III. UNDERSTANDING THE BIOSAFETY LEVEL 4 ENVIRONMENT

Work with an infectious agent is assigned to a biosafety level based on the nature of the agent and the nature of the work being performed. In simple terms this is known as risk assessment. Biosafety Level 4 practices, safety equipment, and facility design and construction are used to support work with dangerous and exotic agents that pose a high ***individual*** risk of life-threatening disease to the laboratory worker handling them, and for which there are no available vaccines or therapies. In the laboratory, some of these agents may be transmitted to workers through aerosols generated by the work being conducted even though this may not be the normal route of infection for the agent under study. Biosafety Level 4 laboratories, staffed by properly trained workers, using appropriate procedures should be the safest of all microbiological laboratories (Bressler and Hawley, 2006). The operating principle of BSL-4 laboratories is extremely simple: isolate the worker from the hazardous agent and any aerosols that may be created. This is done by one of two methods: using an air-tight glovebox or Class III cabinet for all manipulations of the infectious agents (a "cabinet laboratory") or by the worker donning an encapsulating, self-contained, positive pressure suit with supplied breathing air and working in the so-called "suit laboratory". The practice of totally isolating the worker from the biological hazard is not new. It has been used, very successfully, for the safe conduct of research with high hazard biological agents since 1943. (Covert 1993). To date, there has not been a laboratory-acquired infection in the United States resulting from work in a BSL-4 laboratory. The stringent precautions taken to protect the laboratory worker's health and to reduce his/her individual risk have the resultant benefit of protecting the community and the environment as well.

In North America, as a result of BSL-4 practices, personal protective equipment, facility design and construction, there has not been a single laboratory acquired case of infection with an organism studied under this level of containment in over 92 cumulative years of research. As a result, the maximum possible risk of an environmental release of any agent from BSL-4 containment is negligible and approaches zero. Outside of the United States there are have been two isolated instances in which a laboratory worker has, generally through needle stick, become infected with an agent requiring BSL-4 containment (i.e., Ebola HF). While one of these infected laboratory workers succumbed to disease, there are no reports of secondary cases among either healthcare workers who administered care or in the larger community. Since there has been no community impact of these rare occurrences outside the United States, it has not been previously possible, or necessary, to model or compare the potential risks posed to the urban Boston South End as opposed to a suburban (Tyngsborough, MA) or rural (Peterborough, NH) community as the result of a hypothetical release.

Since it is not possible to model potential comparative community risks using existing data from the BSL-4 experiences in the United States or those abroad, a series of hypothetical scenarios have been developed (see Section VII) which result in the simulated release of exotic agents into three communities so that risk comparisons can be made. Using sets of exaggerated assumptions, which are necessary to result in an index

case and *at least* one secondary case, hypothetical scenarios can be studied. In each instance, it should be understood that multiple protective barriers and breaches of protocol need to be sequentially evoked in order to establish disease in the index case and result in secondary spread. These breaches of protocol and protective barriers are described in a note at the end of each scenario description in Section VII. As a result of these exaggerated assumptions, the likelihood of any of these scenarios representing "a real life" situation is extremely remote and the maximum possible risk to each community is negligible and approaches zero. Nonetheless, computational modeling under these highly contrived conditions allows for comparison of theoretical risks for each of the three communities.

Please refer to Section 1.2 of the final Environmental Impact Statement (EIS) for the NEIDL published in the Federal Register on December 9, 2005 [70 F.R. 73223-01 (Dec. 9, 2005)] for a detailed description of the elements of biosafety containment.