

W. M. Keck Observatory | FAQ

HYDRAULIC FLUID SEEPAGE AT KECK OBSERVATORY

How did Keck Observatory discover the hydraulic fluid seepage?

In mid-April, observatory technicians conducting routine maintenance discovered hydraulic fluid slowly seeping on the pier wall supporting the Keck I telescope, an area normally concealed behind drywall inside the telescope facility.

How long had it been going on?

Because the slow seepage was hidden behind drywall, the duration of the leak is unknown.

How much hydraulic fluid was involved? How much cinder was contaminated?

The estimated leak rate of hydraulic fluid at the time of discovery was 0.46 gallons/month, some of which was released to the subsurface. Because the duration of the leak is unknown due to drywall concealing the seepage, the total volume of impacted cinder could not be conclusively determined.

Without an exact start date for the seepage, a total quantity is difficult to estimate. However, a quantity is needed to determine what regulatory action to take. As such, Keck Observatory calculated the total release based on the current leak rate and an unlikely scenario that the leak began when the hydraulic bearing system was first installed nearly three decades ago. The total conservative volume of impacted cinder could be 7.0 cubic meters at most; this calculation assumes an oil saturation rate of 10 percent.

When and how was this release reported?

On June 4, technicians extracted samples of cinder from a narrow isolation joint, or seam, in the floor of the Keck I telescope. The cinder sample appeared wet; Keck Observatory sent an immediate notification to the Hawaii Department of Health (HDOH).

Timeline of events leading up to HDOH notification:

- April 19, 2018: Technicians discovered hydraulic fluid seeping on the pier wall; action taken to contain the seepage using absorbent material.
- May 24, 2018: Senior management briefed on the Keck I pier seepage.
- May 29, 2018: Internal task force formed to pursue top-priority investigation.
- June 4, 2018: Cinder sampling suggests presence of hydraulic fluid; immediate notification sent to HDOH

Keck Observatory retained environmental, geotechnical and hydrogeological consulting and engineering firm Masa Fujioka and Associates (MFA) to conduct a third-party investigation of the incident, recommend appropriate action, and prepare a full report per HDOH regulations.

After a five-month long investigation, the report – an Environmental Hazard Evaluation (EHE) and Environmental Hazard Management Plan (EHMP) – were filed with HDOH on November 9, 2018, and updated on March 18, 2019 in consultation with experts at the department. The report is public record and can be found by using HDOH Release ID 20180604-1530.

What were the findings of the investigation?

According to the report submitted to HDOH, MFA found:

“that based on regulatory guidelines, the release is a ‘low-risk’ and low-priority case because the volume of potentially contaminated soil (PCS) is small and does not pose a significant risk to human health and the environment. The release site is concrete capped, and neither groundwater nor surface water are likely to be impacted. Therefore, management in place is appropriate.”

Where was the seepage happening?

On June 4, 2018 technicians extracted samples of cinder from a narrow isolation joint, or seam, in the floor of the Keck I telescope. The cinder sample appeared wet; Keck Observatory sent an immediate notification to the HDOH.

The engineering team initially identified six seepage areas on the Keck I pier coming from the hydraulic bearing system, and no seepage on the Keck II telescope pier. Further investigation revealed the total release includes a small leak coming from hydraulic fluid return lines located a few feet away from the Keck I and Keck II piers.

What has Keck Observatory done to prevent any further release of materials to the environment?

Keck Observatory immediately contained all leakage areas using absorbent material to capture and prevent further fluid from releasing to the environment.

On September 28, 2018, Keck Observatory permanently contained the release by installing a seal in the one-inch wide gap at the base of the Keck I pier. This gap, or isolation joint, was identified as the pathway for hydraulic fluid to travel from inside the building to the cinder below. The sealant blocks any future accidental releases to the environment. Regular inspections of the seal have also been instituted.

Technicians also replaced white PVC pipes that make up the hydraulic fluid return line with a high-quality stainless steel pipe, which has an “accordion pleat” section that provides some give in case of earthquakes or settling.

Keck Observatory continues to address the source of the leaks, making necessary repairs and improvements to the hydraulic bearing system, to ensure nothing like this can go undetected in the future.

What is the composition of the hydraulic fluid? Is it dangerous?

Keck Observatory uses [Mobil SHC 525](#) hydraulic fluid, which is formulated from synthetic, wax-free hydrocarbon base fluids.

Substances in the hydraulic fluid are listed in the [Safety Data Sheet](#). None of these substances are in the Reportable Quantities table in the HDOH’s Office of Hazard Evaluation and Emergency Response (HEER)

Technical Guidance Manual ([TGM](#)), Appendix 2-B; however, “oil” (generically) is listed so that a release of the material requires reporting.

Did regulatory officials inspect the site?

Yes. On August 1, 2018, representatives from the Department of Land and Natural Resources (DLNR) and Office of Maunakea Management (OMKM) conducted an in-person site inspection. On September 5, 2018, representatives from HDOH and OMKM also inspected the release site.

How did the HDOH respond to the submitted reports?

The HDOH has granted Keck Observatory a “no further action with institutional controls” (NFA with IC) , bringing the investigation, reporting, and findings phase to a close, provided that these conditions are met:

- When the concrete dome floor, which acts as a cap to keep impacted cinder from coming into contact with people, plants, water, or wildlife, is eventually removed, the subsurface beneath the floor shall be thoroughly evaluated and addressed as directed by HDOH.
- Keck Observatory shall ensure that the property owner, facility owner/operator, and contractors adhere to the terms of the EHE/EHMP report and recommendations.

What does it mean for the site to meet the conditions for a “No further action” (NFA) determination and case closure?

An NFA determination and case closure issued by the HDOH means oversight for work moving forward is the responsibility of the owner/operator and HDOH oversight is not required. However, courtesy notification of future work involving the impacted cinders may be made and will be in our case. The report prepared by MFA finds that the site meets the following guidelines for an NFA:

- The release has been permanently stopped and ongoing sources of contamination have been removed or remediated to the extent possible;
- Remaining contamination and environmental concerns are documented in the report submitted to HDOH;
- The nature of the release is known and it consists of a material with minimal toxicity that is non-volatile;
- An EHMP has been prepared listing requirements for long-term management of the remaining contamination;
- Engineered controls (concrete) are in place to prevent direct exposure, and there is no vapor intrusion or leaching concerns;
- The release is a low-risk and low-priority case because the volume of potentially impacted cinders is relatively small.

Where can I find more information?

For more information, visit www.keckobservatory.org/responsibility

