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Title: Briefing on a Simulated Forensics Investigation

Author(s): Geist, William H.

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Module 3 – Nuclear Forensics Reporting

BRIEFING ON A SIMULATED FORENSICS INVESTIGATION

Background

- ▶ You are employed at a forensics lab in the country of Denali.
- ▶ Items were identified as a threat have been found in the County of Denali outside of regulatory control.
- ▶ These items are being sent to your lab as part of a forensics investigation.
- ▶ The investigator in the case would like an quick initial report based on the gamma spec measurements and guidance on how to proceed based on these measurements.
- ▶ Please read the “History of the Mountain Peninsula” for context on the questions that the investigator is asking.

Items 1 and 2

- ▶ Items 1 and 2 were found together at CP5
- ▶ The items were detected by a portal monitor and secondary screening was performed
- ▶ There were being transported in a personal vehicle
- ▶ The driver did not have any paperwork for transport of the items.

Secondary Screening on Item 1

- ▶ Dose rate measurements were performed with an IdentiFINDER 2
- ▶ Item description: metal can of approximate dimensions of 26 cm high by 7.5 cm radius

@ 10cm

@ 20cm

Secondary Screening on Item 1

- Identification was performed with an IdentiFINDER 2

Secondary Screening on Item 2

- ▶ Dose rate measurements were performed with an IdentiFINDER 2
- ▶ Item description: 3 fuel rods of diameter 0.5 cm and length 50 cm.

@ 10cm

@ 20cm

Secondary Screening on Item 2

- Identification was performed with an IdentiFINDER 2

Item 3

- ▶ Item 3 was found at CP1
- ▶ The items were detected by a portal monitor and secondary screening was performed
- ▶ The item was being transported by a transport service
- ▶ The driver had paperwork indicating the transport of medical sources.

Secondary Screening on Item 3

- ▶ Dose rate measurements were performed with an IdentiFINDER 2
- ▶ Item description: metal can of approximate dimensions of 24 cm high by 9.5 cm radius

@ 10cm

@ 20cm

Secondary Screening on Item 3

- Identification was performed with an IdentiFINDER 2

Item 4

- ▶ Item 4 was found in the capital city of Elbert
- ▶ The item was found by a service technician performing maintenance in a server room in the Presidential building. Explosives were connected to the item.
- ▶ The explosives were neutralized and the item was then surveyed.

Secondary Screening on Item 4

- ▶ Dose rate measurements were performed with an IdentiFINDER 2
- ▶ Item description: metal can of approximate dimensions of 15 cm high by 6 cm radius

@ 10cm

@ 20cm

Secondary Screening on Item 4

- Identification was performed with an IdentiFINDER 2
- Authorities want to know if this would have been a credible threat if exploded.

Denali Laws Regarding Nuclear Material

The law in Denali states that possession of

- ▶ natural uranium is allowed
- ▶ enriched uranium is illegal
- ▶ plutonium is illegal

The authorities of Denali are asking the following questions about the four items interdicted:

1. Is it legal to be in possession of these items?
2. Do these items originate from within Denali?
3. Are all the fuel rods from the same batch?
4. Do the fuel rods and powder come from the same batch of uranium material?
5. What information can you determine about the Na-22 source?
6. An estimate of the amount of material in each item?

Based on the gamma measurements can these questions be answered? What other analytical techniques would you put in the analytical plan to answer the questions asked by authorities?

Laboratory Logistics

- ▶ You will work together in your groups to try and answer the questions asked by the authorities.
- ▶ Each group will have 40 minutes to perform measurements on each item.
- ▶ Choose reasonable count times.
- ▶ Each group will lead a discussion on their conclusions based on the initial gamma ray measurements.
- ▶ Remember to think about how you would report your results to the investigator to ensure a clear and defensible conclusion.
- ▶ Not all the questions may be able to be answered based on the initial gamma ray measurements.

Nuclear History of the Mountain Peninsula

There are three counties on the Mountain Peninsula. They are Everest, Denali, and Rainier.

Denali

Denali has 3 nuclear power plants for the production of electricity. Denali imports BWR fuel from Rainier. All spent fuel is stored on site at the reactors. Denali once has ambitions to develop nuclear weapons, however they have abandoned this program through a treaty with Rainier in exchange for guarantees that Rainier will supply LEU fuel for their nuclear power plants. Before this treaty was agreed to, Denali constructed a small scale reactor and reprocessing facility for the production of low-burnup plutonium in support of their weapons program. In 1972, Denali produced one batch of plutonium before signing the treaty with Rainier. This plutonium is now being used for research. The main areas of research include plutonium bearing container degradation studies, the development of (α, n) neutron sources using mixtures of light elements and plutonium, and plutonium eutectic melting point determination with various metals.

Rainier

Rainier has a fully developed fuel cycle. They have uranium ore mines, conversion facilities, enrichment facilities, and fuel fabrication plants which produce low-enriched fuel. They have 5 BWR power reactors and a reprocessing plant. They are currently constructing a new power reactor that will be able to operate on MOX fuel. Rainier's nuclear capability has always been used for peaceful uses.

Everest

Everest has no nuclear facilities. Everest and Rainier are major trading partners. Most of their trading is done over the water as there are high taxes to transport goods through Denail.