Thermal Image Interpretation

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1 DAEDALUS

1.1

**What features are in the regions H and F? Explain why these regions appear bright
in the nighttime thermal image. Some light spots can be seen on the rooftops of buildings D and
E. What are these features? Explain why they appear light on the thermal image.**

Regions H and F are predominately comprised of plants. Region H appears to be medium to large trees
and region F appears to be grass with a a large tree or two in the center and potentially some bushes
along the edge.

Plants typically appear ███████, i.e. hotter, than their surroundings during night thermal imaging because
of their high water content. Water has the ██████ known heat capacity (1 cal g^{-1} °C^{-1}) meaning that it is
resistant to temperature channge. As a result, a plant's temperature changes relatively little between day
and night while the temperature of the surrounding environment changes significantly more. Because
thermal imaging is based on *relative* temperature, plants appear relatively cooler during the day and
relatively warmer at night.

The spots in the rooftops in D and E are most likely areas of poor insulation. Given that these images
were taken in New York in November, it is likely that buildings were being heated and therefore warmer
than the ambient temperature. Escaping heat therefore appears ██████ in the thermal images.

1.2

**How do the pavement (G) and the lawn grass look like in the nighttime thermal
image? Can you observe the buried heating lines and manholes on the nighttime thermal image?
The Brookhaven maintenance staff suspects that the steam lines were leaking the heat because
pipe insulation had deteriorated. Visually interpret the thermal image and identify the possible
locations for major leaks.**

In the nighttime thermal image, the pavement appears slightly ██████warmer than the lawn grass. The buried
lines are easily visible as ████████ running across the lawn areas and the manhole covers are even brighter
white spots.

There are a number of potential leak spots, ███████████████████████████████████. Major leaks appear
predominately around areas ████████, with the most leakage occuring at manholes. Another major leak is on the
other ███████████ a sharp bend in the pipe with additional leakage along the pipe running ████████ under the lawn
towards B. There is potential significant leakage at or around many of the buildings, ████████████ but it is
difficult to tell if the high thermal readings are due to plants or pipe leaks.
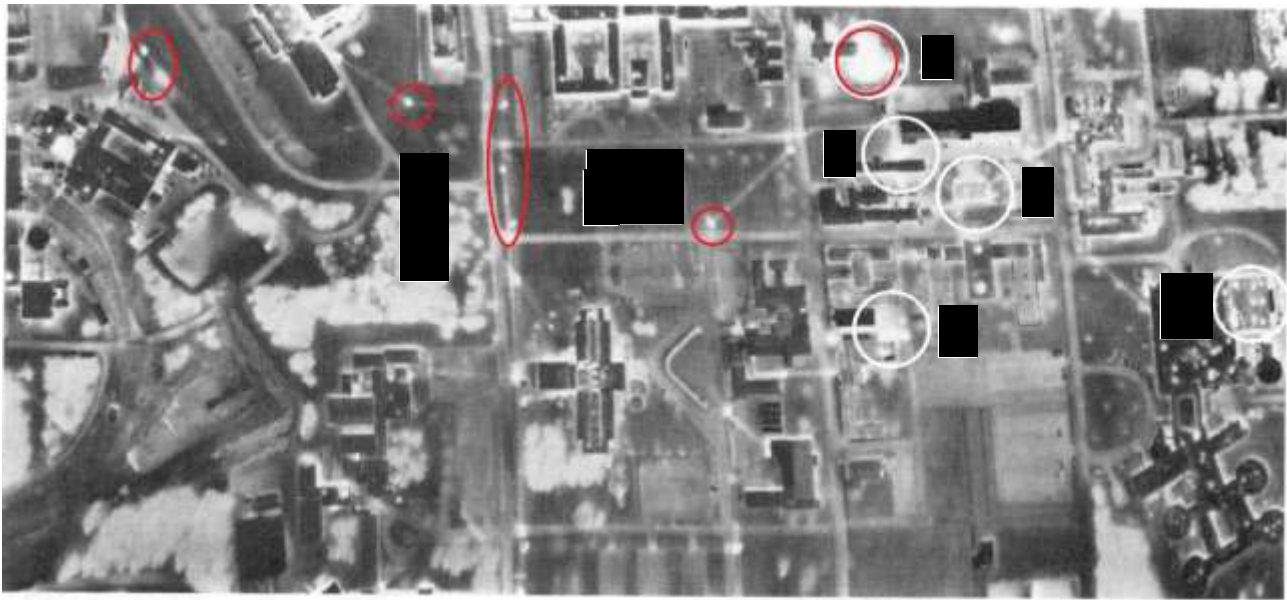
2 ATLAS

2.1
Which image is the daytime thermal image, and which is the nighttime image?
Explain why? Why do the lakes appear dark in the daytime thermal infrared image and light in the nighttime thermal infrared image?

███████ is the daytime image and ████████ is the nighttime image. The easiest way to tell is by looking at the lakes in the upper left. Water has a ████████ heat capacity, meaning it is resistent to temperature change. Between day and night its temperature is relatively unchanged, but the temperature of the surrounding environment changes significantly. Because thermal images are displayed as *relative* temperature, the ████████ of the lakes appear to change significantly in comparison to the other areas.

2.2
Can you observe the shadows from tall building on the daytime thermal image?
Several objects appear very dark in the nighttime image while are relatively bright in the daytime image. What are these objects?

Shadows of tall buildings are observable in the daytime image to some degree.

Objects which appear very dark at nighttime but relatively bright at daytime are ████████████████ or other water impervious surfaces. These surfaces have ██████ heat capacity and are highly susceptible to temperature change. As a result, these surfaces appear bright during daytime and dark at nighttime.