, the test and balance report provided is limited in scope and does not evaluate ventilation rates in each zone and other elements of ventilation effectiveness. The following items were noted in the report:

    - All zones were adjusted to design specifications.
    - It appears that test and balance may have been done by the company that installed the HVAC system. An independent test and balance report is preferred.
    - The report did not include a written summary, including what was found, adjusted, and noted.
    - It appears that the air handlers were tested only in the recirculation mode with the outdoor air dampers fully closed. It is unclear if system performance when providing minimum and maximum outdoor air was assessed.
    - Two of the HVAC systems appear to have balancing power exhaust, AHU-3/4 and EF-10/11/12/13 on the Building B roof and AHU-1/2 and EF-14/15/16/17 on the Building C roof. Based on the design specificaitons these appear to be capable of operating as single pass 100% outdoor air systems. However, the test and balance of the supply only appears to represent recirculation.
    - It is unclear from the test and balance if local exhaust is properly balanced with makeup air.
    - Based on the system configuration (chambers included as part of the main HVAC system) it appears that there may be some ducted returns. These are not individually evaluated in the report.
    - For system AHU-3/4 that includes workshop areas, lab areas, and chambers, it is unclear how air is handled to prevent recirculation of indoor air contaminants (including chemicals from potential vapor intrusion present in negatively pressurized zones not intended for occupancy). This comment may also apply to other building HVAC systems.

    Assuming there are no more recent test and balance reports, available information on the current system design and the HVAC sequence of operations would be needed to evaluate any system impacts on vapor intrusion potential.

3. [Sub-slab Sampling Ports] The response notes that exact measurements may not be possible for subslab ports due to interior building configuration changes. Exact measurements perpendicular from at least two exterior walls should be provided so ports can be reliable located in the future.

4. [SSD System Maintenance and Inspections] Response noted.

Message

Sent: 1/3/2022 4:30:40 PM
To: Poalinelli, Edwin [POALINELLI.EDWIN@EPA.GOV]; Rebekah Reynolds [Reynolds.Rebekah@epa.gov]
CC: Mathew Plate [Plate.Mathew@epa.gov]
Subject: FW: DRAFT/Deliberative Comments RE: TRW Microwave Site, 825 Stewart Dr: Follow-up on the Aug 19 2021 Site Visit
Attachments: DRAFT_SEMD_TRW_VI_RTC_comments.doc; RE: TRW Microwave Site, 825 Stewart Dr: Follow-up on the Aug 19 2021 Site Visit ; 1992-09-28 TRW ACO Docket 92-25.pdf; 2016-05-18 TRW EPA sets forth PPA's reasonable steps, 1160217.pdf; 2014-05-01 Ltr Prospective purchaser - TRW Microwave 825 Stewart Dr, 1147069.pdf

Hi Chip and Rebekah,

Attached is QA's review of the 2015 HVAC test and balance report and TRW's timeline to address EPA site visit follow-up comments provided in an October 7 letter. I will respond to TRW next week stating that their proposed timeline to provide a draft evaluation of the SSD system by mid-March 2022 is inadequate. I'll send you a draft first to get your feedback before I send my response. I'll also meet with Matt and go over his comments and if any additional evaluation is needed to evaluate vapor intrusion potential.

I expect that NGC will work proactively and quickly to address any EPA concerns or potential VI mitigation or O&M issues.

Or existing order with NGC does not address VI, , we do not have one with Apple. However, we do have a BFPA with the current owner (but not Apple), which specifies to maintain BFPA status, the current owner is prohibited from conducting building construction, renovation, or other modifications activities that may affect the integrity of the VI mitigation system.

If, hypothetically, there NGC timely cooperation will result in the quickest response If we find that the SDS mitigation system needs to be modified or that indoor air sampling is warranted,

---

From: Plate, Mathew <Plate.Mathew@epa.gov>
Sent: Monday, December 27, 2021 12:11 PM
To: Johnson, AudreyL <Johnson.AudreyL@epa.gov>; Schulman, Michael <Schulman.Michael@epa.gov>
Cc: Poalinelli, Edwin <POALINELLI.EDWIN@EPA.GOV>
Subject: DRAFT/Deliberative Comments RE: TRW Microwave Site, 825 Stewart Dr: Follow-up on the Aug 19 2021 Site Visit

Attached is my draft review of the TRW RTC and the attached test and balance report. There was insufficient information on the building layout (room and zone sizes), building exhaust, and operations to make many conclusions from the test and balance report. Also since the building layout/operation has been modified since this test and balance I am not sure how accurately it reflects current operations. It did seem odd to me that the environmental chambers were not on dedicated ventilation systems. Maybe it is a reflection of how the chambers are being used? Not sure if it would have any impact on VI, but more information on the HVAC system could be helpful.

Thanks
matt

From: Johnson, AudreyL <Johnson.AudreyL@epa.gov>
Sent: Monday, December 6, 2021 12:59 PM
To: Schulman, Michael <Schulman.Michael@epa.gov>

Message

From: Schulman, Michael [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=35D7024F00644B3D8B5DBA4940506834-SCHULMAN, M]
Sent: 12/13/2021 4:18:38 PM
To: Nandi, Joshua [US] (ES) [Joshua.Nandi@ngc.com]
CC: Holbrook, Holly [Holly.Holbrook@aecom.com]; L'Esperance, James [US] (ES) [James.L'Esperance@ngc.com]; Kurt Batsel [batsel@dextra-group.com]; Poalinelli, Edwin [POALINELLI.EDWIN@EPA.GOV]
Subject: RE: TRW Microwave Site, 825 Stewart Dr: Follow-up on the Aug 19 2021 Site Visit

<!--[if lte mso 15 || CheckWebRef]-->

Schulman, Michael has shared a OneDrive for Business file with you. To view it, click the link below.

2021-11-05_TRW Microwave_USEPA Letter RTCs_Final.pdf

<!--[endif]-->

Hi Josh,

I'm following up on below and our call last week. Can you give me an update by **this Wednesday** on EPA's comments and RTCs attached? I particularly need to know the specifics for what changes to the roof vents for the SSD system that NGC is recommending for EPA review and what plans NGC has to formalize the SSD system maintenance and inspections.

Feel free to call me if there is anything you want to go over. Thank you,
Michael

Michael Schulman
Remedial Project Manager
US EPA Region 9, Superfund Division
75 Hawthorne St, San Francisco, CA 94105
628-629-2421 (m)

From: Nandi, Joshua [US] (ES) <Joshua.Nandi@ngc.com>
Sent: Friday, November 5, 2021 1:01 PM
To: Schulman, Michael <Schulman.Michael@epa.gov>
Cc: Holbrook, Holly <Holly.Holbrook@aecom.com>; Kurt Batsel <batsel@dextra-group.com>; L'Esperance, James [US] (ES) <James.L'Esperance@ngc.com>
Subject: RE: TRW Microwave Site, 825 Stewart Dr: Follow-up on the Aug 19 2021 Site Visit

Hi Michael,
Please find NGC's response to the EPA's comments regarding the 19 August 2021 Site visit attached.
Thank you,
Josh

JOSHUA NANDI | Project Manager, Environmental Remediation
Northrop Grumman | Enterprise Services
C: 310-912-8307 | joshua.nandi@ngc.com

From: Schulman, Michael <Schulman.Michael@epa.gov>
Sent: Thursday, October 7, 2021 6:44 PM

Message

From: Schulman, Michael [Schulman.Michael@epa.gov]
Sent: 10/6/2021 1:38:51 AM
To: Plate, Mathew [Plate.Mathew@epa.gov]
Subject: RE: DRAFT VI [TRW] assessment
Attachments: 2021-05-24 TRW Microwave SSD Annual Inspection Memo.pdf

Thanks! I'm adding the bullet below (2021-10-04 DRAFT EPA Letter, Follow up on 825 Steward Site Visit.docx). Is there anything that should be specifically inspected for a passive SDS system? If so, then I'll add that to the letter. For reference, attached is the 2020 annual (visual and observational) inspection.

- **SSD System Maintenance and Inspections:** In May 2021 GES, on behalf of NGC, prepared the first Annual Maintenance Inspection memorandum for the 825 Steward Ave SSD System. The memorandum documented a November 2020 inspection and NGC prepared the memorandum to address the 2019 EPA Five Year Review Report recommendation to incorporate "long-term stewardship measures for the current vapor mitigation measures in place." EPA asks that NGC document in a work plan or technical memorandum the scope of the annual SSD system maintenance inspections, including how and when the inspections will be reported to EPA.

Michael

From: Plate, Mathew <Plate.Mathew@epa.gov>
Sent: Monday, October 4, 2021 1:17 PM
To: Schulman, Michael <Schulman.Michael@epa.gov>
Subject: RE: DRAFT VI [TRW] assessment

Here are some proposed edits. Today I am less busy than tomorrow.

Thanks
matt

From: Schulman, Michael <Schulman.Michael@epa.gov>
Sent: Monday, October 4, 2021 11:26 AM
To: Plate, Mathew <Plate.Mathew@epa.gov>
Subject: RE: DRAFT VI [TRW] assessment

Hi Matt,

I got an email last week from NGC that they are switching project managers as Kurt is moving to another site. I have a transition meeting with Kurt and the new PM this Thursday and I want send NGC a site visit follow up letter before then. Do you have time today or tomorrow to review the attached letter and the recommendations?

Thank you,
Michael

From: Plate, Mathew <Plate.Mathew@epa.gov>
Sent: Monday, August 23, 2021 9:19 AM

To: Schulman, Michael <Schulman.Michael@epa.gov>
Subject: DRAFT VI [TRW] assessment

When you are back let's talk about the highlighted recommendations. . . . or if you want you can just incorporate this into whatever you put together.

Thanks
matt

Message

From: Schulman, Michael [Schulman.Michael@epa.gov]
Sent: 7/27/2021 12:14:18 AM
To: Plate, Mathew [Plate.Mathew@epa.gov]
Subject: RE: TRW Microwave - 2020 SSD Inspection Memo

Hi Matt,

I've asked for a site visit in August for you and me to attend. Except for August 9-11 and August 23-27 and not on Fridays. We could measure then. No air samples have been collected from the stacks. I'll let you know what dates the RP proposes, they said they get back to me this week.

From: Plate, Mathew <Plate.Mathew@epa.gov>
Sent: Monday, July 26, 2021 3:35 PM
To: Schulman, Michael <Schulman.Michael@epa.gov>; Johnson, AudreyL <Johnson.AudreyL@epa.gov>
Subject: RE: TRW Microwave - 2020 SSD Inspection Memo

Michael,

In the main building the SSD vents appear to be under components of the chiller. This is not appropriate and we should discuss. We should also get the distances between the vents and the HVAC outdoor air intakes.

Have samples air samples from the passive stacks been collected?

Thanks
matt

From: Schulman, Michael <Schulman.Michael@epa.gov>
Sent: Monday, July 26, 2021 12:48 PM
To: Plate, Mathew <Plate.Mathew@epa.gov>; Johnson, AudreyL <Johnson.AudreyL@epa.gov>
Subject: FW: TRW Microwave - 2020 SSD Inspection Memo

Hi Matt,

Can you review the attached TRW Microwave November 2020 passive mitigation system inspection report for 825 Stewart Drive? I reviewed the inspection report and it looked OK to me, but I'd like a second opinion and if you had an recommendations to the inspection or potential modifications. For context, the following building mitigations were conducted in 2014-2015:

- A sub-slab vapor collection system was installed underneath the site building to vent vapors to the atmosphere.
- Contaminated soil from underneath the building in the former TRW Microwave source area was excavated and removed to prevent contaminants in the soil from volatilizing into the building.
- Small diameter groundwater wells inside the building were decommissioned and sealed to eliminate a potential vapor intrusion pathway into the building.
- Openings through pipes, seams, or cracks in the building's concrete sub-slab were sealed to prevent vapor intrusion. Additionally, the spaces between the walls of the three sections of the buildings were also sealed.

I have requested August dates to conduct a site visit of the 825 Stewart Drive building now leased and occupied by Apple.

Thank you,
Michael

From: Kurt Batsel <batsel@dextra-group.com>
Sent: Tuesday, May 25, 2021 2:03 PM
To: Schulman, Michael <Schulman.Michael@epa.gov>
Cc: TWright@gesonline.com; Holbrook, Holly <Holly.Holbrook@aecom.com>
Subject: TRW Microwave - 2020 SSD Inspection Memo

Hi, Michael – As you requested during our last discussion on TRW Microwave, attached is a technical memorandum prepared by GES that summarizes the 2020 SSD system inspection conducted at the onsite building currently leased by Apple. Please let me know if you have any questions or need any additional info.

Kurt R. Batsel, P.E. | The Dextra Group, Inc.
T: 770.578.9696 | batsel@dextra-group.com

NORTHROP GRUMMAN

Transmittal

Date: May 24, 2020

To: Michael Schulman
Remedial Project Manager, Superfund Division
U.S. Environmental Protection Agency, Region 9
75 Hawthorne Street, SFD-7-1
San Francisco, CA 94105

From: Michael Shannon
Corporate Manager, Environmental Remediation
Northrop Grumman Systems Corporation
One Space Park Drive
Mail Stop: CER/XE6D21
Redondo Beach, CA 90278

Phone: 310-332-5915
Email: Michael.Shannon@ngc.com

CC: Kurt Batsel, Dextra Group
Holly Holbrook, AECOM
Tom Wright, GES

Subject/Title: Annual Maintenance Inspection Memo: Sub-Slab Depressurization (SSD) System
Former TRW Microwave Site, 825 Stewart Drive, Sunnyvale, CA

We are sending you the above referenced document(s):

	For your review and comment
X	For your information and file
	For your approval
	For your signature

Total number of copies sent: 1

Remarks:

Please find the attached memo summarizing the results of the annual SSD inspection conducted in 2020 for the Former TRW Microwave Site. If you have any questions of comments on the memo, please contact Kurt Batsel at batsel@dextra-group.com.

Technical Memorandum

To:	Kurt Batsel, Dextra Group
From:	Tom Wright, GES Project Manager
cc:	Jennifer Clay, GES Holly Holbrook, AECOM
Date:	May 21, 2021
Re:	TRW Microwave Site (Site), Sunnyvale, California: Annual Maintenance Inspection: Sub-Slab Depressurization (SSD) System

Groundwater Environmental Services, Inc. (GES) on behalf of Northrop Grumman, has prepared this technical memorandum (memo) for the 2020 Annual Maintenance Inspection: Sub-Slab Depressurization (SSD) System for the former TRW Microwave Site (Site) in Sunnyvale, California (**Attachment A**). The United States Environmental Protection Agency (USEPA) is the lead regulatory agency for the Site, after regulatory oversight transferred from the California Regional Water Quality Control Board – San Francisco Bay Region on August 7, 2014 (USEPA, 2014). This memo has been prepared to address a recommendation in the 2019 Five Year Review Report (USACE, 2019) to incorporate "long-term stewardship measures for the current vapor mitigation measures in place." This memo provides a summary of the first annual visual inspection of the SSD system in place and observations made during the site visit conducted on November 12, 2020.

SSD Background

The passive SSD System was initially installed in August and September of 2014 as a proactive measure before renovation of the building. The purpose of the SSD was to mitigate potential vapor intrusion due to sub-slab concentrations of volatile organic compounds (VOCs). The sub-slab concentrations of VOCs were identified during a vapor intrusion assessment conducted in 2014 and reported in the Passive Sub-Slab Vapor Collection System Installation Work Plan (AECOM, 2014).

The major components of the SSD system consists of a series of permeable lateral vents (a combination of slotted polyvinyl chloride pipe and GeoVent™ Trenchless Gas Collection system) installed beneath the concrete slab for vapor collection, which are then connected to vertical risers that vent to the roof of the building via wind-powered roof turbines on each section of the building. The current vent layout is shown on **Attachment A**. A detailed description of the SSD system is documented in the Passive Sub-Slab Vapor Collection System Installation Work Plan (AECOM, 2014).

Between May 2015 and December 2015, the building conditions changed due to construction for the building tenant, Apple, Inc. (AECOM, 2016). Changes to the building included the installation of additional heating, ventilating, and air conditioning (HVAC) equipment on all three building roofs and the installation of barriers along the perimeter of the building roofs. In order to complete this work, modifications were made to the wind-powered roof turbines in each section of the building. The modifications included reducing the height of the roof turbine risers in some locations to install equipment over the top of the roof turbines.

In December 2015, AECOM performed an additional building survey and conducted vapor intrusion (VI) sampling to assess whether the VI risk had changed due to the tenant improvements. The survey included collection of three sub-slab samples, collection of nine indoor air samples, and collection of one outdoor ambient air sample, and concluded that, chemicals detected in indoor air do not pose a human health risk to current building occupants. The survey conclusion was based on the current building conditions, which included the building modifications completed for Apple (AECOM, 2016).

SSD Visual Inspection

GES conducted a visual inspection of the SSD during a site visit on November 12, 2020. Access was granted by the current tenant Apple, Inc. The SSD system was visually documented to assess the system for its current working state. Observations were made regarding current building roof layout of HVAC systems, barriers, and roof equipment. Each of the three buildings associated with the site have a cluster of two to three vent risers that extend from the sub-slab collection laterals and penetrate the roof to allow for passive depressurization of the sub-slab area. Each vent riser is equipped with a wind-powered roof turbine, and during the site visit observations were made to assess if the turbines were freely turning and free of corrosion, were actively turning due to wind, and their current location relative to existing roof equipment. A comparison photo log is in included as **Attachment A**.

SSD Observations

During the annual maintenance inspection of the SSD system, the following visual observations were noted:

- Wind barriers are still in place on all three buildings;
- The vent risers on the main building (**Attachment A**) are currently approximately 1-foot tall, the installed height was approximately 3-feet; and
- All roof turbines spin freely with manual assistance and do not appear to be seized due to corrosion or rust. During the site visit, only the roof turbines on the north building were observed to be spinning due to ambient wind.

Conclusions

The current configuration of the SSD system is consistent as configured during the December 2015 sampling and VI assessment (AECOM, 2016), and roof turbines are in working condition.

Recommendations

The roof turbines of the SSD system should be inspected during the 2021 sampling event tentatively scheduled to be conducted in fourth quarter 2021.

References

AECOM, 2014. Passive Sub-Slab Vapor Collection System Installation Work Plan, Former TRW Microwave Facility, 825 Stewart Drive, Sunnyvale, California. August 13.

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USEPA, 2014. Notice of Lead Agency Transfer – California Regional Board to US EPA Triple Site: AMD 901/902 Thompson Place Superfund Site, Philips (formerly Signetics) Site, and TRW Microwave Superfund Site and Offsite Operable Unit, Sunnyvale, California.