

## V. WARHEAD DISMANTLEMENT MONITORING OPTIONS

In considering the various transparency and verification options, many of the monitoring concepts for warhead dismantlement are largely facility independent. That is, the options might employ, for example, monitoring of receiving areas, storage areas, or disassembly areas, which in general terms would be common to any dismantlement facility. It is the *implementation* of the options which would be facility specific. The following discussion is written in terms of implementation of warhead dismantlement monitoring activities at Pantex. The application of the options discussed below to the monitoring of warhead dismantlement at Russian facilities is outside the scope of this report. An in-depth analysis of the impact of a warhead dismantlement monitoring regime on the Y-12 Plant should be conducted as part of the implementation plan for warhead dismantlement transparency, as detailed in Appendix G.

The activities and technologies described in Chapter IV are building blocks from which various options for the monitoring of warhead dismantlement can be constructed. Four potential warhead dismantlement monitoring options have been constructed from these building blocks, with the intention of spanning the range of intrusiveness, level of confidence, and impact on facility operations consistent with meeting the objective of monitoring warhead dismantlement.

The four options chosen for discussion are as follows:

- **Option 1:** Monitoring of warheads and components in the storage area (*Zone 4 at Pantex*) and chain-of-custody monitoring to and from the gate to the dismantlement area (*Zone 12 at Pantex*).
- **Option 2:** Option 1 *plus* portal perimeter continuous monitoring (PPCM) of a portion of the dismantlement area (*inside Zone 12 at Pantex*) dedicated to dismantlement of TLI warheads.
- **Option 3:** Option 1 *plus* further chain-of-custody procedures to monitor warheads and components within the dismantlement area (*inside Zone 12 at Pantex*), to and from the disassembly bays and cells (without PPCM).
- **Option 4:** Option 3 *plus* direct observation or remote monitoring of the dismantlement process (*inside Zone 12 at Pantex*).

The four options selected for analysis are shown in more detail in Table 6. Many other scenarios formed from combinations of the activities and technologies discussed in the previous chapter are possible in support of warhead dismantlement monitoring. However, the study group found the range of options summarized above to provide a convenient framework for discussing the costs and benefits of minimally intrusive through highly intrusive monitoring scenarios.

After carefully considering the details of current Pantex operations, the study group concluded that all of the activities and technologies discussed in Chapter IV can be applied either at the Unclassified to C/NSI or RD/FRD level, with varying effectiveness depending on the classification level chosen for each activity. Each of the options summarized above can be implemented at the C/NSI level if a General Security of Information Agreement (GSOIA) or Executive Order permits the exchange of NSI with the treaty partner, or at the RD or FRD level if an Agreement for Cooperation (AFC) permitting the exchange of such information is in place with the inspecting party. The confidence gained by the monitoring activities contained in Options 1-4 is generally greater at higher classification levels. The intent of the study group is that each activity be implemented at the classification level determined by a balance of level of confidence, intrusiveness, and cost consistent with legal constraints on the exchange of classified information at the time of the inspection.

**Table 6. Options for Monitoring Dismantlement.**

Option 1 = Monitored storage

Option 2 = Portal perimeter continuous monitoring of a dedicated portion of Zone 12

Option 3 = Chain-of-custody from storage to and from the dismantlement bay or cell

Option 4 = Direct observation or remote monitoring of dismantlement in the bay or cell

<i>Activity</i>	<i>Option 1</i>	<i>Option 2</i>	<i>Option 3</i>	<i>Option 4</i>
<b>Declarations</b> of dismantlement schedules and inventories	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>
<b>Spot checks</b> of weapon and component storage in Zone 4	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>
<b>Remote monitoring</b> of weapon and component storage in Zone 4	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>
<b>Chain of custody</b> of warheads and components from Zone 4 to Zone 12 gate	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>
<b>Portal perimeter continuous monitoring</b> of a segregated portion of Zone 12	<b>No</b>	<b>Yes</b>	<b>No</b>	<b>No</b>
<b>Chain of custody</b> of warheads and components within Zone 12	<b>No</b>	<b>No</b>	<b>Yes</b>	<b>Yes</b>
<b>Sweeping of bay or cell</b> before and after dismantlement	<b>No</b>	<b>No*</b>	<b>Yes</b>	<b>No</b>
<b>Direct or remote observation</b> of dismantlement in the bay or cell	<b>No</b>	<b>No</b>	<b>No</b>	<b>Yes</b>
<b>Chain of custody</b> of nuclear components from Zone 12 gate back to Zone 4	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>
<b>Monitoring of non-nuclear components</b> following dismantlement	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>

\*One-time sweeping of the entire dedicated portion of Zone 12 is required at initialization of Portal Perimeter Continuous Monitoring.

A detailed discussion of each of the options considered in Table 6 follows. The descriptions of the options given in this chapter represent possible scenarios for implementation of the four options chosen for discussion. Many other choices are possible for the details of the options presented here. The descriptions which follow are intended to be representative of the possible choices for each option, and to stimulate discussion of the possibilities for monitoring of warhead dismantlement.

## OPTION 1. MONITORED STORAGE

Activity	Option 1
Declarations of dismantlement schedules and inventories	Yes
Spot Checks of weapon and component storage in Zone 4	Yes
Remote monitoring of weapon and component storage in Zone 4	Yes
Chain of custody of warheads and components from Zone 4 to Zone 12 gate	Yes
Portal perimeter continuous monitoring of a segregated portion of Zone 12	No
Chain of custody of warheads and components within Zone 12	No
Sweeping of bay or cell before and after dismantlement	No
Direct or remote observation of dismantlement in the bay or cell	No
Chain of custody of nuclear components from Zone 12 gate back to Zone 4	Yes
Monitoring of non-nuclear components following dismantlement	Yes

### Option 1 Goal

Option 1 is designed to be a minimally intrusive monitoring method. Option 1 involves monitoring the storage of warheads and components coming from dismantled warheads in the Zone 4 storage area at Pantex, and HEU from CSAs if implemented at the Oak Ridge Y-12 Plant. This *monitored storage option* is designed to be a minimally intrusive option that includes following the warhead to the gate of the dismantlement or disassembly area (Zone 12 at Pantex), but does not provide access to the dismantlement area itself, where actual dismantlement of the warhead takes place. As such, even with the use of classified declarations and the implementation of warhead radiation signatures to correlate the signature of the warhead with that of its components, this option would provide the lowest level of confidence of all the options considered that dismantlement has taken place. Figure 12 shows the areas at Pantex that would be covered under Option 1.

A meaningful procedure for monitoring of warhead staging and storage depends strongly on a reliable method for establishing the fingerprint of a warhead and the resulting components, or of tracking them with high confidence from an authenticated origin (e.g., from DoD custody). Chain-of-custody and fingerprinting radiation measurements are therefore important parts of monitored storage.

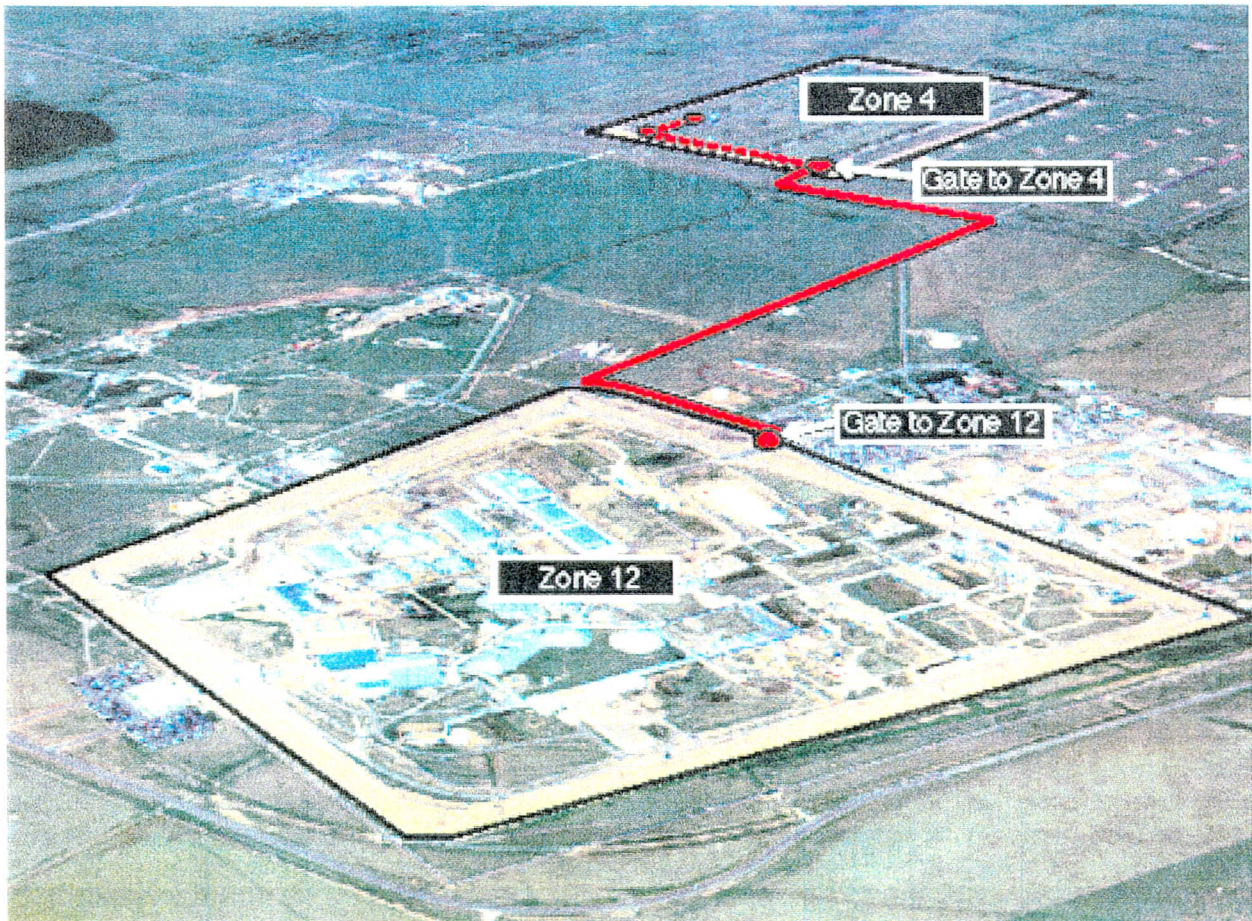


Figure 12: Pantex Access Areas for Option 1.

#### Option 1 Pantex Monitoring Procedure Summary

- Pantex segregates magazines for TLI warheads scheduled for monitored dismantlement and pits removed from dismantled TLI warheads
- Inspectors are permitted to make independent confirmatory radiation measurements on containers in each TLI magazine
- Inspectors are allowed to observe the unloading of SSTs containing TLI warheads arriving at Pantex for dismantlement
- Inspectors are allowed to observe the loading and unloading of transport trucks carrying TLI warheads from Zone 4 to Zone 12 and TLI pits from Zone 12 to Zone 4
- Chain-of-custody of TLI warheads scheduled for dismantlement is carried only to the gate of Zone 12 in Option 1
- Chain-of-custody of TLI warhead components removed from dismantled TLI warheads begins at the gate of Zone 12 in Option 1
- Chain-of-custody of non-nuclear components removed from dismantled TLI warheads begins at the gate of Zone 12 in Option 1

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## Detailed Description of Option 1 at Pantex

Option 1 begins with a declaration from Pantex that identifies the location of every TLI at Pantex (i.e., in a storage magazine in the segregated, dedicated portion of Zone 4, in Zone 12, or in transit). In particular, this declaration includes the bar-code, seal number, warhead type or pit type, warhead serial number or part number, magazine, and location within the magazine for every TLI warhead and pit from a TLI warhead stored within the dedicated portion of Zone 4. Pits and other nuclear components within TLI warheads staged in the dedicated portion of Zone 4 and in the dismantlement process in Zone 12 will also be identified. Under Option 1 such items will only be subject to monitoring when they are within Zone 4 (within a warhead or as a separated pit) or during transfer between Zone 4 and Zone 12. Because the dismantlement of each warhead type is unique, a part of the declaration process will be a special briefing for the inspectors detailing the specific dismantlement process for the warheads of interest.

For Zone 4 monitoring of stored pits, the inspectors will have the right to observe the opening of the magazine and watch the real-time video and bar code data returned from each container as the Stage Right inventory system moves down the aisle of the magazine. In addition, the inspectors will be allowed to randomly select containers to be removed from the magazine for a fingerprint measurement, which could involve template matching to the extent required by the classification level at which the inspection can be performed, subject to legal constraints on the exchange of classified information.

The inspectors may perform as many fingerprint measurements as possible during the time allowed by the treaty on items selected by the inspectors, in order to confirm that they contain TLIs. During the first few visits the statistics resulting from a small number of measurements will provide a relatively modest level of confidence. However, as inspections continue, the overall level of confidence in the inventory will increase as the statistics improve. During the initial inspection, the inspectors will be permitted to place a remote monitoring camera on the magazine. In this manner the inspectors can obtain a record of the activities that take place in the magazine while they are not present between inspections.

In addition to these pit measurements, the inspectors would have the right to inspect magazines that contain TLI warheads being staged for dismantlement. The inspectors may perform fingerprint measurements on as many TLIs as the time allowed by the treaty permits. The inspectors may require that measurements be performed in a measurement room which will be constructed or identified within Zone 4 in order to reduce background signals from adjacent warheads. A remote monitoring camera would also be placed on the TLI warhead storage magazine to record activities between inspections.

In order to complete Option 1 as a credible monitoring system, and in order to monitor the rate of dismantlement, the inspectors would be allowed to install remote monitoring containment and surveillance equipment on magazines containing TLIs. This would be designed to ensure that undeclared material movements do not occur. These requirements may be fulfilled by installing tamper indicating video monitoring systems at the door to each magazine, motion detectors, etc.

Remote monitoring equipment installed in Zone 4, and direct observations during inspections will provide an opportunity for the inspectors to observe the unloading at Zone 4 of SSTs containing TLI warheads arriving at Pantex for dismantlement, and the loading and unloading in Zone 4 of transport trucks carrying TLI warheads scheduled for dismantlement and pits removed from them moving between Zone 4 and Zone 12, to confirm that activities are consistent with the declared dismantlement schedule. Information transfer concerning Pantex operations involving non-TLIs should be kept to a minimum.

For the purposes of this study, the radiation signature measurements used in Option 1 are assumed to include MRI-type measurements (presence of plutonium, mass, shape) on excess materials if RD can be exchanged with the inspectors, or measurements restricted to determining the presence or absence of plutonium and HEU if Restricted Data cannot be exchanged. Unclassified or C/NSI confirmatory radiation measurements of fissile material under Option 1 would be far more limited, such as a confirmation of the presence of plutonium in a storage container without revealing isotopic, shape, or mass information.

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## OPTION 2. PORTAL PERIMETER CONTINUOUS MONITORING OF A DEDICATED PORTION OF ZONE 12

<i>Activity</i>	<i>Option 2</i>
<b>Declarations</b> of dismantlement schedules and inventories	Yes
<b>Spot checks</b> of weapon and component storage in Zone 4	Yes
<b>Remote monitoring</b> of weapon and component storage in Zone 4	Yes
<b>Chain of custody</b> of warheads and components from Zone 4 to Zone 12 gate	Yes
<b>Portal perimeter continuous monitoring</b> of a segregated portion of Zone 12	Yes
<b>Chain of custody</b> of warheads and components within Zone 12	No
<b>Sweeping of bay or cell</b> before and after dismantlement	No*
<b>Direct or remote observation</b> of dismantlement in the bay or cell	No
<b>Chain of custody</b> of nuclear components from Zone 12 gate back to Zone 4	Yes
<b>Monitoring of non-nuclear components</b> following dismantlement	Yes

\* One-time sweeping of the entire dedicated portion of Zone 12 is required at initialization of PPCM.

### Option 2 Goal

The goal of Option 2 is to increase the confidence in dismantlement above that obtained in Option 1 by adding Portal Perimeter Continuous Monitoring to the Option 1 activities. That is, all traffic, whether by vehicle or by foot, entering and exiting the segregated portion of the dismantlement area would be subject to inspection in Option 2.

### Detailed Description of Option 2 at Pantex

Chain-of-custody and monitored storage (Option 1) techniques are used in Option 2 in order to add confidence that no TLIs are illicitly moving in and out of the area dedicated to dismantlement of TLIs. Chain-of-custody between Zone 4 and the segregated portion of Zone 12 would be included as described in Option 1, but in Option 2 there would be no chain-of-custody within the portion of Zone 12 dedicated to monitored dismantlement of TLIs. Figure 13 shows the areas at Pantex impacted by Option 2.

The study group considered PPCM around all of Zone 12 but found, as did previous studies, that this would be extremely intrusive. For PPCM to be meaningful, all items, vehicles, and personnel entering and leaving Zone 12 would have to be subject to search by the inspectors. This could result in unintentional loss of information regarding the active enduring stockpile.

Option 2 as considered in this report includes portal perimeter continuous monitoring of a segregated portion of Zone 12 dedicated to monitored dismantlement. Setting up such a dedicated dismantlement sub-section of Zone 12 would have a significant impact on current Pantex operations, and require a one-time investment in facility modification of \$12 million or more and increased ongoing operational costs, as discussed in Appendix F.

By dedicating part of Zone 12 to dismantlement of TLI warheads, intrusiveness into the overall Pantex operations can be reduced. Conceptually one part of Zone 12 could be placed under PPCM and dedicated for dismantlement monitoring, while the remainder of Zone 12 continued to operate as at present. For example, segregation for dismantlement could include cells 12-98-1, 12-98-2, 12-98-3, and 12-98-4, and all bays in

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building 12-84 west of Ramp 12-R-84, which includes 11 disassembly cells and an x-ray LINAC, as indicated schematically in Figure 13. These cells and bays are all co-located in the southwest section of Zone 12. Operations on non-TLI warheads, such as surveillance operations for the enduring stockpile, could then proceed in the remaining part of Zone 12 with minimal impact from these monitoring measures.

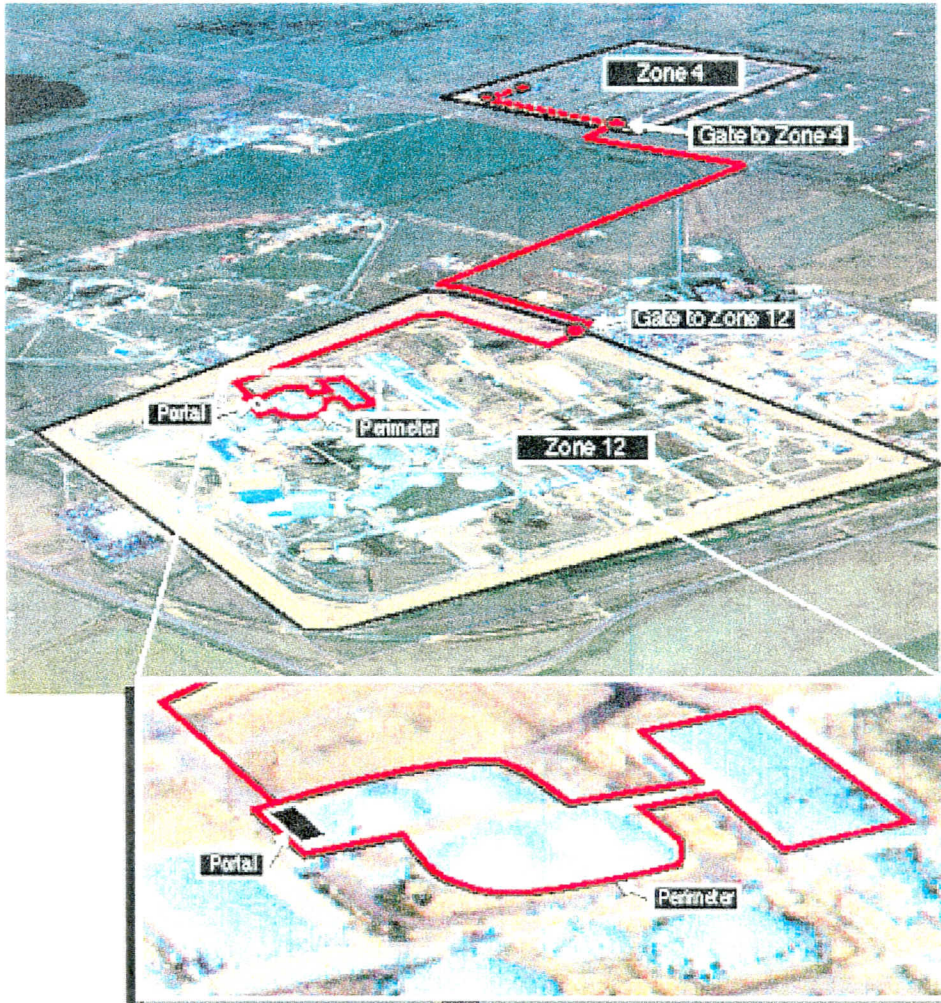


Figure 13: Pantex Access Areas for Option 2.

## Option 2 Pantex Monitoring Procedure Summary

- Option 1 procedures are applied in Zone 4 and upon any transfers between Zone 4 and Zone 12.
- The dedicated portion of Zone 12 must be swept one time at the inception of PPCM to ensure that a stockpile of components does not exist inside the facility prior to long-term operation of the portion of Zone 12 subject to PPCM.
- Inspection points should be established on the boundary of the area of Zone 12 dedicated to dismantlement.
  - These points are to be placed in such a way that all traffic in and out of the dedicated portion of Zone 12 is channeled through inspection stations.
  - Adequate provisions must be made to ensure that parts of the perimeter closed to traffic are fenced off or otherwise sealed, and that these fences have not been breached.

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- This might be accomplished through the use of remote monitoring devices, or by permanent presence.
- Option 1 monitoring procedures apply to components exiting through the Zone 12 portal and returning to Zone 4 or Y-12.
- PPCM inspections for Option 2 may be carried out in one of two ways:
  - All vehicles and pedestrian traffic passing through the checkpoints around the dedicated portion of Zone 12 may be inspected for TLIs or components. This may be done with physical inspections and/or radiation measurements that have been discussed above in the context of monitored storage (Option 1). While this method yields the highest confidence, it could also impact plant operations significantly.
  - Inspections of pedestrians, packages, and vehicles passing through the checkpoints around the dedicated portion of Zone 12 may be conducted at random using the same methods. This strategy would reduce the impact on plant operations somewhat, but would also provide a lower level of confidence that movements of TLIs inconsistent with treaty restrictions are not being undertaken.

## OPTION 3. CHAIN-OF-CUSTODY FROM STORAGE TO AND FROM DISMANTLEMENT BAY OR CELL

<i>Activity</i>	<i>Option 3</i>
Declarations of dismantlement schedules and inventories	Yes
Spot checks of weapon and component storage in Zone 4	Yes
Remote monitoring of weapon and component storage in Zone 4	Yes
Chain of custody of warheads and components from Zone 4 to Zone 12 gate	Yes
Portal perimeter continuous monitoring of a segregated portion of Zone 12	No
Chain of custody of warheads and components within Zone 12	Yes
Sweeping of bay or cell before and after dismantlement	Yes
Direct or remote observation of dismantlement in the bay or cell	No
Chain of custody of nuclear components from Zone 12 gate back to Zone 4	Yes
Monitoring of non-nuclear components following dismantlement	Yes

### Option 3 Goal

The goal of Option 3 is to make the fullest possible use of chain-of-custody techniques in place of PPCM. In addition to monitoring the warhead receipt area and component storage area as in Option 1, Option 3 provides a direct and continuous chain-of-custody from arrival and storage of the warhead at Pantex (or CSA at Y-12) in the storage area to and from dedicated dismantlement bays and cells in the dismantlement area. Option 3 does NOT include PPCM as does Option 2. Instead, in Option 3 the warhead can be followed up to a dedicated bay for mechanical disassembly and then to a dedicated dismantlement cell where the physics package is taken apart and the high explosive is removed from the pit (at Pantex), or to the area where the CSA is disassembled (at Y-12).



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In Option 3, inspectors would have the right to sweep or sanitize the bays and cells both before and after disassembly to determine that there are no nuclear components or undeclared entrances and exits in the bay or cell. In addition, inspectors would have the right to examine the declared warhead or CSA in the staging area outside of the bay or cell and confirm that it is the object of inspection using fingerprint measurements and tags and seals. The warhead is then taken into the cell to be taken apart and separated into its key parts (pit, CSA, high explosive, and other non-nuclear components), or the CSA is taken into an area without inspectors present and disassembled. When the nuclear and non-nuclear components are removed from the bay or cell, the inspectors could perform additional radiation measurements on each container leaving the cell to confirm the absence or presence of fissile material, and/or conduct radiation signature measurements to determine whether the components are actually from the declared warhead or CSA. It might not be feasible to perform radiation measurements in the bay or cell staging areas. The feasibility of such measurements will depend on the size of the equipment involved, the time require for the measurement, and the number of persons involved in the measurement activity. Figure 14 shows the areas at Pantex impacted by Option 3.

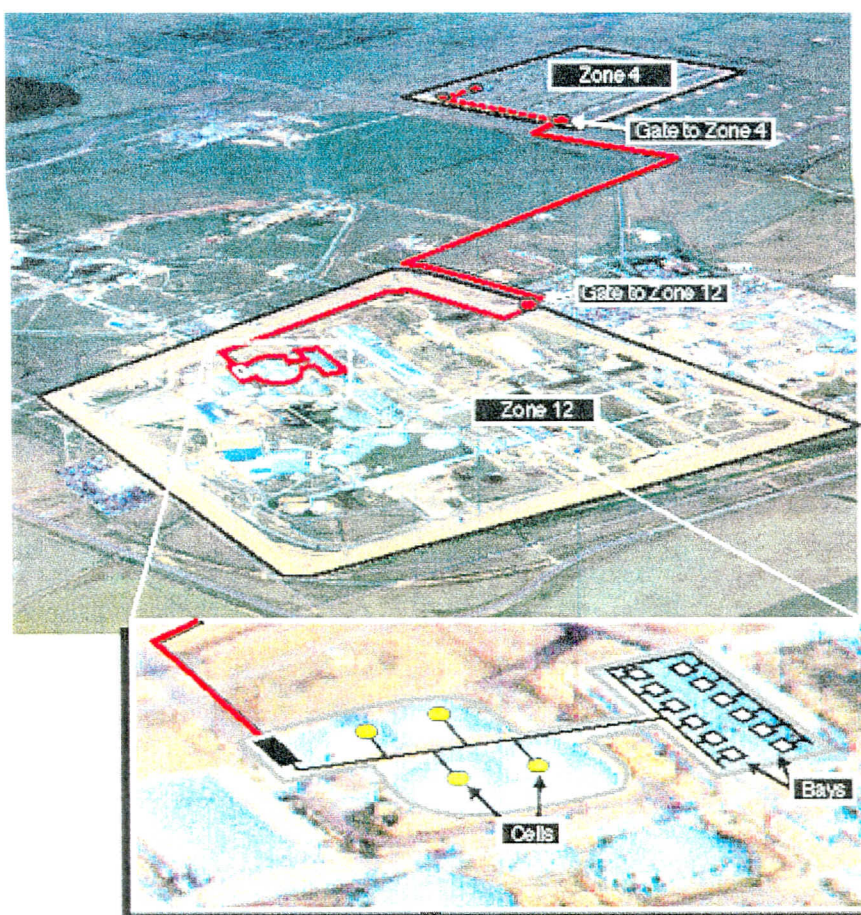


Figure 14: Pantex Access Areas for Option 3.

## Option 3 Pantex Monitoring Procedure Summary

Warheads scheduled for dismantlement are brought to Pantex by SST. Warheads are staged in magazines in Zone 4, until they are transferred to Zone 12 for dismantlement. Within Zone 12, warheads scheduled for dismantlement are staged temporarily until they are transferred to a bay or cell for dismantlement. A particular warhead may be transferred to and from several bays or cells during the course of dismantlement, as successive stages of dismantlement are performed. After dismantlement is complete, pits are returned to Zone 4 for storage and the canned subassemblies to the Y-12 plant for disassembly.

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The steps under Option 3 in taking a warhead from delivery at Pantex through the dismantlement process to final storage of components are as follows:

- Option 1 procedures are applied in Zone 4 and upon any transfers between Zone 4 and Zone 12.
- The inspectors are provided with a schedule of the TLI warheads to be delivered to Pantex over the next month and when they are to arrive.
- An SST carrying items declared to be TLI warheads scheduled for dismantlement arrives at Pantex Zone 4.
- The SST is opened and unloaded in the presence of the inspectors.
- Radiation or fingerprint measurements, using template matching as required by the classification level at which the inspection is being performed, are made to determine that the declared items are warheads and that they are the declared TLI warheads.
- The inspectors apply TIDs to the TLI warheads or to the containers containing the TLI warheads.
- Each TLI warhead is then taken to temporary storage in a magazine in Zone 4 until it is to be dismantled.
- Based on a schedule supplied to the inspectors as part of the declarations, a TLI warhead is taken from Zone 4 to Zone 12 to be dismantled, using Option 1 monitoring procedures to track the TLI warhead from Zone 4 storage to the Zone 12 portal.
- At the time the TLI warhead is scheduled for transfer from staging in Zone 4 to Zone 12 for disassembly, the inspectors are permitted to “sweep” the transport vehicle prior to loading and to check the seals/tags (TIDs) on the TLI warhead or warhead container.
- Radiation or fingerprint measurements can again be taken and compared with prior measurements or templates, according to the classification level at which the inspection is being conducted.
- The inspectors track the transport vehicle to the Zone 12 portal as in Option 1.
- In Option 3, the inspectors escort the TLI warheads from the Zone 12 portal to a temporary staging area in Zone 12.
- TIDs and/or remote monitoring techniques are applied to TLI warheads in temporary staging in Zone 12 pending dismantlement.
- When a TLI warhead is ready for dismantlement the TLI warhead is transferred from the staging area to a bay or cell for dismantlement.
- The inspectors have the right to verify TIDs at the staging area prior to transfer.
- Chain-of-custody extends along dedicated pathways between the temporary staging areas and the dismantlement bays or cells by the use of remote monitoring devices, by inspection of TIDs, and/or by escort of the TLI warhead by the inspectors to the bay or cell.
- The inspectors search each bay or cell before the TLI warhead is moved into the bay or cell to determine that there are no nuclear warheads, nuclear components, or undeclared portals in the bay or cell.

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- The inspectors examine the TLI warhead in the staging area outside of each bay or cell which the TLI warhead enters, and determine that it is a TLI warhead using fingerprint measurements and TIDs, using template matching as required by the classification level of the inspection.
- The TLI warhead is taken into the bay or cell to be separated into components (i.e., dismantled).
- The inspectors do not observe the dismantlement process itself in Option 3.
- Radiation or fingerprint measurements are performed on all containers entering or leaving each bay or cell in which dismantlement of TLI warheads is declared to occur, in order to determine whether they contain TLI warheads or components.
- When nuclear components in containers are removed from the bay or cell, the inspectors perform radiation or fingerprint measurements in the staging area outside of the bay or cell to determine that they are from the declared TLI warhead, using template matching as required by the classification level of the inspection, and apply TIDs to the containers.
- The inspectors monitor the chain-of-custody using the techniques described above for Option 1 as the nuclear components are shipped to Zone 4 (pits) or Y-12 (CSAs) for storage pending ultimate disposition.
- The inspectors have the right to track nonnuclear components removed from the bay or cell to storage or final disposition using TIDs, escort of nonnuclear components, and/or remote monitoring.
- The inspectors search the bay or cell after the components are removed to determine that no separated nuclear components remain in the bay or cell and that the TLI warhead (or the portion that remains at this stage of dismantlement) is or is not present in the bay or cell.
- Since the same TLI warhead may have dismantlement operations performed in several bays or cells, if the TLI warhead or an undismantled portion of it is still present in the bay or cell, this process is repeated as required as the TLI warheads move between bays and cells and to and from temporary staging in Zone 12.
- Option 1 monitoring procedures apply to components exiting through the Zone 12 portal and returning to Zone 4 or Y-12.

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## OPTION 4. DIRECT OBSERVATION OR REMOTE MONITORING OF DISMANTLEMENT

<i>Activity</i>	<i>Option 4</i>
Declarations of dismantlement schedules and inventories	Yes
Spot checks of weapon and component storage in Zone 4	Yes
Remote monitoring of weapon and component storage in Zone 4	Yes
Chain of custody of warheads and components from Zone 4 to Zone 12 gate	Yes
Portal perimeter continuous monitoring of a segregated portion of Zone 12	No
Chain of custody of warheads and components within Zone 12	Yes
Sweeping of bay or cell before and after dismantlement	No
Direct or remote observation of dismantlement in the bay or cell	Yes
Chain of custody of nuclear components from Zone 12 gate back to Zone 4	Yes
Monitoring of non-nuclear components following dismantlement	Yes

### Option 4 Goal

Option 4 is intended to provide the highest level of confidence that a TLI warhead brought to Pantex for dismantlement is in fact dismantled. To achieve this level of confidence, Option 4 uses direct observation or remote monitoring of dismantlement in the bays and cells in addition to chain-of-custody (Option 3) and storage monitoring (Option 1) procedures. Figure 14 shows the access areas covered under Option 4.

### Option 4 Pantex Monitoring Procedure Summary

In direct observation or remote monitoring of dismantlement the inspector has the ability to see, either visually or through suitably authenticated video equipment, the activities involved in dismantling the TLI warhead and its physics package. Thus the chain-of-custody approach of Option 3 is extended into the bay or cell in Option 4. Also involved in this process are means of checking before and after dismantlement that treaty limited items (TLIs) enter and leave the dismantlement process. The loss of information through the observation process could be controlled by limiting the quality of the view given the inspectors through various means such as controlling the resolution of optical devices, restricting the field of view, or careful masking.

Option 4 is similar to Option 3, but allows the direct or remote observation of the dismantlement process in the bays or cells at the Unclassified to C/NSI or RD/FRD level, depending on the level of information which can be exchanged with the inspecting party. When combined with the rigorous chain of custody of warheads from staging in Zone 4 to the dismantlement bay or cell and for components from the bay or cell back to storage in Zone 4 or at Y-12 developed in Option 3, Option 4 provides the highest confidence in dismantlement of any of the options considered in this study. It is also the most intrusive.

If performed at the RD/FRD level, it would require an Agreement for Cooperation allowing the exchange of RD and FRD, and the willingness to include very sensitive warhead design information in such an exchange. Option 4 would use all of the steps described in Option 3, except sweeping of the bay or cell prior to dismantlement, which would be superfluous if the inspectors had direct visual access to the bay or cell during dismantlement. In addition, it would add the following step after the warhead is introduced into a bay or cell for dismantlement:

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- The dismantlement process in the bays or cells is observed by inspectors, either by the use of remote monitoring or by going into the bays or cells and visually observing the dismantlement process in person.

The access areas for Option 4 are the same as for Option 3, except that access to the bays and cells is allowed during the dismantlement in Option 4, as indicated schematically in Figure 15.

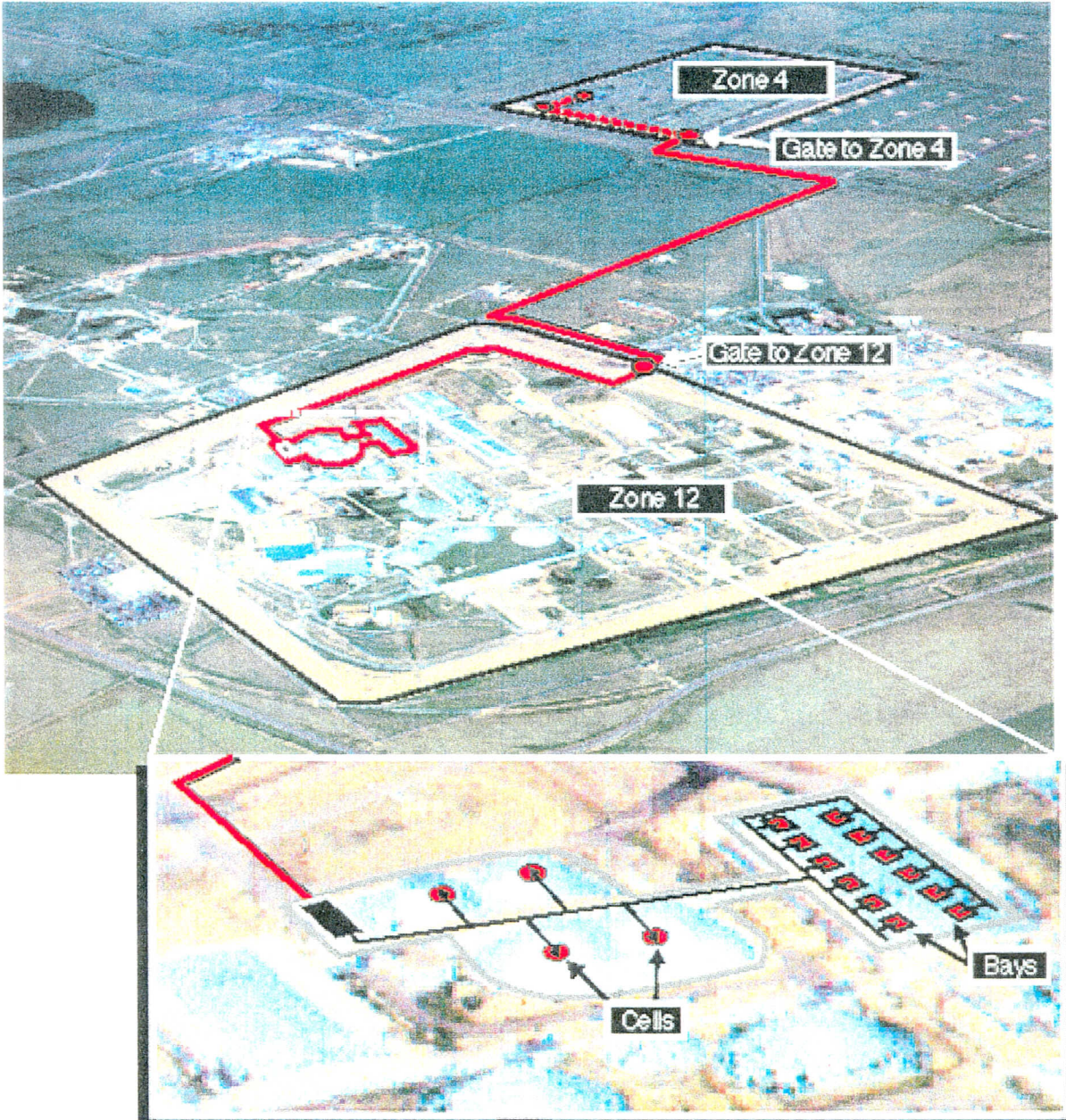


Figure 15: Pantex Access Areas for Option 4.

The confidence in dismantlement provided by direct observation or remote monitoring of dismantlement in the bays or cells at Pantex, or by direct observation or remote monitoring of disassembly in the disassembly areas at Y-12, is such that variants of Option 4 deleting one or more of the activities included in Option 3 could also provide a high level of confidence in the warhead dismantlement process.

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