

**SYRIA UPDATE II: SYRIA BURIES FOUNDATION OF SUSPECT REACTOR SITE**  
THE INSTITUTE FOR SCIENCE AND INTERNATIONAL SECURITY  
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A further examination of the DigitalGlobe imagery featuring the suspected Syrian reactor construction site on October 24, 2007 reveals that in addition to dismantling and removing the building, Syria appears to have buried the foundation (Figures 1 and 2). Syria bulldozed a section of a hill adjacent to the suspected reactor building and used the excavated dirt to cover over the site. Furthermore, if Syria intended to conceal an underground portion to this building that had been subsequently exposed by bombing, burying it would have been easier than removing it. The excavated hill was brought to ISIS's attention by two close readers of the imagery who noticed it.



Figure 1. Suspect reactor site before September 6, 2007 Israeli raid.

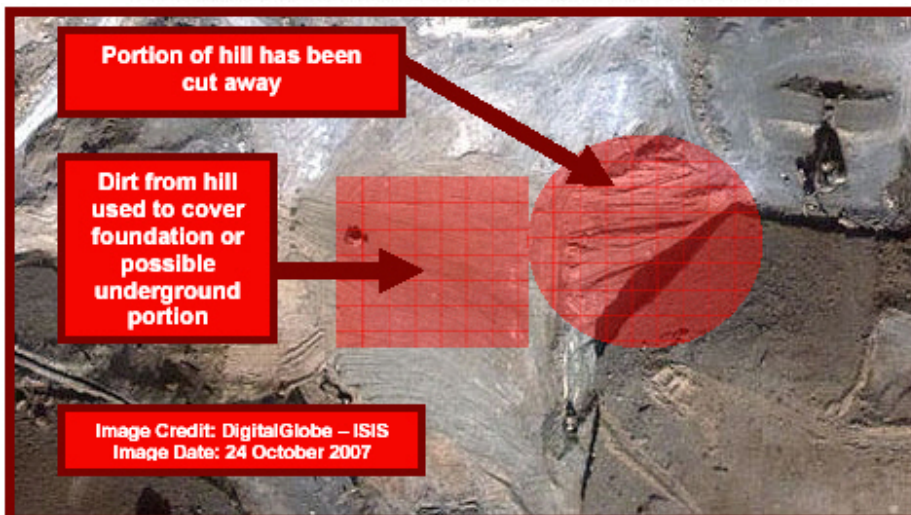


Figure 2. Suspect reactor site after September 6, 2007 Israeli raid.

## **SYRIA UPDATE: SUSPECTED REACTOR SITE DISMANTLED**

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ISIS has obtained commercial satellite imagery from DigitalGlobe taken on October 24, 2007 that shows the suspected reactor construction building completely removed and the ground scraped (Figure 2). [ISIS released a report on October 23, 2007](#) that featured DigitalGlobe imagery from August 10, 2007 showing the suspected reactor construction site of the September 6, 2007 Israeli raid inside Syria. A comparison of these two images effectively confirms that this site was indeed the target of the Israeli raid (Figures 1 through 6).

The pump house and secondary structure still remain in the October 24, 2007 imagery, but the suspected reactor building has been razed to the ground (Figures 2 and 6). Dismantling and removing the building at such a rapid pace dramatically complicates any inspection of the facilities and suggests that Syria may be trying to hide what was there. Iraq followed a similar strategy in the 1991 after the first Gulf War, though eventually the International Atomic Energy Agency (IAEA) and UN inspectors pieced together a full picture of Iraq's activities. Iran razed the site at Lavizan and insisted that no prohibited nuclear activity was conducted at the facility.

Tractors or bulldozers can be seen in the October 24 imagery where the suspected reactor building once stood. Scrape marks can be seen around the razed part of the site. There also appears to be a trench in the October 24, 2007 imagery that is better defined than in the August 10, 2007 imagery. This trench may be more visible as a result of the Syrians digging up buried pipelines running from the pump station to the now-gone suspected reactor construction building. Because of a more prominent shadow in the October 24, 2007 imagery, there appears to be evidence of an underground portion of the suspect reactor building.

### **Safeguards Issues**

An important question is whether Syria may be in violation of its agreements with the International Atomic Energy Agency. Syria is a member of the Nonproliferation Treaty (NPT) and maintains what are known as full-scope IAEA safeguards. Syria signed the NPT in July 1968 when the Treaty opened for signature, and ratified it two months later on September 24, 1968. It concluded a safeguards agreement with the IAEA on May 18, 1992, which "safeguards" a single small nuclear research reactor on Damascus.

Syria is not an adherent to the Additional Protocol, which establishes more comprehensive reporting requirements and inspection rights for the IAEA. The terms of precisely how Syria's safeguards agreement is implemented are set forth in what are

known as "subsidiary arrangements." Neither the safeguards agreement nor the subsidiary arrangements are public documents.

Nevertheless, countries with full-scope safeguards agreements are obligated to provide the IAEA with so-called "design information" about nuclear facilities that they plan to construct. According to the IAEA Safeguards Glossary ([http://www-pub.iaea.org/MTCD/publications/PDF/nvs-3-cd/PDF/NVS3\\_prn.pdf](http://www-pub.iaea.org/MTCD/publications/PDF/nvs-3-cd/PDF/NVS3_prn.pdf)), design information for new facilities "is to be provided by the State as early as possible before nuclear material is introduced into a new facility." In addition, states are "to provide preliminary information on any new nuclear facility as soon as the decision is taken to construct, or to authorize the construction of, the facility, and to provide further information on the safeguards relevant features of facility design early in the stages of project definition, preliminary design, construction and commissioning."

Regardless of whether Syria is an adherent to the Additional Protocol, it had an obligation to inform the IAEA of its decision to construct any new nuclear facility.

There is reportedly debate now among those familiar with safeguards implementation over how serious a violation this amounts to, in the absence of nuclear material being present at the site. Iran informed the IAEA in April 2007 that it will not notify the Agency of work on new facilities until six months before nuclear material is to be introduced, thereby reverting to an outdated, 1976 safeguards protocol. There is no public record of Syria similarly amending its safeguards obligations. Further, the IAEA noted in the case of Iran that such obligations cannot be amended unilaterally.

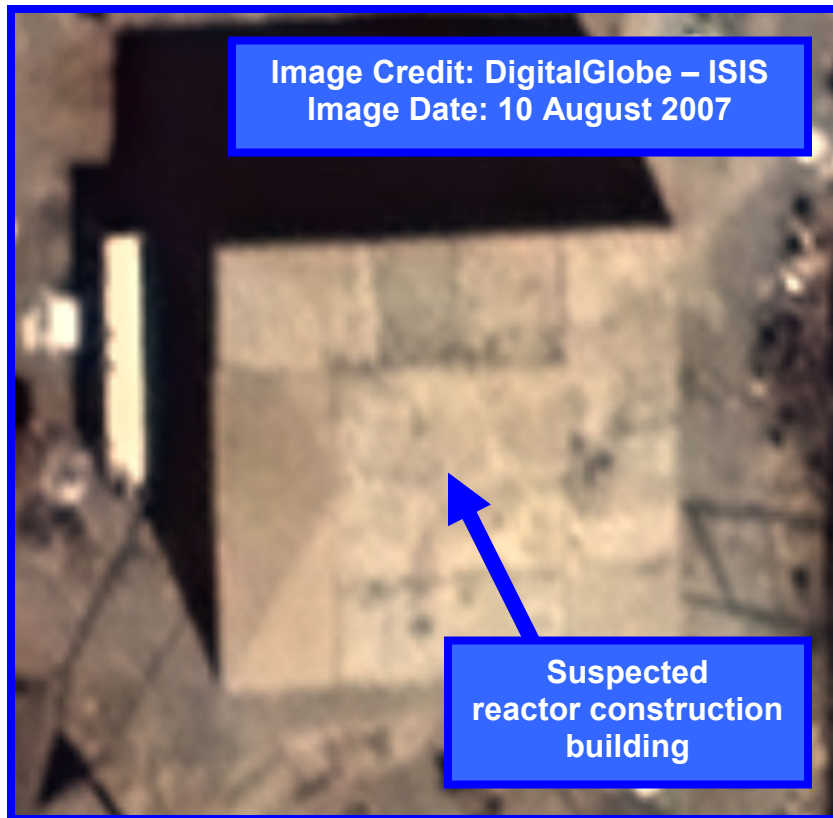




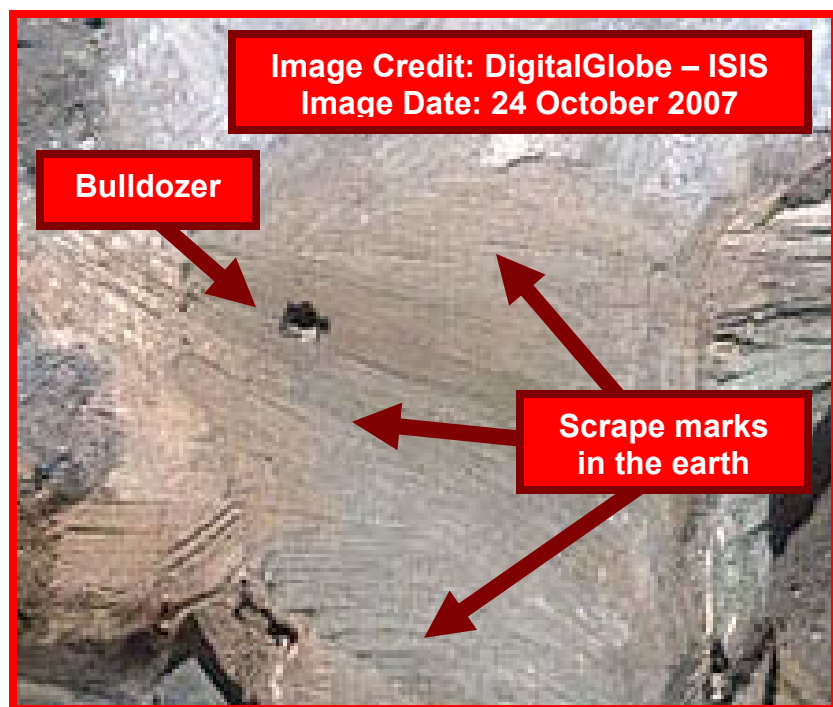
**Figure 1. Overview of suspected reactor site before September 6, 2007**



**Figure 2. Overview of suspected reactor site after September 6, 2007**



**Figure 3. Suspected reactor construction building before September 6, 2007 Israeli raid.**



**Figure 4. Suspected reactor construction building dismantled.**



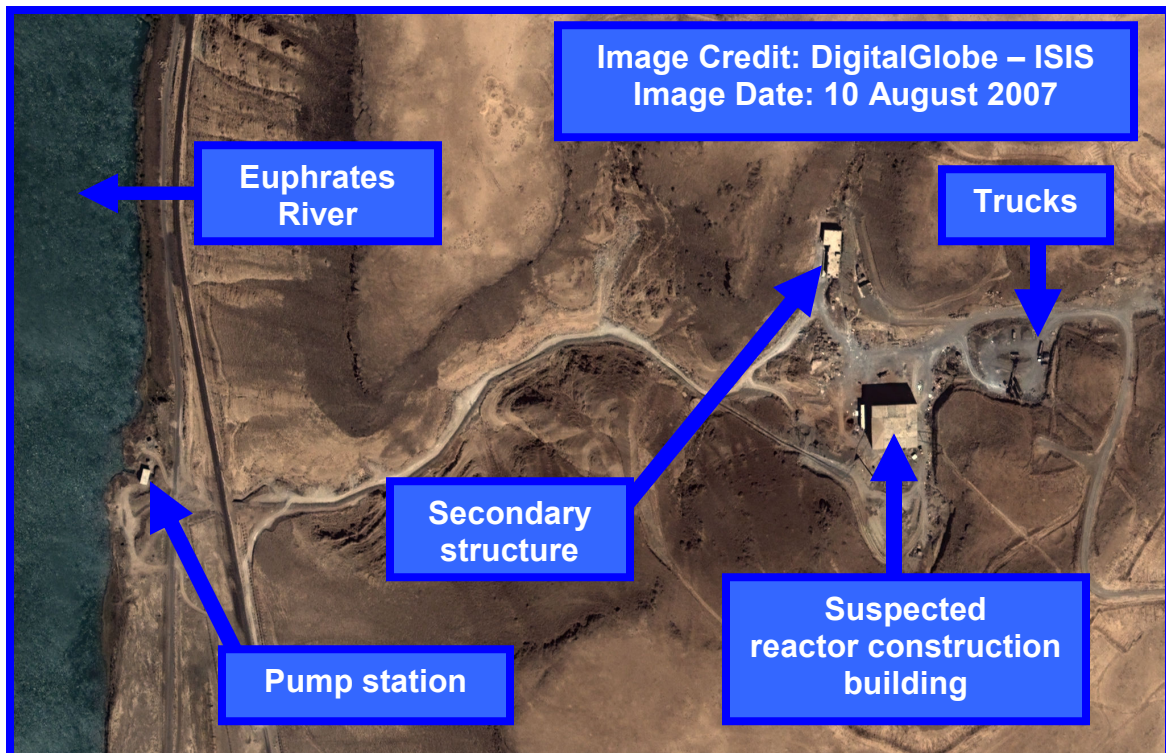


Figure 5. Before the September 6, 2007 Israeli Raid.

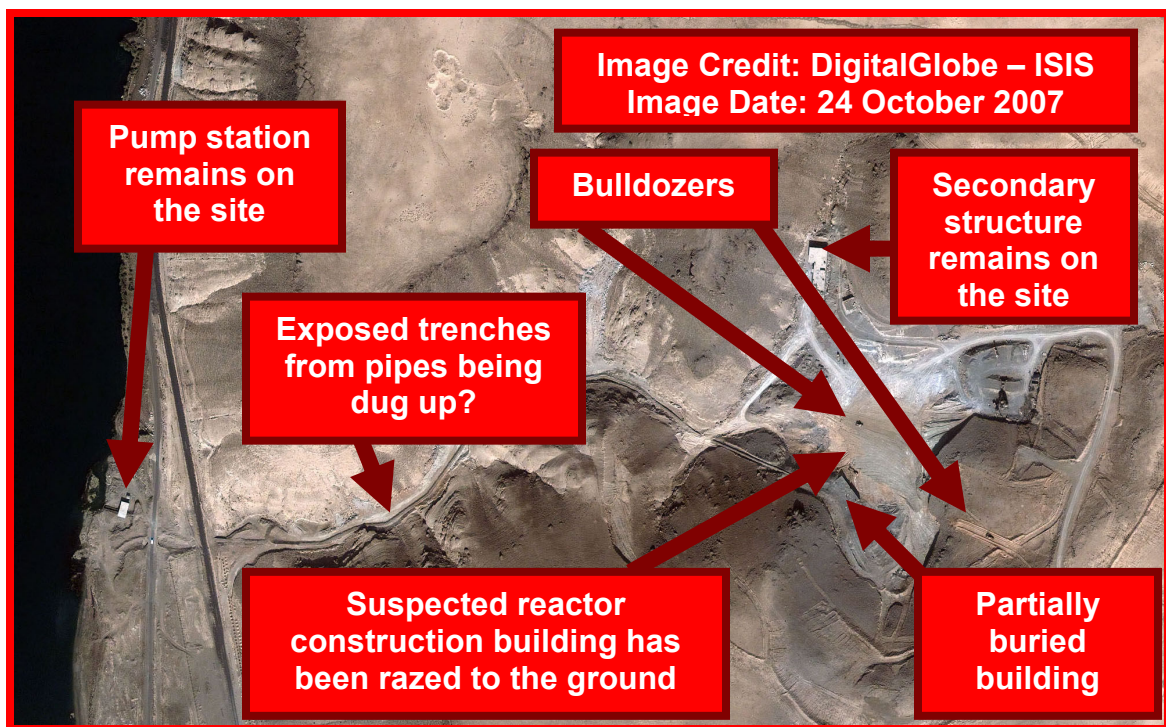


Figure 6. After the September 6, 2007 Israeli raid.

# **SUSPECT REACTOR CONSTRUCTION SITE IN EASTERN SYRIA: THE SITE OF THE SEPTEMBER 6 ISRAELI RAID?**

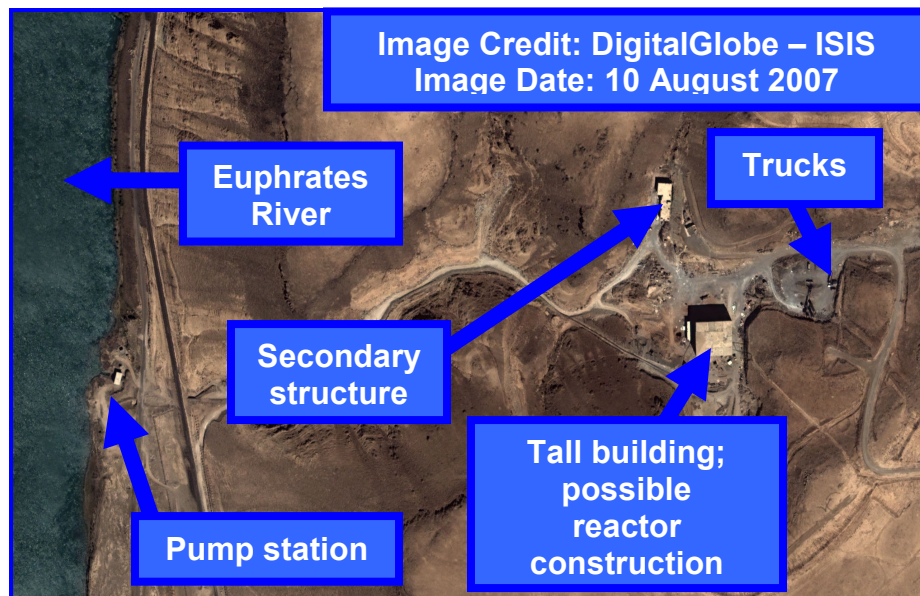
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ISIS recently obtained commercial satellite imagery from DigitalGlobe taken on August 10, 2007 of a large portion of Eastern Syria along the Euphrates River. After an extensive search and analysis of the imagery, ISIS found a site that could be the target of the Israeli raid inside Syria on September 6, 2007.<sup>1</sup> The tall building in the image may house a reactor under construction and the pump station along the river may have been intended to supply cooling water to the reactor (Figure 1).

The tall building, located approximately 780 meters from the river, is square with approximately 47 meter length sides. There is what appears to be a pump station located on the banks of the river directly west of the tall building. A reactor requires a large volume of water for cooling and this pump station could serve that purpose. The purpose of the secondary building in the image (see Figure 1) is unknown, but it does not appear to be a temporary structure. Trucks can be seen approximately 100 meters to the east of the tall building. This, along with evidence of heavy machinery tracks around this site, indicates recent construction activity.



**Figure 1.**

<sup>1</sup> On October 22, ISIS provided a draft report to *The Washington Post*. According to an October 24 article by Robin Wright and Joby Warrick, “U.S. and international experts and officials familiar with the site, who were shown the photographs yesterday, said there was a strong and credible possibility that they depict the remote compound that was attacked.”

This site is approximately 145 kilometers from the Iraqi border and situated 11 kilometers north of At Tibnah in the Dayr az Zawr region of Syria (Figure 2). There is an airstrip located 3.5 kilometers north of the site (Figure 3). Such an airstrip would serve as quick transportation of personnel and officials.

ABC News reported on Friday, October 19<sup>th</sup>, 2007 that Israel had recruited a spy to take ground photographs of the reactor construction from inside the complex. Recruiting a spy to take ground photographs of an exposed reactor vessel is unnecessary—as high resolution non-commercial satellite imagery would negate this need. If, however, the reactor vessel and associated shielding were surrounded by a building and covered with a roof, a spy may have been necessary to take photographs from inside the reactor building.

[\*The Washington Post\* reported](#) on Friday, October 19<sup>th</sup>, 2007 that an official described a facility as similar in structure to a North Korean reactor. North Korean reactor construction is based on an old Russian model—in which the reactor vessel is built gradually and is not brought to the site already constructed or in large pieces, requiring a large crane to move heavy equipment inside. This North Korean/Russian approach would mean that a roof would be placed on a building earlier than in some other reactor designs, and it would hide what was inside the building earlier in the construction timeline.

In comparing the five megawatt-electric (or 20-25 megawatt-thermal) reactor building at North Korea's Yongbyon nuclear facility to this suspected Syrian reactor building, the length of the outer walls of the structures are approximately the same (see Figures 4 and 5). The taller roof of North Korea's reactor measures approximately 32 meters by 24 meters on its sides. There also appears to be a faint square on top of the Syrian building's roof. It is unclear whether something would be built there, but its dimensions, 24 meters by 22 meters, are consistent with the subsequent construction of an upper roof. From the image, the Syrian building is similar in shape to the North Korean reactor building, but the Syrian building is not far enough along in its construction to make a definitive comparison.

If the design of the reactor is similar to a North Korean reactor, it is likely a small gas-graphite reactor of the type North Korea built at the Yongbyon nuclear site north of Pyongyang. The Syrian building size suggests that the reactor would be in the range of about 20-25 megawatts-thermal, large enough to make about one nuclear weapon's worth of plutonium each year (see Figures 4 and 5).

If Syria wanted to build nuclear weapons, it would need a specialized facility to chemically separate the plutonium from the irradiated fuel discharged from the reactor. It is unknown whether Syria has such a facility under construction or planned.

On October 23, 2007, Google Earth posted imagery that covers a wide swath of eastern Syria and includes this site. The suspected reactor building can be seen, but the



secondary structure and the pump station are both missing in this image. The exact date on which the image was taken is not provided by Google Earth, but it must be significantly earlier than August 10, the date of the DigitalGlobe imagery obtained by ISIS. The absence of the pump station would make interpretation of the purpose of the site very difficult.

The images raise as many questions as they answer. How far along was the reactor construction project when it was bombed? What was the extent of nuclear assistance from North Korea? Which reactor components did Syria obtain from North Korea or elsewhere, and where are they now? Is Syria able to produce any of the key reactor components itself? Could Syria have finished the reactor without on-going North Korean assistance? Did Syria plan to build a plutonium separation plant?

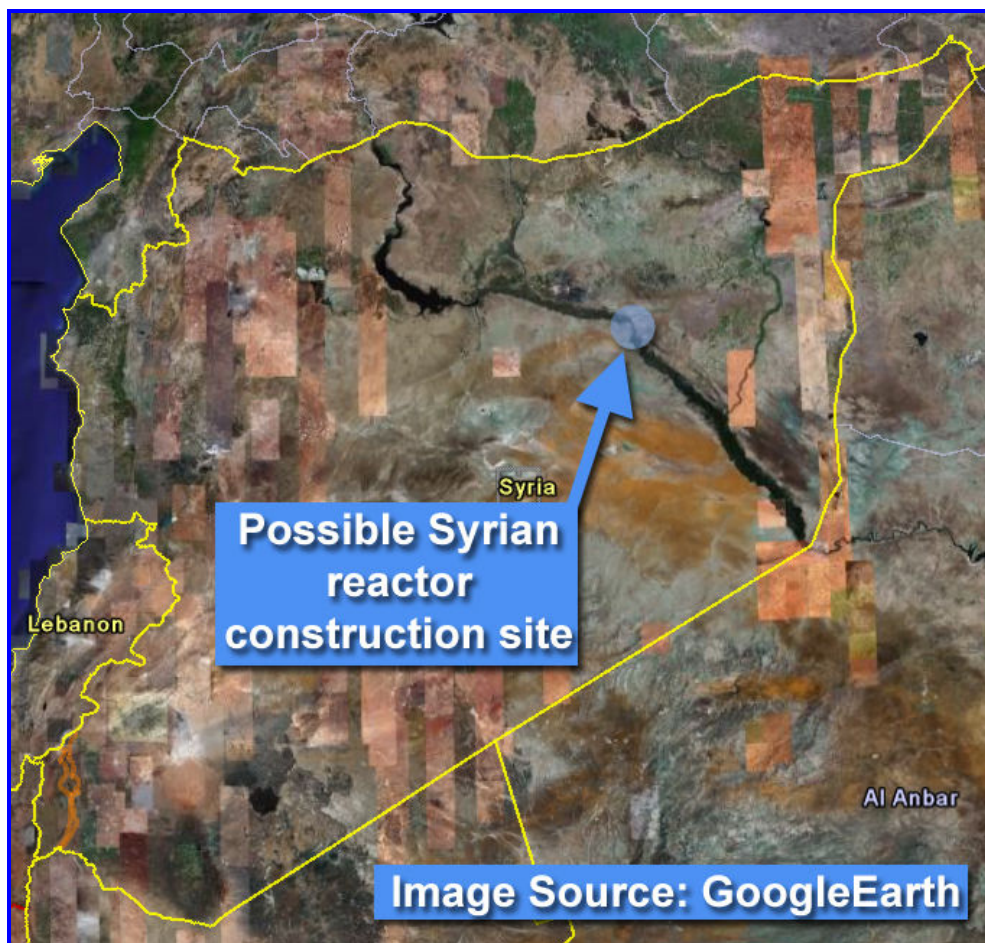
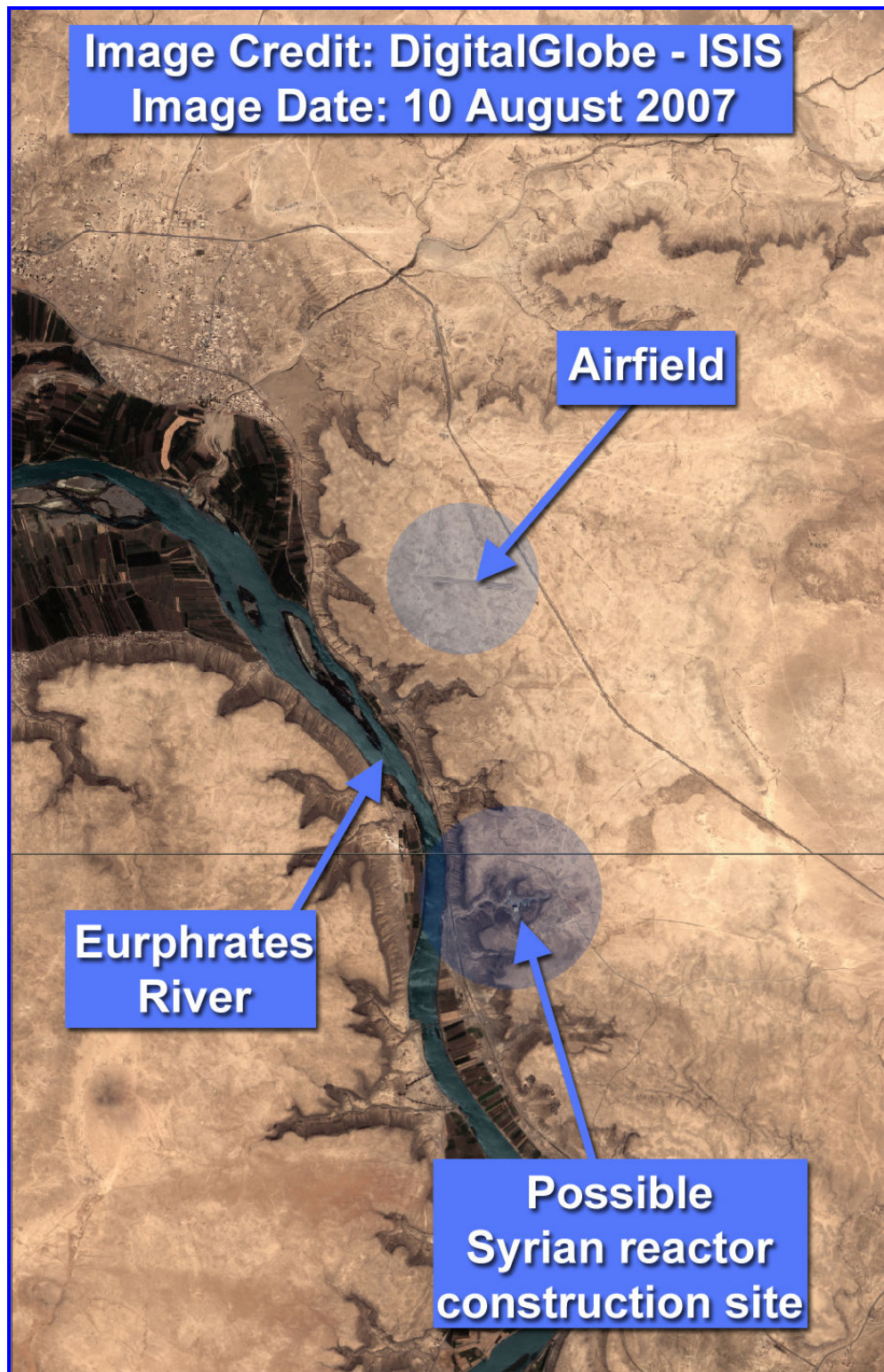


Figure 2.



**Figure 3.**





Figure 4. The five megawatt electric reactor building at Yongbyon, North Korea.

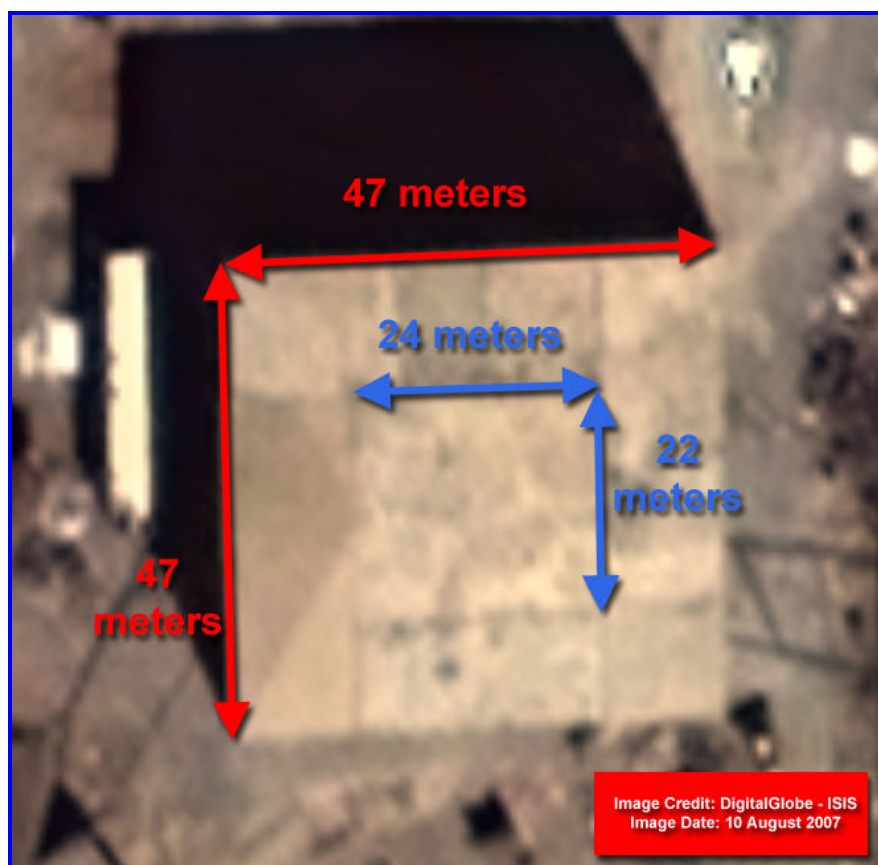


Figure 5. Possible Syrian reactor construction site.