Table 2.1 Diversion Path Analysis: Generic Route: U-235, Undeclared Facilities

POTENTIAL FACILITY /SOURCES OF MATERIAL		URANIUM MINE	URANIUM MILLING	URANIUM CONVERSION	URANIUM ENRICHMENT FACILITIES							RESEARCH/ TEST REACTOR/	ENRICHED URANIUM CONVERSION/	EXTRACTION FROM IRRADIATED ENRICHED FUEL	SMUGGLED URANIUM MATERIALS			EXISTING STOCKPILES
RISK RELEVANT PARAMETER					Electromagnetic separatio (UCl4/calutron)	Thermal Diffusion (UF6)	Gaseous Diffusion (UF6)	High Speed Gas Centrifuge (UF6)	Laser Separation Methods	Chemical Exchange Methods	Aerodynamic Separation Methods	ISOTOPE PROGRAM USING HEU	FUEL FABRICATION FACILITY		Natural Uranium Ore	Raw Enriched Uranium Compounds	Refined Weapon Grade Material	
LIKELIHOOD	NWS	low	low	low	Fig.1.2.1a	low	Fig.1.2.1b	Fig.1.2.1c	Fig.1.2.1d	low	low	medium	low	low	low	low	low	high
OF FACILITY	NNWSD	low	low	low	Fig.1.2.1a	low	Fig.1.2.1b	Fig.1.2.1c	Fig.1.2.1d	low	low	medium	low	medium	low	low	low	low
ANOMALY (L)	NNWSU	high	high	high	Fig.1.2.1a	high	Fig.1.2.1b	Fig.1.2.1c	Fig.1.2.1d	low	low	low	high	low	high	high	high	very low
IMPORTANCE OF FACILITY ANOMALY TO FINAL MATERIAL ACQUISITION (I)		low	low	medium	high	medium (useful as an LEU feed)	medium	high	high	low (R&D stage, France/Japan)	high	low	medium	low	low	high	very high	high
DIVERSION SIGNATURES		•Transportation, personnel, infrastructure needs •large tailings piles •If solution mining, tailings piles not large but large number of well drillings •Phosphate mining activity (tailings more significant than for U-ore mine as ore ≈0.01%U) •Airborne and surface radioactivity levels •waste water discharges high for open pit mining	•Large size of mill and tailings piles/ ponds (1Mg of U-235 from 0.1% uranium ore produces ≈ 200,000 tonnes leached ore) •usually located close to mine •transport activity if remote from mine	•Medium size chemical reprocessing buildings with liquid wastes •use of HF	•Large power supply needed per plant area. •Large amount of cooling. •Medium size chemical reprocessing with liquid effluent wastes (organics, acids) •Depleted U tails storage •Large number (hundreds) of calutrons needed	•Large plant size but much smaller than GD, high steam volume consumption •Large electrical supply for pumps/compressors •No known facilities currently operating •liquid effluents	• Extremely large plant size (few hectares) • extremely large electrical power supply and cooling (river or towers) •depleted U tails storage •security fencing •air defence systems	•Plant size large (≈ few thousand sq.m) but much less distinctive (≈1/10) than for GD. • Large manufacturing effort to produce large numbers of centrifuges •security fencing •air defence systems	•20 years of R & D in US. France and Israel have an unknown R&D status. •Plant smaller than for centrifuges. •High power laser operations	•Still at R & D stages •Plant size and power supplies similar to GC •large volumes of specialized chemicals and uranium holdup in Chemex method	•Plant size intermediate between GD and GC. •Large power supplies for compressors	•physical size and structural features •thermal emissions •security fencing •gaseous/ liquid active emisions •air defence systems	•Small size chemical plant, not distinctive	•Very likely located close to a reactor site •active liquid and gaseous wastes	•Material transportation shipments involve large volumes	•Involves small volumes of material •materials & equipment export control information	•Involves small volumes of material •materials & equipment export control information	•Intelligence information
VERIFICATION METHODS	Technical Means	•Optical and infra-red satellite reconnaissance •Atmospheric and surface radioactivity remote monitoring	•Optical and infra-red satellite reconnaisssance •Atmospheric and surface radioactivity remote monitoring	•Chemical/ radiological gaseous emissions minimal, remote monitoring not conclusive	•Optical and infra-red satellite reconnaissance	•Optical and infra-red satellite reconnaissance	•Optical and infra-red satellite reconnaissance	•Optical and infra-red satellite reconnaissance	• Satellite detection of EM signals from high power pulsed laser emissions possible in principle.	•Unknown, possibly chemical waste storage indication	•Optical and infra-red satellite reconnaissance	•Infra-red & optical satellite reconnaissance	•Chemical, nuclear emissions environmental monitoring	•Possibly active emission monitoring	•Intelligence information	•Intelligence information	•Intelligence information	•none
	Routine Inspections	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Special Inspections	TM adequate, SI not needed providing phosphate or other end use can be discounted	TM adequate, SI not needed providing phosphate or other end use can be discounted	U conversion process easy to confirm in-situ, presence of HF and UF6 or UCl4	Needed to confirm TM	Needed to confirm TM	TM should be adequate	Needed to confirm TM	Needed to confirm TM	Likely needed to confirm TM	Likely needed to confirm TM		Needed to confirm TM	Needed to confirm TM	N/A	N/A	N/A	N/A
EFFECTIVENESS OF VERIFICATION METHODS		TM may be conclusive if non-uranium end use is discounted; facility and infra-structure sizes difficult to disguise even if refined U quantity is modest	TM may be conclusive if non-uranium end use discounted; tailings piles/ ponds distinctive even if refined U quantity is modest	TM not conclusive, SI confirmation needed	TM not conclusive	TM not conclusive	TM conclusive	TM Inconclusive	TM verification confidence unknown	SI needed	SI needed	•TM conclusively identifies facility •SI needed to confirm diversion	SI needed	SI needed	•Depends on intelligence, should be conclusive	•Depends on intelligence	•Depends on intelligence	•Ineffective for NWS if large size of hidden stockpiles
		See Figure 2 for the risk ranking hierarchy and Figure 2.2.1a, b, c for the relative risk rankings for NWS, NNWSD and NNWSU respectively and below for ranking order.																
RISK OF FACILITY	NWS	8	9	10	13	11	14	6	2	3 (+other R&D)	4	15	4	15	14	12	7	1
DIVERSION (L x I)	NNWSD	9	10	11	7	12	14	4	1	2 (+other R&D)	5	16	5	16	15	13	8	3
	NNWSU	9	10	11	3	7	15	4	1	13	6	16	6	16	8	2	1	14