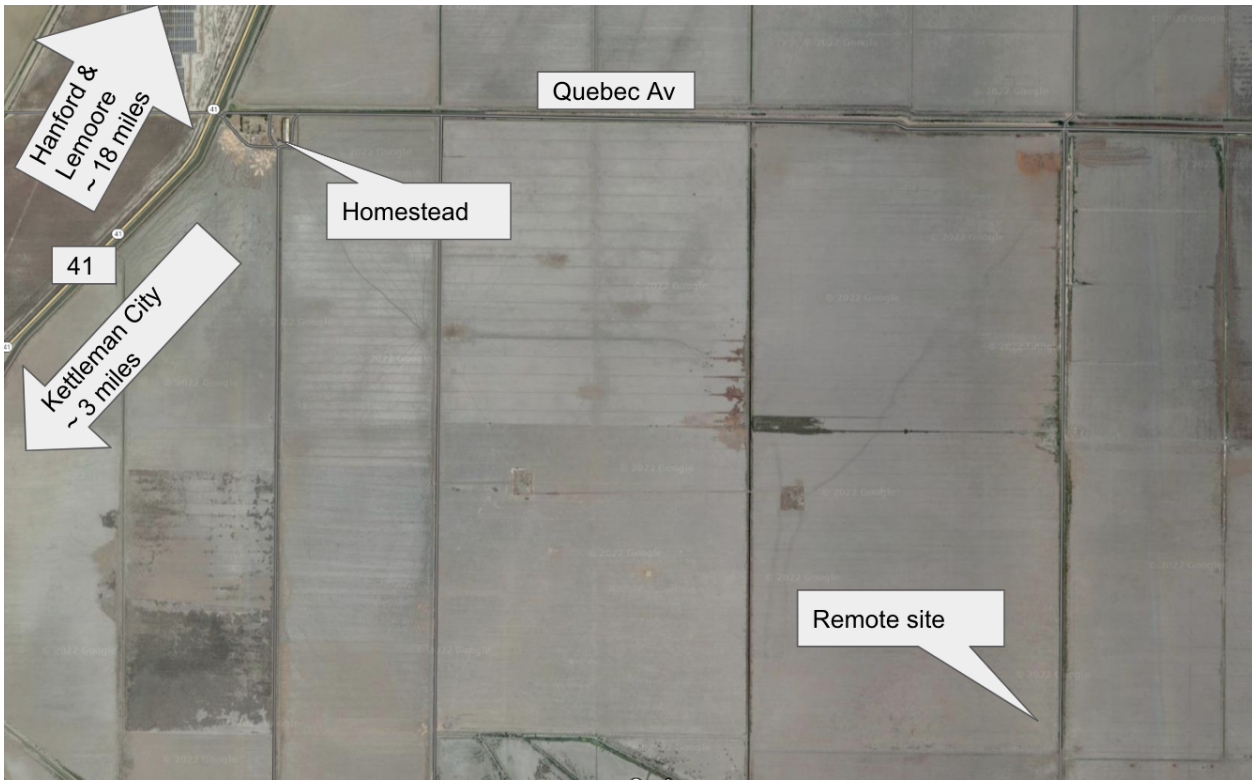
M2HATS ISS Site Survey

Feb 15 - 17, 2023
Bill Brown, Wendy Torrance, & David Ortigoza

A site survey for the ISS deployment for M2HATS was carried out Feb 15 - 17, 2023 by Bill Brown, David Ortigoza and Wendy Torrance. We met co-PI Shane Mayor from Chico State University at the site.

The campaign will be carried out on a farm about 3 miles north of Kettleman City CA at the same location that the AHATS campaign was conducted in 2008. The farm is owned by Sandridge Partners LP and our contact there is COO Andrew Craig. We have a lease agreement from May 1 to September 15, 2023.

There are two locations on the farm that will be used, a Homestead site and a Remote site. The Homestead site is adjacent to route CA-41 (the main road between Kettleman City and Lemoore about 18 miles to the north) and the Remote site is about 3 miles to the southeast in a field.

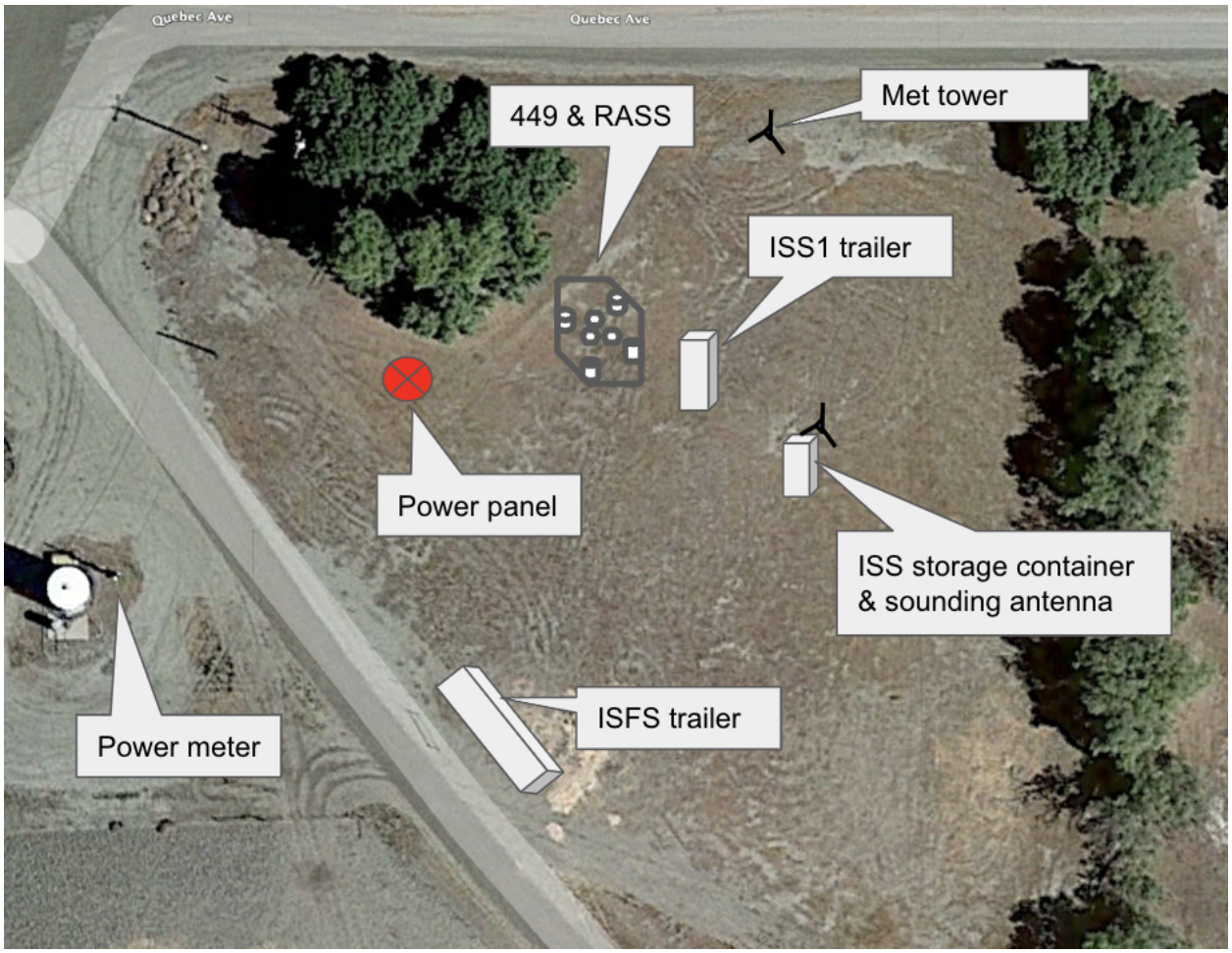


Homestead Site:

Approx location: 36° 3' N, 119° 56' 37" W, 57 m

The Homestead site is just southeast of the intersection of route CA-41 and Quebec avenue. There are the ruins of an old homestead, a large barn that is still being used for hay storage, various old farm remnants, and trees. NCAR equipment (from ISS, ISFS, and RSF) will go at the west end of the homestead area. There is a power drop operated by the farm that we will tap into.

Shane Mayor plans to install the Chico State REAL lidar (housed on a 40-foot trailer) in the northeast corner of the homestead area. From this position the REAL lidar will be able to scan to the east and southeast, and observe the aerosol field and winds approaching the remote site. A fresh power drop will be installed for the Chico operation.



The potential layout of the NCAR area at the homestead. The area is behind a barbed wire fence along the west and south side of the area. The ground around the site is dirt and mostly clear of vegetation. Cattle have been on the area recently when the ground was softer and have left deep hoof marks so the surface is quite rough in places. We will likely need to smooth some areas to avoid tripping or twisting an ankle.

POWER: We met on-site with Dan Pratt of Stan Vierra Electric of Hanford to discuss connection options. He (with help from a PG&E rep from Chico State), have been considering options for power, however PG&E say they will only provide one new drop and that will need to be reserved for the REAL trailer where there is no existing drop.

For the NCAR area, the only option is to use an existing metered drop with 240V 200A service adjacent to a solo operated by the farm. There is a fence and access road in between the site and this drop. Dan recommended that a power cable be strung over the road and fence from the meter pole to a temporary pole with a power panel, potentially at the red circle in the above image.

Equipment for the Homestead site:

The ISS equipment to be installed here includes:

- ISS1 trailer with DM
- 449 MHz Modular Profiler with RASS
- Sounding system (120 radiosondes + spares)
- Surface met with DSM
- Storage container
- Water Vapor GPS
- Web cameras

The wind profiler and RASS will be surrounded by a chain link fence to reduce sidelobes, interference and clutter as well as to reduce radiation to passers-by. The profiler is placed on the west side of the ISS1 trailer and the sounding antenna will be placed on the east side to reduce radio interference from the profiler to soundings. The sounding antenna on the east side will provide better range for soundings at altitude as they get blown eastward down range.

The surface met equipment will include a 10m tower with DSM, Gill wind observer at the 10m level, Lufft 300 Temperature / Relative Humidity and PTB210 pressure at the 2m level. The tower will be located on the north side of the area for optimal fetch of the predicted northerly to NW winds. A Lufft 800 sensor will be on a 3m tower nearby.

The storage container will be either the lidar container or a rented storage pod. In the case of the lidar container, it will be used to transport the lidars and other equipment to the site, and on-site it would be used for storage and for the Helium for soundings.

ISFS proposes to place their base trailer along the road on the south side of the area, where it will have direct line-of-sight to the remote site for the Ubiquiti link. RSF will be installing two MPD lidars adjacent to the power panel.

View looking southwest across the NCAR area at the Homestead site

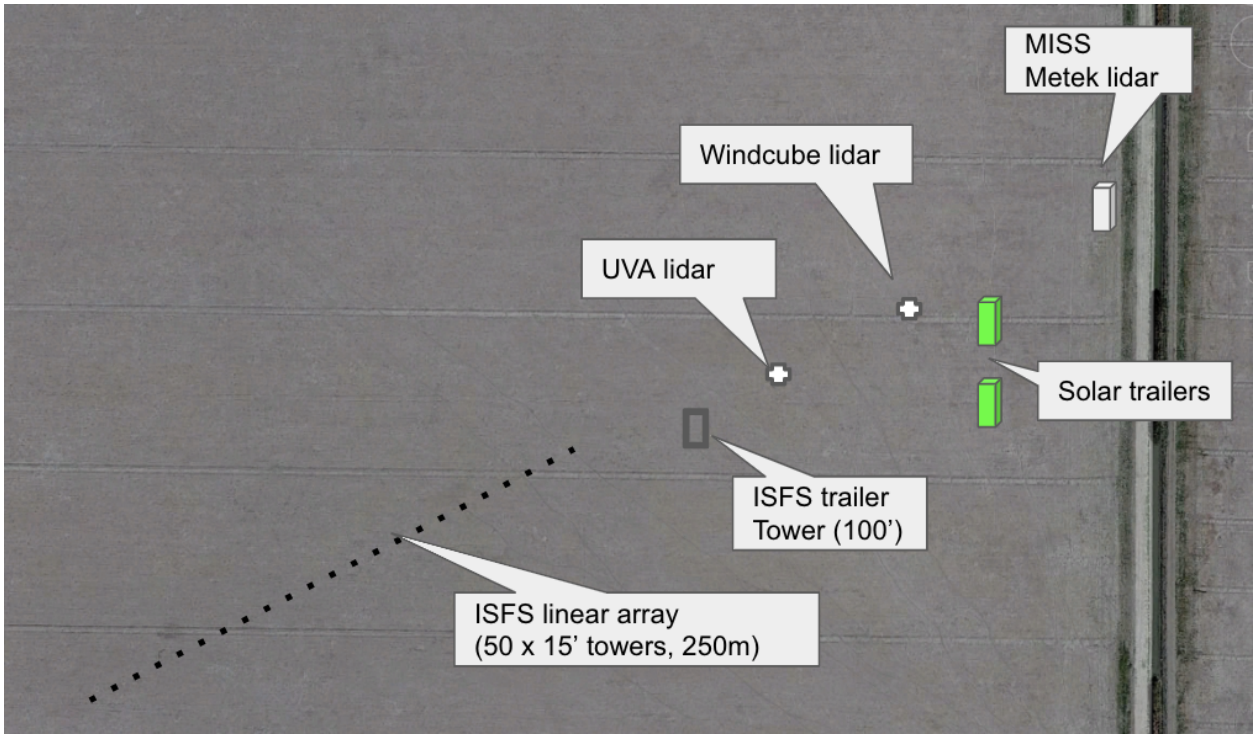
View looking northwest across the NCAR area at the Homestead site

View in the central area of the homestead site

Remote Site:

Approx location: 36° 1' 30" N, 119° 54' W, 54 m

The remote site is a field approximately 3 miles southeast of the homestead site. It is nearly 5 miles drive via the unpaved Quebec avenue and a rough farm road adjacent to an unused irrigation ditch on the east edge of the field. The rough farm road is currently overgrown with vegetation (eg tumbleweed and similar shrubs) and will require mowing before we can drive along it. The field is used for grazing and a number of cattle were in the area when we visited. We may need to add fencing or protection although apparently by summer the cattle should be removed.



ISFS will install a linear array of fifty 5 meter towers along a 250 m path perpendicular to the prevailing wind. There will be 3-D sonics at the 4 m level as well as a range of other equipment. At the northeast end of the array they will install a 30 m telescoping trailer tower.

The ISS equipment will be further to the northeast and includes:

- MISS with DM computer and 915 MHz profiler
- 3m tower with Lufft800 and CS125 visibility sensor
- Windcube 200S lidar (primarily doing PPI cone scans for VAD winds)
- University of Virginia (UVA) HALO lidar (primarily staring vertically)
- Metek HALO lidar (primarily staring horizontally along ISFS 4m sonics)

MISS is being deployed to provide a stable platform for the Metek lidar, which will sit on the roof at the 4 m level and stare along the line of ISFS sonics at the 4 m level. MISS will also provide a useful sheltered space for computers such as the ISS DM, computers for the lidars and the wind profiler. The wind profiler is being deployed as a back up for the 449 profiler. Shane plans to operate another lidar (REVEAL) from a location approximately 300 m further to the northeast.

At regular intervals (potentially hourly) all three lidars will perform the same scan for intercomparison and calibration purposes. This will likely be a DBS or PPI scan. The UVA lidar may be installed on the deck of the ISFS tower trailer. All three lidars are specified to operate at up to 45C (113F), however may require supplemental cooling or at least shading from the sun.

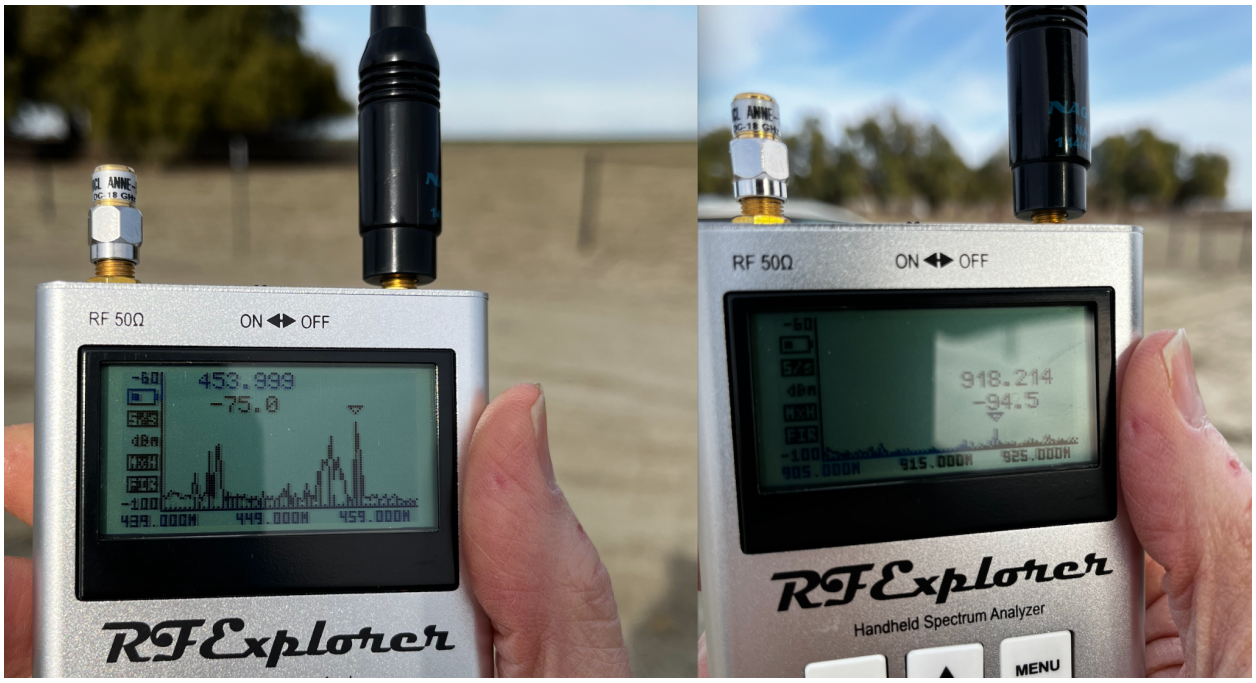
Power will be provided by solar trailers leased from SunforRent with a 7.6 kW solar array, 60 kWh battery capacity and backup diesel generator. MISS also has a diesel generator that can be used if there is a problem with trailer generators.

View looking west across the remote site field

View to the northwest across the irrigation ditch and the field beyond

Radio Frequency Interference:

We carried out a radio frequency survey using an RF Explorer portable spectrum analyzer.



The frequency band around 915 MHz was very clean. The band around 449 MHz was noisier, with intermittent signals around 440 MHz and 455 MHz in the -80 to -75 dBm range with the unextended whip antenna on the RF Explorer WSUB3G analyzer. These are similar to those seen at CFACT and SWEX, so are unlikely to cause major problems at M2HATS although we should install a chain-link fence around the profiler to reduce the interference and clutter.
For comparison, in Boulder we get intermittent signals around 10 dB stronger and closer to 449 MHz which can be problematic at times. The 400 MHz band where the radiosondes operate was clean, although we will need to separate the sounding antenna from the Modular Profiler antenna.

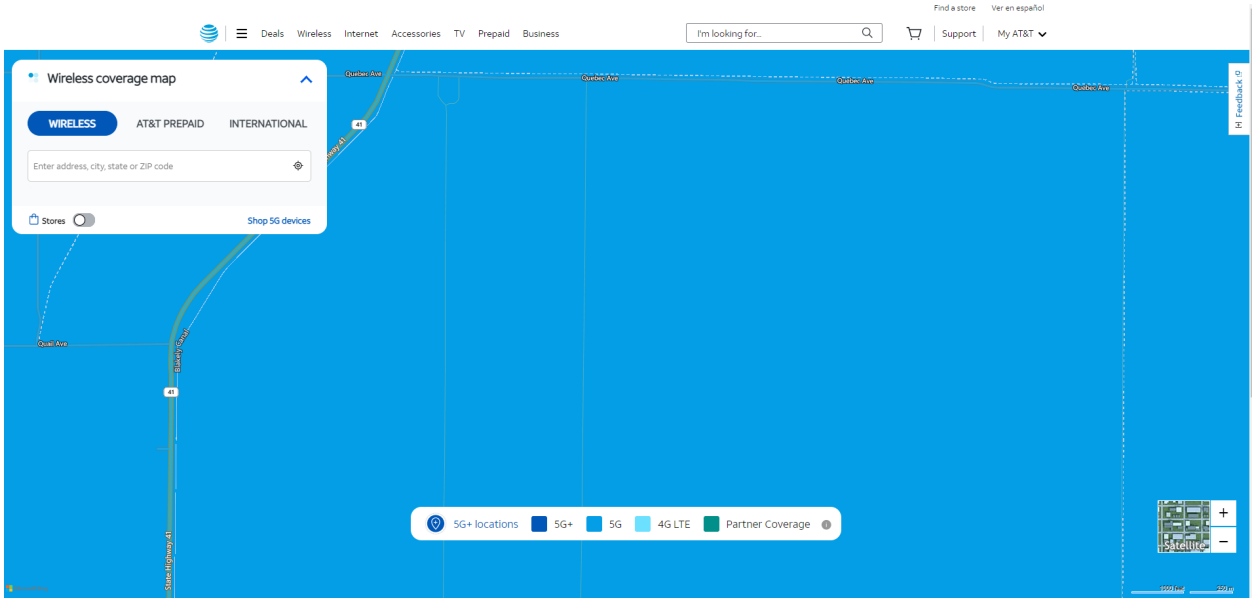
A directional antenna was used in an attempt to find the direction of the interference, however this was mostly inconclusive. The radio spectrum activity was similar at both the Homestead and Remote sites.

Cell Service / DSL at Homestead Site:

We found no cable or phone service along the highway next to the site, so DSL or other hardwire service appears to be unavailable. There is good cell coverage however. We carried out speed tests using our cell phones. A Verizon phone reported LTE service with downloads in the 15 - 35 Mbps range and uploads in the 6 Mbps range. A T-mobile phone reported 5G coverage if held aloft. Raising the phones produced higher speeds so an external antenna mounted on the roof of the trailers will likely provide better service.

In looking at AT&T service maps the property has access to AT&T 5G. The homestead field site does not have a physical address but does have coordinates and a plus code.

Quebec Ave & Hwy 41
36.05056° N,119.94436° W
Reef-Sunset Unified School District, CA
3324+67C Kettleman City, California (Plus Code)



Travel to Field Site:

The Kettleman CA field sites can be reached from Colorado by air from DIA. Flights from Denver, CO to Fresno, CA are the most direct to the field site. United and SouthWest which have a few non-stop flights, are approximately 2.5 hours in length. Other airlines do fly to Fresno but do not have non-stop flights.

Fresno to Kettleman is approximately a 60 mile drive. Other close airports would be Bakersfield, CA (approximately 80 miles) or Sacramento, CA (approximately 215 miles) to Kettleman.

Driving to Kettleman is approximately 1,115 miles from Boulder, CO as there will be a few individuals driving the equipment to the field site.

Lodging:

Lodging is available in Kettleman, Lemoore or Hanford.

Kettleman has a population of 1,500. The **only** hotels are the Quality Inn and Best Western with limited food options. Wild Jack's Tex-Mex BBQ was a restaurant enjoyed by four of us and has a wide variety of food. Kettleman is approximately 5 miles from the field site.

- For those with night field operations, it may be preferable to stay in Kettleman.

Lemoore has a population of approximately 26,000. Hotel and food options are more limited than Hanford. The Tachi Casino is the most likely location to stay in Lemoore. Lemoore is approximately 18 miles to the field site.

Hanford has a population of 57,000 and multiple hotels and food options. Hanford is approximately 27 miles from the field site. Suggested hotels include the Home2 Suites by Hilton and the Comfort Inn. Hanford would be our recommendation as it has the most hotels, most food options and most shopping including Home Depot, Lowes and Tractor Supply.

Hanford Home2 Suites rooms include a kitchen area with a refrigerator, microwave, dishwasher, cookware, coffee maker and toaster. Induction burner cooktops are also available free from the front desk. Additionally a hot breakfast is available, free wifi, outdoor pool and fitness center. At the front desk area there is a small Home2 Mkt with some basic food options. Wendy has been working with the hotel on a group rate for the project.

Hanford Comfort Inn rooms include a refrigerator, microwave, and coffee maker. A free hot breakfast is available, free wifi, outdoor pool, outdoor parking, laundry and interior corridors. There is a train nearby that is supposed to not go past after 8pm. However Wendy did hear a train in the 5am hour on one day of the stay but not the other.

Hospitals and Medical Centers

While we did not officially check the medical facilities / hospitals, this is the information currently available:

Kettleman
Aria Community Health Center
www.ariachc.org
304 Becky Pease Street
Kettleman City, CA 93239
(559) 386-4501
Open 9am-6pm, Monday - Thursday

Lemoore
There are a number of health centers but no hospital in Lemoore. If the employee is ok to drive from Kettleman then it's probably preferable to continue to Hanford which has an actual hospital and far better reviews.

Hanford
Adventist Health Hanford
235 beds - which is a big hospital
https://www.adventisthealth.org/hanford/

115 Mall Drive
Hanford, CA 93230
(559) 582-9000
Open 24 hours

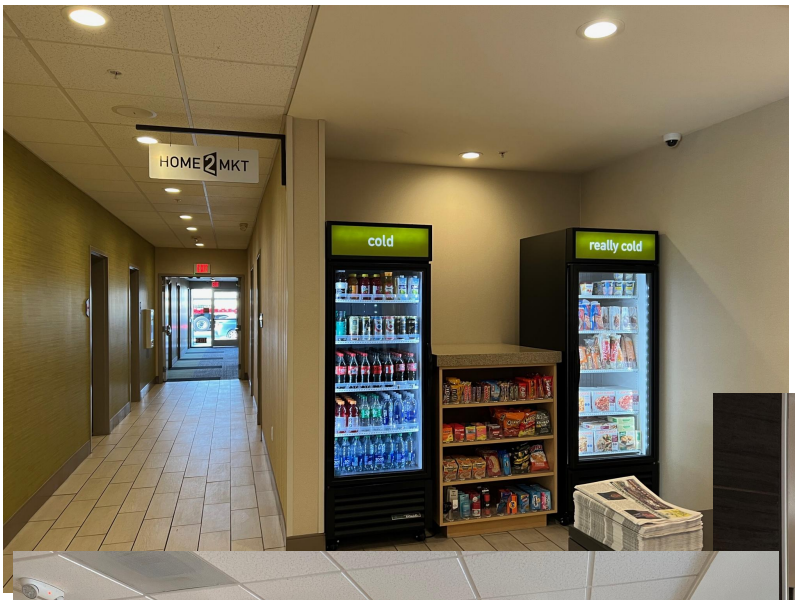
It is worth noting that Valley Fever is common in this area. The Valley Fever fungus is most prevalent between June and November. If you inhale the valley fever spores, you may develop a lung infection. Symptoms may appear between one and three weeks after a person breathes in the fungal spores. Most cases of active Valley Fever resemble a minor touch of the flu and in rare instances Valley Fever can progress to a severe and serious infection. CDC Symptoms of Valley Fever (Coccidioidomycosis) page.

Safety and Personal Preparedness:

At the site wear protective shoes (such as sturdy tennis shoes or hiking boots), hats and ensure you have enough water. Summer months will see temperatures above 100 and lows in the 60's. Additionally rattlesnakes and fire ants, at a minimum, will potentially be present at the site.

We don't have particular personal safety concerns at the site or nearby towns (Kettleman, Lemoore or Hanford). However it should be noted that in the next county (Tulare County), there were criminal gang shootings earlier this year. As always, staff should exercise caution and beware of personal safety when traveling around, particularly at night. In addition there have been recent fatal accidents along CA-41, the highway to the site, so please be careful driving to and from the site.

Pictures below for Home 2 Suites - we were not able to see a room. Use website for review of rooms.


HOME 2 MKT
cold
really cold

Pictures below for Comfort Inn - we stayed here for the site visit.