As noted in Section 4.3.1, individual states are not assessed for specific facility risk. This is beyond the scope of the current report but the analysis structure provided could easily be expanded to provide this sort of detail.

5. Analysis Discussion

Tables 1.1/2/3, 2.1/2/3 and 3.1/2/3 summarize the diversion analysis risk-relevant information for the three material diversion routes. Figures referenced from the tables provide rankings, in histogram form, for the relative likelihood of facility anomalies as a function of state type, for some of the high importance facilities. The overall facility relative risks are similarly shown in the referenced figures in histogram form. The numerical order of the risk rankings is also provided for the three state types on the bottom rows of the tables. To aid interpretation the columns with vertical shading also highlight the dominant diversion paths for the state types. Sections 5.2 and 5.3 below summarize the results.

Comparison of the relative risk between each of the three potential material routes has not been systematically analyzed. To place the three isotope route risks in relative context the most important factors that influence the choice of fissile material route are summarized below.

From an availability viewpoint both U-235 and Pu-239 are much more likely than U-233 to be diverted, primarily because little U-233 has ever been made, and because of the complex thorium fuel cycle needed to produce it, in a reactor. In addition, the fuel reprocessing then needed to extract the U-233 and the subsequent radioactive handling of this material offer no advantages over the more widely developed plutonium production and extraction process.

The simplest weapon design uses the "gun" technique, where a sub-critical mass of material is shot down a tube into a similar subcritical mass. Either of the enriched uranium isotopes must be used for this type of device. Once available, then, U-235 is considered to be more attractive than Pu-239 to potential proliferators who have limited access to sophisticated bomb design technology. Plutonium cannot be used in a gun device, because a more rapid means of assembly of the critical mass is required, to prevent preignition, [Bibliography reference (vi), p.228]. Either Pu-239 or U-235 can be used in the alternative, implosion weapon design, which is more complex than the gun design. Less Pu-239 than U-235 is, however, needed in an implosion-type weapon. On the other hand, production of plutonium is technically less demanding than production of U-235, assuming a reactor facility for fuel irradiation is available, but Pu-239 does involve handling and storage of highly radioactive materials. While U-235 production is still very difficult, uranium enrichment is still a dynamic field, and proliferation assessment of developing, as well as older, enrichment technologies should be continuous.

5.1 Examples of Actual Diversion Scenarios

To illustrate where actual examples of attempted or successful material diversions have occurred with NPT signatory states, a list is provided below citing the Iraq and North Korean situations. These examples are cross referenced to the analysis tables, so that these diversion scenarios can be seen in context with other potential paths.

Iraq:

- yellowcake (U_3O_8) obtained from indigenous phosphate mine, (undeclared) — Table 2.1
- yellowcake obtained from foreign sources, (undeclared) — Table 2.1
- attempted acquisition of kg quantities of Russian made Pu-239, (undeclared) — Table 2.2
- development of calutron U-235 enrichment facilities (two separate locations), (undeclared) — Table 2.1