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NOTE BY THE SECRETARY-GENERAL

The Secretary-General has the honour to transmit to the members of the Security Council the attached communication which he has received from the Director-General of the International Atomic Energy Agency (IAEA).

Annex

Letter dated 12 July 1991 from the Director-General of the International Atomic Energy Agency addressed to the Secretary-General

Attached herewith is a consolidated report on the first two IAEA inspections under Security Council resolution 687 (1991). You may deem it appropriate to transmit this report to the Security Council members.

(*Signed*) Hans BLIX

Enclosure

CONSOLIDATED REPORT ON THE FIRST TWO IAEA INSPECTIONS UNDER SECURITY COUNCIL RESOLUTION 687 (1991) OF IRAQI NUCLEAR CAPABILITIES

INTERNATIONAL ATOMIC ENERGY AGENCY

11 July 1991

CONSOLIDATED REPORT ON THE FIRST TWO IAEA INSPECTIONS UNDER SECURITY COUNCIL RESOLUTION 687 (1991) OF IRAQI NUCLEAR CAPABILITIES

1. This report summarizes the principal findings of the first two inspections under Security Council resolution 687 (1991) conducted by the IAEA of Iraqi nuclear capabilities. These inspections were carried out between 15 - 21 May 1991 and 22 June - 3 July 1991 with the assistance and co-operation of the Special Commission of the United Nations. The first inspection was carried out by a team of 34 drawn from 20 Member States and was headed by Mr. D. Perricos of the IAEA as Chief Inspector. The second inspection consisted of a team of 18 personnel from 8 Member States and was headed by Mr. M. Zifferero (22 June - 26 June) and Mr. D. Kay (26 June - 3 July), both from the IAEA.

2. These two initial inspections had three principal inspection objectives:

- first, the verification of the accuracy and completeness of the Iraqi declarations submitted under the requirements of Security Council resolution 687,
- second, to conduct inspections of sites designated by the Special Commission established under resolution 687 where there were ground to believe that undeclared nuclear activities had been conducted or that undeclared equipment might be stored, and
- third, to develop an over-all picture of the nature, direction and capabilities of the Iraqi nuclear programme.

Verification of the accuracy and completeness of the the Iraqi declarations

3. The declaration by the Government of Iraq of 27 April 1991 principally concerned facilities, material and activities at Al-Tuwaitha Nuclear Research Centre.[1] Inspection of Al-Tuwaitha found the

[1] Al-Tuwaitha Site Map in Annex I

following:

a. Facilities

i. The inspection found that many building where significant activities may have taken place were thoroughly destroyed -- in many cases by military activities during the conflict, but in some significant cases by extensive clearing operations carried out by Iraqi authorities during and after the conflict. In almost all cases documentation and records had disappeared and were not available. Smear tests and samples of intact or only partially damaged equipment and of the surrounding areas were taken and their analysis continues. However, much of the site was damaged or cleared to such an extent that this analysis process is very difficult, and in some cases is incapable of definitive results. The overall impression is of a site where most significant buildings have been thoroughly destroyed or cleared and, with only a few exceptions noted below, provide only limited concern for future verification unless substantial rebuilding takes place.[2] However, it is clear that much of the equipment which once existed at Al-Tuwaitha has been removed to other locations, most of which were not disclosed to the first two inspections.

ii. **Research reactors.** (B24 and B13)[3] Both the Tamuz 1 & 2 reactors were heavily damaged. They would be difficult to restore and, in any event, the weapons significance of the facilities is now dependent on the HEU fuel only. In the case of Tamuz 1, there had been no attempt to rebuild the reactor since the 1981 attack, and the heat exchangers and pumps were found in a separate store and had not been used elsewhere.The building housing the IRT-5000 reactor was very heavily damaged, but the pool with reactor fuel and storage racks was still intact, albeit covered with substantial amounts of debris and rubble. The fuel was still inside the core, the pool and the external storage bay. The fuel is highly enriched uranium (80% and 36%) and, therefore, requires future action to remove it as required by resolution 687. After the fuel is removed the remains of the reactor building will be unusable.

iii. **Hot cells.** The hot cells in the reactor building (B24) are mechanically badly damaged with the master-slave manipulators

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[2]Annexes II and III summarize the status as of the first inspection.

[3]Numbers refer to Al-Tuwaitha Site Map in Annex I

destroyed on the outside but with the concrete structure intact. Because of the surrounding debris it was impossible during the first mission to confirm the situation inside the cell and monitoring is required until the status is determined. Hot cells with damaged manipulators, but with their basic structure sound, remain in the Radioisotope Production Laboratory (B15). Additional hot cells remain in the "LAMA" Hot Metallurgy Testing Laboratory and in the radioactive waste treatment station. Future monitoring will be required of all these cells.

iii. **Laboratory and Workshop Building (B23).** The Iraqi authorities declared this building to have been used mainly for laser and optics work. However, due to the total destruction of this building and the removal by Iraq of all accessible equipment it was not possible to verify its use.

iv. **"LAMA" Hot Metallurgy Testing Laboratory (B22).** This building had been heavily bombed and there was no independent evidence of the use that had been made of this building. There had been salvage of some of the equipment from the two hot cells.

v. **Radioactive Waste Treatment Station (B35).** This building was partially damaged, but had two hot cells in good condition and with the machinery inside the station undamaged. The cells were not equipped with manipulators and were equipped for the specialized waste treatment process consistent with the declared use of the building.

vi. **Radiochemistry Laboratories (B9).** All three compartments of the hot cells with 150 mm of lead shielding were intact. The first part was used for dissolution, the second for equipment maintenance and the third for mixer settlers. The equipment had been used for separation of fission products from spent fuel. A separate room had 10 free-standing alpha glove-boxes for actinide separation. The process was on a small scale (2.26 g of plutonium was declared as separated) but has a larger significance in establishing the capability for plutonium separation.

vii. **Radioisotope Production Laboratory (B15).** This building contained two hot cells, one with 900 mm of shielding, the other with 1200 mm barytic shielding. The building was e[illegible]sively damaged with all services destroyed. There were also originally [illegible]3 lead cells which are now scattered as a result of the bombing. the applications for which this building was declared to be used would be allowed under the terms of resolution 687, but future monitoring would be required to ensure that its use was limited to these purposes.

viii. **The "Italian" Area (B73).** This area was heavily bombed and the fuel fabrication plant and chemical engineering research were almost completely destroyed. The material testing building sustained some damage but the essential equipment survived.

ix. **Materials Testing laboratory (Ceramics and Metals) (B63).** The building was rendered unusable by the bombing, and all of its equipment had been removed. Equipment said by the Iraqis to be from this building was later shown to the first inspection team. This equipment, if indeed from this building, would be consistent with its stated use.

x. **Nuclear Physics Laboratories (B80).** The Iraqi authorities declared that these building had been devoted to plasma physics, ion source physics, magnet development and for future operation of a cyclotron. The building had been heavily damaged during the bombing and had been subjected to an unusually heavy site clearance operation by the Iraqis -- which included even removing the substantial, concrete reinforced floor and -- by the time of the second mission -- regrading the site to a level field. All equipment had been removed from the building before the first mission -- except for two magnets left on the top of the rubble. The building had been serviced by unusually large electrical (7.4 megawatts) and cooling services which appeared to exceed its declared needs.

xi. **Complex Chemistry and Chemical Engineering Research and Development (B85).** The declared purposes of this building were chemical and chemical engineering-related R&D, including a pilot-scale extraction process to recover uranium from ore with a high organic content. The building had been very extensively damaged, first from bombing, then from a vigorous removal operation of the Iraqi authorities. At the time of the first inspection, Iraq had completely removed the two process halls of this building, and by the second inspection very little remained of this complex. The building had an unusually large ventilation system, but the lack of any residual equipment together with the extensive site levelling has made it difficult to determine with certainty the actual uses of this building. Environmental samples were taken and are now being analyzed.

b. Nuclear Materials

i. With respect to the nuclear material declared by Iraq, the Agency inspection teams had to locate, identify, characterize, verify, "freeze" the material so it could only be moved with Agency approval and assess the accessibility for removal of the nuclear-weapons-usable material. The Iraqi declaration of 27 April 1991 had covered all the nuclear material that had been subject to safeguards.[4] The Iraqi authorities had relocated a substantial amount of the nuclear materials to both areas adjacent to and further removed from Tuwaitha.[5]

ii. Extensive verification efforts were carried out during the first inspection on all declared nuclear material. For the nuclear weapons-usable material this involved the following: The presence of all fresh high enriched uranium was confirmed by measurements (17664 g U/12633 g U-235). The presence of irradiated high enriched uranium was confirmed -- [61 items = 16.8 kg U =52% verified by fuel type identified and non-destructive assay (NDA) carried out] [41 items = 8.3 kg U =26% verified by item counting and NDA] [35 items = 7.0 kg U =22% presence indirectly confirmed by radiation dose mapping]. Presence of recovered plutonium [2.26 g] was confirmed.

iii. For non-nuclear weapons-usable material the measurements involved: The presence of low-enriched uranium was confirmed by measurement [irradiated fuel, 10% enrichment = 69 items = 87.8 kg U] [fresh bulk = 2.6% enrichment = 75 items =1762 kg U]. The presence of depleted and natural uranium was confirmed by measurement [3% of inventory =327 kg uranium was reported to be under rubble]. The presence of yellow cake was confirmed by measurements[752 items = 204 tons of natural uranium]. The presence of previously exempted material was confirmed.

iv. The nuclear material outside of the damaged reactor was brought under Agency custody by means of the extensive applications of Agency seals and a regime was established for frequent inspection until this material can be removed from Iraq. Studies were begun for the

[4]Annex IV provides an overview of the nuclear materials and there locations.

[5]Annex V indicates the distribution of this material.

removal from the damaged reactor of the material still there and for applying seals as an interim control measure.

Inspection of Sites Designated by the Special Commission

4. Beginning with the first IAEA inspection, short-notice inspections were carried out of sites designated by the Special Commission. These have included sites at Tarmiya (20 May and 24 June), Abu Ghraib 23, 25, and 26 June), Al Hamath (24 June), Zaafaraniya (26 June), Al Musayyib (27 June) and Falluja (28 June). At two of these site, the Iraqi authorities denied the right of access for the purposes of inspection and removed materials even after the Chief Inspector had ordered that no material or equipment be moved for the sites under the inspections had been completed. Photographic evidence substantiated a strong case that the material which was moved was related to undeclared uranium enrichment activities.

Over-all Development of the Iraqi Nuclear Programme

5. At the end of the second inspection, the team concluded that based on the evidence it had found the Iraqis had been pursuing an undeclared uranium enrichment programme using the electromagnetic isotope separation technique (EMIS).[6]

6. The technologies that must be mastered for a successful EMIS programme include high current ion source development, high voltage DC power supply design and manufacture, high current power supply

[6] EMIS is accomplished by creating a high current beam(10's to 1000's of milliamps) of low energy (10's of KeV) ions and allowing them to pass through a magnetic field (typically 3000-7000 Gauss. or .3-.7 Tesla). The heavier ions bend in a larger radius than the lighter ions and suitable placed collector pockets capture the different isotopes. EMIS is the process originally used by most of the nuclear weapons states to prepare their first highly enriched uranium for nuclear explosives. Its advantages are a well understood design, with much detail available in the open literature, and the ready availability of much of the hardware. The disadvantages of EMIS are the large energy cost per unit of HEU produced and high labor costs associated with operation. This latter disadvantage can now be reduced, however, with the use of readily available computer control software.

design and manufacture, large vacuum system design and operation, collector design and fabrication, and insulator design and fabrication.In addition specific chemical process technologies are required for operation of a uranium EMIS facility: acid washers to clean the vacuum chambers, combustors to burn the graphite collectors, dissolvers to dissolve the ash, solvent extraction systems to purify the uranium solutions, and chemical reactors to prepare uranium tetrachloride feed material. Mechanical engineering capabilities are required for fabrication of massive steel magnet pole pieces, support fixtures, and equipment transport. By the end of the second inspection the following dedicated facilities for each of these required technologies had been located and inspected by the first two IAEA inspection teams. These facilities included:

i. **Buildings Within the Berm at Tuwaitha.** When the first IAEA team visited Tuwaitha it was noted that building 80 had installed power of 7.4 megawatts. This is an inordinately large amount of power for a building of its size and declared function. Building 85 was declared to be a chemical engineering building and therefore should have had equipment in it that would have allowed lab/pilot scale EMIS process chemistry to be demonstrated. These buildings were heavily damaged during the war, as were many other buildings at Tuwaitha. However, these two buildings were singled out for unusually thorough demolition after the first team's visit. The sites where these buildings stood have been graded and cleared to an inexplicable extent. This action, in combination with the extraneous rubble which the first team noted covered the site, suggests an attempt to render difficult the identification of the activities and purposes of these buildings. Environmental samples were taken from nearby objects during this inspection.

ii. **The Al Hamath Workshop.** A significant new site was inspected outside the berm just south of the water purification complex in the northwest portion of the Tuwaitha facility. This site was called Al Hamath by the Iraqis. Our Iraqi military representative stated that the site was used for truck maintenance. This declaration was later amended when the Iraqis said that the facility was a machine shop. Neither declared usage of these buildings is credible. The site had two high bay buildings sharing over 1 megawatt of electrical service and a suitably sized water purification and chiller system. Neither building had been damaged during the war, yet both buildings had been stripped of their contents and the concrete floors had sections removed. If the

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facilities had been used for either of the declared purposes there would be no need for either this much power or this much cooling capacity, and there certainly would be no need to gut the buildings. These high bay buildings each had multiple utility drops consisting of high capacity, 380 volt, three phase receptacles, and 220 volt single phase receptacles cooling water facilities spaced along the walls. Each building had large traveling cranes of the same type installed at Tarmiyah, one of which was labeled, "Iraqi Atomic Energy Commission". One of the two cranes was very strongly magnetized. It is the consensus of the team that this site was used as a magnet test facility. Because there was not a nearby suitable chemical processing facility, and because the installed power is relatively low, it is surmised that this facility did not do actual uranium isotope separation (though environmental samples were taken at this site). It is surmised that buildings 80 and 85 did do lab/pilot scale uranium isotope separation with approximately five units for some unknown period of time. The Al Hamath buildings are believed to have been used for magnet tests (possibly including coil winding) and for engineering integration tests of separator systems.

iii. **Tarmiyah.** The Tarmiyah site[7] when inspected by the first team was noted as being unusual because of the mix of buildings with unusually large installed electrical power co-allocated with buildings with large chemical processing capabilities. When the second team reinvestigated the facilities it was clear that the site was a multi-billion dollar EMIS facility. Building 33 was stated by the Iraqis to be used for transformer fabrication. In the technical view of the inspection team this is simply not credible. A transformer plant required metal forming, coil winding, and other capabilities that were clearly absent from this building. The building had two ten ton bridge cranes and two twenty-five ton bridge cranes, an enormous installed electrical supply (over 100 megawatts), and a supply of purified and chilled water. These features are consistent with building 33 housing EMIS machines. The interior of the building was configured as a large bay with two large (5m by 60m) parallel piers for electromechanical equipment with utility outlets and space suitable for approximately 100 EMIS units. The EMIS units would sit approximately three meters above the floor of the central bay, with the power supplies in the adjacent bay and the vacuum pumps on the floor. It is surmised that this building was the site for the first stage of enrichment. The consensus of the team is that this building was never operational, with initial operation six to eighteen months away.

[7] Tarmiyah Site Map in Annex VI

Building 245 is in important ways a smaller version of building 33. The building has approximately 40 megawatts of power, uninterruptable power systems, for control computer power and a large unfinished control room.

It is hypothesized to be the building for the second stage of enrichment. The building could have held 20 EMIS units. The facility utilities were incomplete and it is believed that this facility was twelve to eighteen months from operation.

Building 46 was a process chemistry building that was suitable for high quality batch chemistry work. The building had little process equipment installed and was probably six to twelve months from first operation. This building may have been designed for uranium tetrachloride processing.

Building 57 was stated as being for parts cleaning. The washing facilities in the building were designed for washing heavy objects of the size postulated for the EMIS vacuum chamber. A rail system two meters above the floor was installed for conveniently loading a heavy object into the pressure washers. This building was incomplete with first operation estimated to be in six to twelve months. The team emphasizes that this building was built to conveniently wash parts of a particular configuration and it is the team's opinion that these parts were to be vacuum boxes used in EMIS separators.

Building 225 was stated by the Iraqis to be a heavy metal recovery facility. This is assessed to be a true statement. The building appears to be designed for recovering uranium for recycle into the process. The air handling and filtration equipment in this building was enormous. It is surmised that the extensive filtration was both to conserve valuable enriched material and to prevent isotopic signatures from escaping the plant.

The configuration of buildings 33 and 245 with their unusual electrical and cooling utilities led the team to conclude that Tarmiyah was an EMIS site. The co-located buildings containing all of the necessary ancillary functions completes the case. The only purpose of a multi-billion dollar facility of this type apparent to the team is EMIS of uranium. It is the opinion of the team that Tarmiyah was never operational. Initial startup of the facilities was six to eighteen months away. It has effectively been rendered non-operational and may be adequately monitored by periodic inspections.

iv. **Zaafarniyah.** The IAEA had reason to believe that the Al Dijjla and Al-Rabee sites located in Zaafarniyah were used to fabricate EMIS components. Al Dijjla is a Ministry of Industry site with electrical engineering design and fabrication facilities. The manufacturing plants inspected were observed to have the following capabilities: coil winding, chassis assembly, computer aided design, printed circuit board fabrication, and control system design and assembly. Some of the equipment at Tarmiya appeared to originate from this site. It is the team's belief that the required electrical components for an EMIS program could be designed and fabricated at Al Dijjla but that this facility is not dedicated to EMIS work.

The Al-Rabeeh metal working shops were excellently equipped for precision work as well as very large metal piece work on steel, stainless steel, and aluminium. There was no evidence that facilities for working with pyrophoric (e.g. uranium) or toxic (e.g. beryllium) are present. Al-Rabeeh clearly has the capacity to fabricate the major EMIS metal components but was not being used for EMIS fabrication at the time of the inspection.

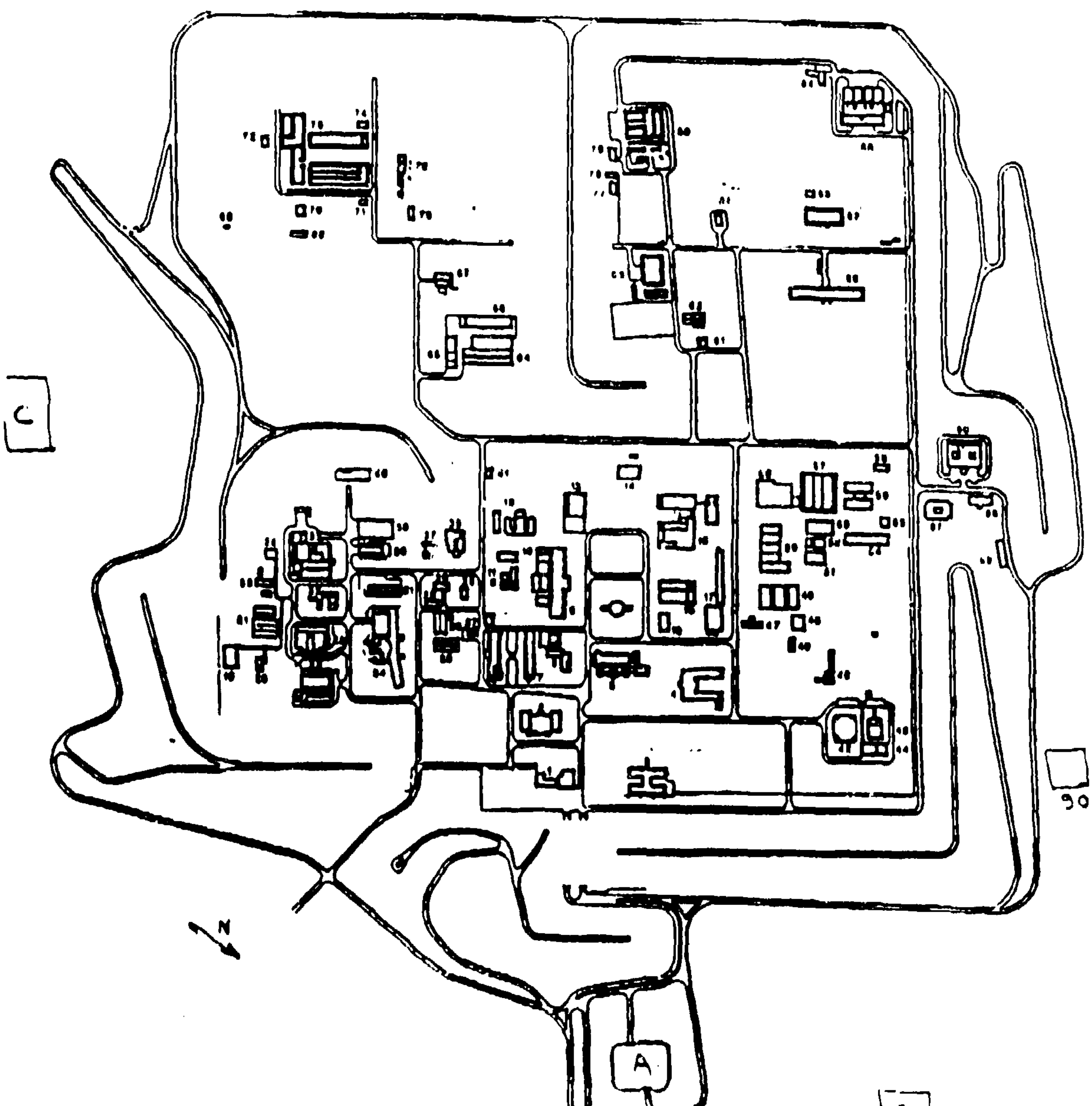
v. **Possible EMIS Components and Equipment.** As detailed elsewhere in the full inspection report many storage facilities and trucks were inspected by the team. A substantial amount of dual-use equipment suitable for use in EMIS power supplies was noted. None of this equipment is conclusive by itself, but taken as a whole, enough equipment was documented to state that there seemed to be an unusual amount of electrical equipment that would be appropriate for an EMIS program. Equipment that appeared to be real EMIS equipment (coils, magnet pole pieces, and vacuum chambers) was seen and photographed by several team members as the Iraqis attempted to move it from Fallujah.

Conclusions

There is Iraqi declared evidence of the research and development required for EMIS work (ion source, magnet development, and insulator research at Tuwaitha). There is documented evidence of the ability to manufacture all required components for an EMIS separator. There is evidence that lab or pilot scale EMIS development was done at Tuwaitha. There is further evidence that this research was successful and that a large EMIS process plant was under construction at Tarmiyah. Conclusive evidence that uranium isotope separation was accomplished must await the results from the environmental samples. Uranium unusually depleted in U-235 would be prima facie evidence that EMIS (large scale laser isotope separation is not credible for Iraq) has been done in Iraq. Accurate assessments of actual production are impossible at this point. It is the opinion of this team that Tarmiyah has never operated and that Tuwaitha had facilities to operate at most five to ten separators. If each separator can produce 1 gram of highly enriched uranium per day (as estimated in a technical note prepared by the second inspection team) then the maximum amount of HEU produced can be estimated if the initial commissioning dates and operating time can be determined. Our best estimate is that Tuwaitha could have had five machines operating for no more than two years and could not have produced more than three kilograms of highly enriched uranium.

Annex I

The Tuwaitha site map



TUWAITHA NRC

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ACTION TEAM CONFIDENTIAL

UNSC 687 ACTION TEAM
FIRST ON-SITE INSPECTION

Annex II

List of buildings at Al-Tuwaitha

Bldg. No.	Iraqi Declaration 1991-05-15	Inspector's specification (if different)
1	Personal Control Office	
2	Restaurant	
3	Administrative Building	
4	Biology and Agricultural Labs	
5	Head Administration	
6	Administration	
7	Administration	Training Office
8	Training Offices	External Relations Department
9 *	Chemical Analyses Labs and Radiochemical Labs	
10 *	Chemical Analyses Labs	
11	Telephone Communication	
12	Engineering Services Workshop	Engineering & Neutron Generator
13 *	Research Reactor IRT-5000	
14	Sub-Station	
15 *	Isotope Production Laboratory	
16 *	Mechanical Production Workshop	Workshop for IRT
17 *	Mechanical Production Workshop	
18	Medical Analyses Lab	
19	Offices and Stores	Open Air Pool
20	Offices and Stores	
21	Offices and Stores	
22	Hot Laboratories LAMA	
23	Laboratory Workship Building	
24	Tamuz-2 Zero Power Reactor	
25	Store	
26	Chemical Cleaning Workshop	
27	Caravan	
28	Caravans	
29	Chemical Cleaning Workshop	Caravan

Bldg No.	Iraqi Declaration 1991-05-15	Inspector's specification (if different)
30	Chemical Cleaning Workshop	
31	Cooling Tower	Cooling Tower for Tamuz
32	Cooling Tower	Warehousu
33	Offices	
34	Offices and Stores	
35 *	Radioactive Waste Treatment Station (RWTS)	
36	Store	Solid Waste Store
37	Training Offices	Storage
38	Training Offices Labs	
39	Store	Permanent Solid Waste Storage
40	Solid Waste Storage	Waste Storage for IRT
41	Control Room for No. 40	Nuclear Instrument Calibration and Waste Storage
42	Technical Library and Conference Rooms	
43 *	Technical Library and Conference Rooms	
44	Technical Library and Conference Rooms	
45	Water Treatment Station	
46	Biology and Agricultural Labs	
47	Biology and Agricultural Labs	
48	Biology and Agricultural Labs	
49	Biology and Agricultural Labs	
50	Mechanical Workshops and Stores	(Includes also IOZ-)
51	Mechanical Workshops and Stores	
52	Mechanical Workshopsand Stores	
53	Mechanical Workshops and Stores	
54	Mechanical Workshops and Stores	Graphite Workshop
55	Mechanical Workshops and Stores	
56	Mechanical Workshops and Stores	
57	Mechanical Workshops and Stores	
58	Calcteria	
59 *	Health Physics Building	
60	Offices	

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Bldg No.	Iraqi Declaration 1991-05-15	Inspectors specification (if different)
61	Incinerator	
62	Sewage Station	
63 •	Cold Material Testing Laboratories	
64	Chemical Waste Treatment (liquids)	Rad Waste Process Building
65 •	Chemical Waste Treatment (liquids)	
66	Chemical Waste Treatment (liquids)	Offices/Training Building
67	Deionized Water Production Units	
68	Utilities	Storage
69	Utilities	Oil Storage
70	Utilities	Electrolytical/Production of Hydrogen
71	Utilities	
72	Utilities	
73	Workshops	Workshop for Fuel Fabrication Laboratory and Hall for Material Testing
74	P wer Sub-Station	
75	Caravans	
76	Power Sub-Station	Canteen
77	Utilities Workshop	
78	Utilities Workshop	
79	Caravans	
80 •	Nuclear Physics Laboratories	
81	Cafeteria	
82 •	Electronic Research Laboratories	Electronics Department & Computer Center
83	Utilities	
84	Utilities	Chemistry & Chemical Engineering R&D
85 •	Chemical Research Laboratories	
86 •	Mechanical Design Laboratories	
87	Medical Centre	
88	Health Center	
89	Caravans	
90	Polymer Chemistry Laboratory	

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Annex III

Summary of follow-up actions

	Building	Status of Building	Recommended further Action
1	B24 TAMUZ 1,2	heavily damaged	Future monitoring of recovered equipment from Tamuz 1 (e.g., heat xchangers and pumps) required
2	B24 Hot Cells	badly damaged (but concrete structure intact)	Monitoring until positive confirmation of status
3	B23 Laboratories and workshop	totally damaged	Future monitoring of recovered equipment (e.g., lasers and optics work) required
4	B22 "LAMA"	damaged	- Monitoring of the status of hot cells - Future monitoring of recovered equipment (e.g., some parts of 2 hot cells - one concrete and one lead) required
5	B35 Radioactive waste treatment	partially damaged but 2 hot cells in good condition	Future monitoring of hot cells
6	B13 IRT-5000	heavily damaged	Removal of 80% and 36% enriched fuel
7	B13 Hot Cells	concrete structure undamaged	- clearance of debris - monitoring until positive confirmation of status and removal of fuel from IRT-5000
8	B9 Radiochemistry Laboratories	equipment within B9 largely escaped damage	Future monitoring

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	Building	Status of Building	Recommended further Action
9	B15 Radioisotopes Production Laboratory	damaged but 2 hot cells structure intact	Future monitoring if the building is restored
10	B73 The "Italian" area	heavily bombed	- Future monitoring of the material testing laboratory - Future monitoring of recovered equipment (e.g., equipment relevant to reprocessing) required
11	B64, 56, 66, 67	buildings damaged	Future monitoring
12	B63, B80, B85 (new R&D area)	heavily damaged	Future monitoring of recovered equipment (e.g., related to material testing, plasma physics and uranium extraction) required
13	B45 to B58 workshop area	many buildings, one still usable	- Future monitoring - Future monitoring of recovered equipment (e.g., graphite machine shop tools) required
14	Remaining areas	many buildings are still usable	- Monitoring of any future reuse of buildings - Check of removed equipment

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Annex IV

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Summary-description of locations

NO.	LOCATION			STATUS
1	IQA-	IRT Research Reactor		1. Facility destroyed; however no H_2O leackage for core pool and spent fuel detected yet. 2. Nuclear Material: (a) Apparently no damage of fuel since contamination of pool water not above normal level. (b) In both pools significant amounts of soil and rubble were discovered. (c) It was not possible to confirm the presence of all fuel items. (d) Fresh fuel removed, verified at new site.
2	IQB-	Tamuz 2 Research Reactor	(empty = no nuclear material present)	1. Facility destroyed. 2. Nuclear material: all material (fresh and spent fuel) was removed from the facility. (Fresh fuel to Site A, spent fuel to Site B)
3	IQC-	Fuel Fabrication Laboratory		1. Facility destroyed, area contamination. 2. Nuclear Material: - Fuel assemblies damaged, under rubble - 53 out of 55 fuel rods recovered. - 74% of bulk material recovered, rest suspected under rubble.
4	IQZ-	Storage Facility	(empty = no nuclear material present)	1. Facility destroyed. 2. Nuclear material: all nuclear material removed to a new storage.
5	New Storage Facility			Nuclear Material: (a) Previously "exempted" material (b) IQZ- material = DU, NU, LEU (2.6%) (c) rods, pellets recovered from IQC-.
6		Location A		Nuclear Material: (a) Fresh fuel, HEU; from IQA- (b) Fresh fuel, HEU; from IQB-
7		Location B		Nuclear Material: Spent fuel from IQB-
8		Location C		Nuclear Material: (a) Yellow Cake in drums (b) Bulk material recovered from IOC

ACTION TEAM CONFIDENTIAL

June 13, 1991

Annex V

Location, types and quantities of nuclear fuel assemblies

I. Fresh Fuel Assemblies at Location A Adjacent to Nuclear Site

- 68 items of IRT-5000, tubular type, total U-235 content 10,973 g (enrichment: 80%) 1/
- 10 items EK-36 type (rod cluster) total U-235 content 1,272 g (enrichment: 36%)
- 1 item Osirak type (French MTR) total U-235 content 388 g (enrichment: 93%)

II. Spent Fuel Assemblies Stored at Location B Near Nuclear Site

- 38 items Osirak type (French MTR) total U-235 content 11,050 g (enrichment: 93%)
- 20 items IRT-5000 tubular type initial U-235 content 3,165 g (enrichment: 80%) 2/
- 3 items EK-36 type (rod cluster) initial U-235 content 360 g (enrichment: 36%) 3/
- 69 items EK-10 type (rod cluster) initial U-235 content 8,776 g (enrichment: 10%) 4/

III. Spent Fuel Assemblies Remaining in the IRT 5000 Core, Pool and Storage Bay 5/

- 22 items in core, IRT-5000 tubular type, total U-235 content 3,510 g (enrichment: 80%)
- 42 items in adjacent storage bay, IRT-5000 tubular type, total U-235 content 6,832 g (enrichment: 80%)
- 12 items in core pool storage rack, IRT-5000 tubular type, total U-235 content 1,890 g. (enrichment: 80%)

1/ Detailed drawings available. Two items damaged but nuclear material not affected.

2/ Estimated burn-up is 40%.

3/ Burn-up unknown, but probably very low.

4/ Removal of these items still to be decided.

5/ Detailed drawing of fuel assembly available. Estimated average burn-up of 42 items and the 12 items is 40%; burn-up of remaining 22 items in core unknown.

Annex VI

Tarmiya
Possible Nuclear Facility
33-36N 044-23E