12 August 2015

Water supply to the Syrian bombed site: what it is telling us

Robert Kelley
Associate Senior Research Fellow, SIPRI

In 2007 a building at a site in northeast Syria called Al Kibar (AK) was bombed.[1] The building presumably was a nuclear reactor under construction as assessed by the US Intelligence community with low confidence.[2] The building apparently was bombed by Israel[3] although it has never publicly taken credit. Syria initially did not even acknowledge an attack but later stated in response to a query from the IAEA that the destroyed building was a military installation unrelated to any nuclear application and lacked sufficient electricity and treated water supplies.[4]

If the building was "very likely"[5] a gas cooled graphite moderated reactor, as assessed by IAEA Director General Yukiya Amano in his May 2011 report, a cooling system for the reactor core is an essential requirement. As there are no cooling towers visible at the site, a large pipeline to the nearby Euphrates River is suspected as providing the cooling water for the "reactor". There is such a pipeline link but it is more complex than described by the IAEA[6] and the actual cooling system opens up new questions about this site and another site. It is important to consider all strategic signatures of nuclear activity when analyzing this and other Syrian sites.

The first thing that is clear is that a large, modern water treatment plant was built in the desert long before the AK bombed building was completed. This Desert Water Treatment Plant (DWTP) is clearly visible in 2004 Google Earth imagery when the bombed building was still under construction. In 2004, mature trees around the perimeter of the DWTP are already clearly visible. There are no other customers for this water treatment plant so its connection to Al Kibar is perfectly clear.

---

[1] It is also called by other names such as Dair Alzour and variations on this transliteration from Arabic to English

[2] Iran-North Korea-Syria Ballistic Missile and Nuclear Cooperation, US Congressional Research Service, Paul K. Kerr, Analyst in Nonproliferation, Steven A. Hildreth, Specialist in U.S. and Foreign National Security Programs, Mary Beth D. Nikitin, Specialist in Nonproliferation, May 11, 2015

[3] IAEA, "Implementation of the NPT Safeguards Agreement in the Syrian Arab Republic", Report by the Director General, 19 November 2008, www.iaea.org.

[4] Ibid.

[5] IAEA, "Implementation of the NPT Safeguards Agreement in the Syrian Arab Republic", Report by the Director General, 24 May 2011, www.iaea.org.

[6] Ibid

12 August 2015

Figure 1. The Desert Water Treatment Plant is well established even in 2004.

The trace of a pipeline from the DWTP to the AK under construction is clearly visible in 2004. The most obvious good road to the AK is from the DWTP and not from the shortest route to the Euphrates. There is no security fence or perimeter protection at AK. By 2007 the pipeline connecting the DWTP to the Al Kibar bombed building is clearly visible.

Figure 2. A water supply to the building comes from the DWTP in 2007.

The DWTP is connected to the Euphrates River by its own 5 km long pipeline which is clearly visible even in 2004. The DWTP takes water from the river from a well-secured pumping station about 4.5 km south of the alleged reactor. Three large pipes connect the riverside pump house to the pipeline. There are several other structures, probably a buffer tank for water surge protection and an accumulator at the river pump house. This riverside pumping station has two road entrances with a security wall encompassing about 2.5 hectares. The security wall extends a few metres into the river on either side of the pump house. There is a small guard house at both entry points. This is a protected site.

In 2007 imagery reveals a new pump house much closer to the AK bombed building. According to the IAEA, which visited the site once, this pump house has an electrical supply adequate to cool a 25 MW (thermal) nuclear reactor. The IAEA assesses this pumping station as the cooling supply for the AK suspected reactor. The IAEA does not report visiting the DWTP and does not note it is connected to the Euphrates River by its own historical pipeline that it overlooks in its site diagram.[7]

[7] Ibid

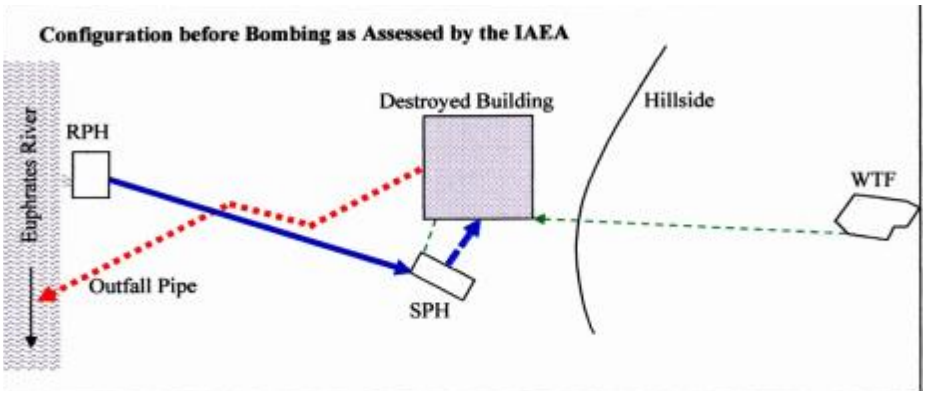

Figure 3. The IAEA labels the Desert Pumping Water Plant as the WTF and does not note its long-standing connection to the Euphrates River. The IAEA site pumping house (SPH) has no visible reserve and will be exhausted immediately in event of a power failure which can lead to a reactor melt-down. The SPH is not visible in satellite imagery and is not described in any detail in IAEA reporting. IAEA assesses the dotted green line as a Small Diameter Treated Water and/or Electrical Connection [8]

The new pump house is similar in size to the DWTP pump house. It is located just 25 metres from a north-south public highway and has no security fences, guard house or any other visible protection. The water line from the pump house must pass under the public highway and a nearby railroad track and there is no protection of the corridor for the pipe. A small lagoon connects the pump house to the Euphrates River. It is a completely unprotected facility that would be critical to the operation of an allegedly strategic site.

Figure 4. The new unprotected pump house would pump water up hill to the building according to IAEA. The pipeline passes under two right-of-ways without fencing or protection. The better road to the site leads from the DWTP and not up the canyon from the river. There is no major security checkpoint on either road leading to the building, a building which supposedly housed a reactor core load of uranium fuel.

[8] Implementation of the NPT Safeguards Agreement in the Syrian Arab Republic, **GOV/2011/30,** 24 May 2011

Significantly, the pump house is about 60 metres below the AK building and there are no storage ponds or reservoirs in the route. If there is any interruption in pumping capacity from the river pump house to the presumed reactor, such as electric power failure or sabotage, cooling will stop immediately and the reactor might melt down. There is also no water treatment facility in this route so the river pump house will be sending raw river water with debris and silt into the reactor heat exchangers. This is not common practice. It is clear that this pump house is not the primary source of cooling for the AK and at best is a secondary supply.

On the contrary, the DWTP has settling ponds and several buildings consistent with filtration and water purification that would be standard for a nuclear reactor. In addition, the DWTP is about 50 metres higher than the AK building so that in the event of a power disruption, for example, gravity could supply the facility from the reservoirs seen in satellite imagery for some time. This is good engineering practice. Pumping raw water uphill without back-up is poor engineering practice.

It is clear that the DWTP was built in anticipation of the AK bombed building, whatever it was. The DWTP was connected to the AK before it went operational and its treated water was part of whatever engineering activity was done there, even possibly a nascent nuclear reactor.

If we accept that the Desert Water Treatment Plant was conceived and built to service the Al Kibar bombed building then it is truly a *significant intelligence signature*. It would be an engineering edifice built by the Syrian authorities as a key component of a strategic facility. Therefore if there was another similar water treatment facility, it would probably also have strategic significance.

After a lengthy search of all the rivers and major cities of Syria only one other water plant almost identical to the DWTP and obviously built from the same engineering plans was discovered.

Figure 5 The DWTP and its riverside pumping station are visible on the left and the nearly identical Tibni water treatment plant is on the right. Clearly they were built from the same engineering drawings

The second plant is the Tibni water treatment plant. It is secured by a wall all around and a secure entry point, as is its pumping station. It is located a mere 10 kilometres from the Euphrates pumping house for the DWTP. It is connected to the Tibni Salt Mine operated by the GECOPHAM (General Company for Phosphates and mines). GECOPHAM has been doing pilot extraction of uranium with IAEA/UN assistance from phosphate fertilizers at Homs, Syria.[9] Tibni has been studied as storage site for the permanent disposal of Normally Occurring Radioactive Material (NORM) with IAEA review.[10] Tibni has seen both physical modifications and a large drop in salt output since the Al Kibar bombing. At the very minimum Tibni is the most likely site for disposal of the debris from the Israeli bombing. In the worst case, there is another concealed industrial facility there, with process water from a strategic water treatment plant identical to the one supporting Al Kibar. These features and other aspects of the Al Kibar analysis were communicated to the IAEA in 2010 prior to publication in Jane's, as a courtesy.[11] The IAEA replied that it was not convinced.[12] The nonproliferation community should be interested in these facts even if the IAEA is not.

[9] http://www.nti.org/facilities/457/
[10] http://www-pub.iaea.org/MTCD/publications/PDF/wmra-23-24/INVESTIG.pdf
[11] Critical mass - Is Syria pursuing nuclear capability?, Jane's Intelligence Review. 14 October 2010.
[12] Private Communication, , IAEA, 15 October 2010.

Furthermore, the IAEA has advanced unsubstantiated theories for why the Al Kibar facility is a graphite moderated light water cooled nuclear reactor. Graphite particles collected in debris by IAEA at the Al Kibar site are not reactor grade graphite. IAEA has implied that Syria was buying reactor grade graphite but there is no connection to Al Kibar. There were very few graphite particles collected out of tons that should have been dispersed. IAEA has accused Syria of buying large quantities of barite as shielding for gamma radiation but none of the concrete samples analyzed from inspections at Al Kibar contain any barite. IAEA amazingly has mentioned that stainless steel particles in samples collected at Al Kibar are not pertinent to the conclusions. [13] Stainless steel is a ubiquitous construction material in everything from cars to cooking utensils to Israeli earth penetrating bombs.

It is time for the international nonproliferation community to demand an independent scientific assessment of the data from Al Kibar. The process of sample collection and analysis as well as the procedures used to share the samples with its Network of Analytical Laboratories in several member states needs review. The satellite imagery-derived plans of water supply need to be corrected and re-analyzed in light of the deficiencies of the river pumping station built late in the project. A second review of Syrian waterways needs to be conducted to ensure that only two strategic water purification plants were built, and not more. The strategic significance of the Tibni Salt Mine as a debris burial site or another hidden nuclear facility needs to be properly assessed.

Syria is in the middle of an intense civil war and the opportunity for the IAEA to demand access to the Tibni site has been lost. Fortunately much of the analysis can be done remotely using open source literature and satellite imagery. If the Syrian site ever passes into safe hands an expert team composed of international experts in nuclear and other industrial engineering disciplines should visit the two sites for a follow-up assessment. If rebel forces sympathetic to resolving an outstanding nuclear mystery can be approached their assistance also might be valuable. For example, if photos of an unknown facility or a debris burial site could be provided they should have equal provenance to photos of unknown origin used by the US Intelligence Community in its claims, albeit with low confidence, that Al Kibar was a reactor under construction.

[13] Implementation of the NPT Safeguards Agreement in the Syrian Arab Republic, GOV/2011/30Date: 24 May 2011. "The results showed the presence of graphite and stainless steel. The graphite particles were too small to permit an analysis of the purity compared to that normally required for use in a reactor. The types of stainless steel detected at the site were compatible with nuclear use, but not exclusively so."