2 PROPOSED ACTION AND ALTERNATIVES

This SEIS addresses the potential environmental impacts on human health and the environment from the cleanup of recently discovered PCB-containing capacitors and contaminated soils from the NIF site and of residual contamination in the ETC area. Impacts to human health and the environment are evaluated on the basis of this new information and these changed circumstances for the alternative of continuing to construct and eventually operate the NIF and for the alternative of ceasing NIF construction.

DOE decided in the ROD for the SSM PEIS to construct and operate NIF. The SSM PEIS, the NIF PSA (DOE 1996a), and the technology basis report (DOE 1996b) analyzed five alternative locations at four DOE sites and two design options (indirect and direct drive) for NIF. Those alternatives and options are not revisited in this SEIS. Rather, this SEIS examines alternatives related to continuing construction and eventual operation of NIF in light of recently discovered PCB wastes in the NIF Construction Area and residual PCB contamination in the ETC Area. This SEIS also presents the results of the characterization studies that DOE conducted and completed in 1998 and 1999 pursuant to the Joint Stipulation and Order.

2.1 NO ACTION ALTERNATIVES

The Council on Environmental Quality (CEQ) regulations implementing the National Environmental Policy Act (NEPA) require that an EIS consider a no action alternative (40 CFR 1502.14(d)). In this SEIS, DOE examines the no action alternative from two perspectives. The first no action alternative is the ongoing activity of continuing to construct and eventually to operate NIF. The second no action alternative is to cancel the NIF project, at which time construction would cease and the site would be available for use for another purpose. The latter was the no action alternative of the SSM PEIS included in the draft of this SEIS. Public comment on the Draft SEIS included disagreement with DOE's definition of two no action alternatives. Some members of the public stated that the continuing construction should be considered an action alternative. In addition, some members of the pubic commented that the SEIS should evaluate an alternative of ceasing construction and halting further action. DOE continues to describe the no action alternatives as articulated in the draft of the SEIS but has made modifications to clarify the reasoning and justification to support this discussion of no action alternatives.

2.1.1 Continuing Activity to Construct and Eventually Operate NIF (DOE's Preferred Alternative)

DOE's current activities to construct and eventually operate NIF, as proposed and analyzed in the NIF Project Specific Analysis (PSA) of the SSM PEIS, represents the status quo. DOE believes that continuing ongoing activity is an appropriate no action alternative, and DOE

has not changed this alternative to an action alternative, as requested by public comment. CEQ has indicated that in the case of ongoing activities, the no action alternative is appropriately represented by the status quo. ("[T]he 'no action' alternative may be thought in terms of continuing with the present course of action until that action is changed" [Forty Most Asked Questions Concerning CEQ's NEPA Regulations, Question 3, 46 FR 18027 (March 23, 1981)].)

Under this alternative, DOE would make no changes in the design of NIF, would undertake no deviations in construction techniques, and would impose no operational changes in response to the information regarding site contamination obtained during the characterization studies completed pursuant to the Joint Stipulation and Order. Section 4.2 describes the consequences of continuing to construct and operate NIF with respect to potential buried hazardous, toxic, or radioactive material in the Stipulated Areas. The NIF PSA, the SSM PEIS, and the technical basis and site comparison report (DOE 1996b) analyzed this alternative in detail with respect to all other aspects of construction and operation.

2.1.2 No Action as Ceasing Construction of NIF at LLNL

Because no action could also be interpreted as "no project at LLNL," DOE has determined that ceasing construction of NIF at LLNL is also an appropriate no action alternative. This alternative consists of several options described in the following sections. This was the no action alternative from the SSM PEIS. DOE believes that "no action" when defined as ceasing construction of NIF is not a reasonable alternative. This alternative would be reasonable to consider only if the characterization studies had determined that the contamination caused by buried hazardous, toxic, or radioactive materials was so extensive as to raise serious questions of the advisability of continuing the project in its current location. This is not the case, since, as summarized below in Section 2.3 and discussed in detail in Sections 3 and 4, no further contamination was found at levels or in extent great enough to require halting NIF construction to protect human health or the environment. However, to provide an alternative for comparison with DOE's Preferred Alternative, certain options related to ceasing NIF construction are briefly analyzed in Section 4.3. The selection of these options is described below.

2.1.2.1 Placing the Facility in a Safe Condition

This option was added in response to public comment. A decision to cease construction of NIF at LLNL could be followed by activities to place the facility in a condition that would permanently protect workers, the public, and the environment. The facility would then be left idle ("mothballed," as described in public comment). Necessary activities would include modifying the construction plan to allow for closure, monitoring, and maintenance. Construction activities would include sealing entryways and providing access for inspection, protecting structures from degradation by the elements, modifying site drainage to prevent runoff, and completing landscaping. All construction materials and any chemicals that would present a

hazard (e.g., paints, solvents, and cleaning agents) would be removed. The impacts of this alternative are briefly considered in Section 4.3.

2.1.2.2 Using the Facility for Another Program

For this option, the NIF facility would be completed to the extent that it could be used for another program. For the purpose of this SEIS, this program is considered to already exist at LLNL. The NIF building would be redesigned. Unneeded equipment would be torn out and recycled as scrap. The interior layout would be modified to accommodate the new use, possibly including new windows, floors, walls, wiring, and plumbing. Remaining excavations would be filled, and the site landscaped, as planned for construction of NIF. Depending on the intended alternative use of the facility, the level of construction activity might be less or equal to that required for completion of NIF. The major difference would be that the NIF scientific equipment would not be installed. The duration of activities might be less than required to complete NIF if modifications were minor, or the duration of activities might be longer than required to complete NIF if modifications were major. Because the NIF was designed as a radiological facility, it is reasonable to assume that alternative use might include storage of or experiments with radionuclides. The impacts of this option are included in Section 4.3.

2.1.2.3 Demolishing NIF

For this option, the completed structures of the facility would be demolished, excavations filled, and the site returned to a condition that would be appropriate for open space. Equipment, wiring, plumbing, and interior steelwork would be removed and recycled or sold as scrap. Utility services would be disengaged. The building structures would be collapsed or dismantled, broken up, and disposed of as construction wastes. Steel reinforcing bar or other recyclables might be separated from the construction wastes. Where permitted by regulation, some construction debris might be used to fill excavations. Otherwise soil would be brought in from off-site to bring all surfaces to grade. Filled excavations would be revegetated in a manner suitable for open space. The impacts of this option are included in Section 4.3.

2.2 ACTION ALTERNATIVES (ELIMINATED FROM DETAILED STUDY)

The CEQ regulations require that an EIS analyze all reasonable alternatives to the proposed action and discuss the reasons why other alternatives were eliminated from detailed study [40 CFR 1502.14(a)]. As stated by CEQ: "[w]hat constitutes a reasonable range of alternatives depends on the nature of the proposal and the facts in each case" (Forty Most Asked Questions, Question 1, 46 FR 18027). As discussed below, DOE believes that the facts surrounding the proposed action and the purpose and need for this SEIS lead to the conclusion

that there are no reasonable action alternatives under the circumstances, and, therefore, that all action alternatives should be eliminated from detailed study.

One area of possible action alternatives involves operating the NIF with fewer than the planned 192 beams. Recent Congressional budgetary language requires a review of options that would change the schedule for implementing the full design number of 192 beams or options that would possibly operate at a reduced number of beams to allow full demonstration of the system before proceeding with full operation (see Section 1.2). These changes would be modifications of the original proposal, resulting in a reduced initial project scope. DOE has examined the environmental implications of implementing these modifications and has concluded that the impacts would fall within the bounds of those already evaluated for the 192-beam design in the SSM PEIS. The SSM PEIS demonstrated that the impacts of the 192-beam design would be minor. Furthermore, DOE has concluded that the impacts do not vary significantly among the various options that use fewer beams. Therefore, DOE has concluded that alternatives involving the operation of the NIF with fewer than 192 beams should be eliminated from detailed study in this SEIS. This conclusion is supported by the summary of impacts for the original design and for potential designs employing fewer beams given in Section 2.2.2, below.

2.2.1 Changes in NIF Construction and Operation Related to Buried Objects or Residual Site Contamination

Possible action alternatives would consist of various ways to modify the manner in which DOE continues to construct and operate the facility to take into account the results of the characterization studies. These modifications could include changes in the design or changes in the manner of constructing or operating the facility to avoid releasing contamination, as well as modifications in the construction schedule to allow any contamination that was discovered to be remediated before proceeding.

Changes in construction and operation of NIF might be reasonable to consider as alternatives only if the characterization studies concluded that there are additional buried hazardous, toxic, or radioactive materials or soils in the area of the NIF construction site that would adversely affect human health and the environment. Phase I and II evaluations of the NIF site pursuant to the Joint Stipulation and Order have uncovered no positive indications of additional hazardous, toxic, and/or radioactive material. The hazardous materials discovered during NIF construction have already been cleaned up. These materials are now below levels of concern for impacts to the environment or human health. Characterization studies have shown that there is a very low likelihood of further existence of any buried wastes. Further NIF construction and NIF operations would result in no additional potential adverse health impacts to workers or the public from hazardous, toxic, or radiological materials related to buried wastes beyond those analyzed in the SSM PEIS. Therefore, no design, construction, or operation modifications to address the presence of such materials need be considered. Any contaminants within the area defined in the Joint Stipulation and Order, and outside the NIF construction site, will be addressed under the CERCLA process with CERCLA RPM oversight.

2.2.2 Changes in NIF Construction and Operations Not Related to Buried Objects or Residual Site Contamination

Commenters stated that certain changes related to NIF operations should be added to the scope of the SSM SEIS, including the following: use of plutonium, uranium, and lithium hydrides as targets; consideration of potential damage to optics; more frequent maintenance and cleaning of optics; lower energy operations; and reduced number of beam lines (a half-sized NIF). DOE examined these operational changes and determined that they did not require detailed study in this SSM SEIS for reasons discussed below.

The process for determining whether DOE will supplement the SSM PEIS to address a proposal to use plutonium, uranium, or lithium hydrides as targets was established in the Memorandum Opinion and Order issued by the U.S. District Court for the District of Columbia on August 19, 1998, in NRDC v. Richardson. By the terms of that Memorandum Opinion and Order, DOE, no later than January 1, 2004, will either (1) determine that experiments using plutonium, uranium (other than depleted uranium), lithium hydride, and certain other materials will not be conducted in the NIF or (2) prepare a Supplemental SSM PEIS analyzing the reasonably foreseeable environmental impacts of such experiments. DOE will continue to investigate the need for these experiments and will make the required determination or begin the appropriate SEIS by the specified date. However, until DOE has completed the necessary studies and determined that such experiments are needed, no proposal exists, and it would be inappropriate to begin an SEIS.

Public comment requested that the SEIS address more frequent damage to optics, more frequent maintenance of optics, and more frequent cleaning of optics. DOE has examined this issue and concluded that the impacts to workers and the public from damage to the final optics in the beam lines have already been included in the impact assessments conducted as part of the SSM PEIS. The actual frequency at which optics components will have to be cleaned, adjusted, repaired, or replaced would not be determined until the facility is completed and tested. The NIF laser facility includes 192 beam lines consisting of more than 10,000 discrete optical components. The NIF target area provides confinement of tritium and activation products by providing physical barriers and controlling air flow. The facility operates in a pulsed mode (brief shot followed by a 4–8-hour period before the next shot); maintenance and repair of the beam lines would not occur during a pulse. The SSM PEIS evaluated risks to workers and the public and generation of wastes for an enhanced mode with a bounding yield. Normal operations are expected to be within those bounds, including variations in maintenance and repair of optics. For these reasons, DOE determined that this was not an appropriate issue or alternative for inclusion for detailed study in this SEIS.

Commenters requested that DOE evaluate the impacts of operating the NIF at lower energy levels and with a reduced number of beam lines. Also, language in the Conference Report accompanying the Energy and Water Appropriations Act for Fiscal Year 2001 directs DOE to examine these issues (see Section 1.2). The potential impacts associated with these

options are analyzed below, both in terms of the envelope of operations evaluated in the SSM PEIS and in absolute terms.

The SSM PEIS evaluated operations of a 192-beam NIF in an enhanced mode with a maximum credible yield of 45 megajoules (MJ) per shot, a maximum tritium inventory of 500 Ci (0.05 g), a tritium throughput of 1,750 Ci/yr (0.175 g/yr), and tritium effluents of 30 Ci/yr (0.003 g/yr). Operations with fewer beam lines and/or at less energy would result in less or no yield per shot, less tritium inventory, less tritium throughput, and less tritium effluents. Other impacts, including those related to radiological health effects, air emissions, water and energy usage, and hazardous wastes would be either reduced or unchanged. Only socioeconomic impacts might increase, but only slightly. These impacts are summarized in Table 2.1.

Impacts summarized in Table 2.1 were evaluated for NIF configurations employing the full 192 beams, as well as reduced configurations of 120, 96, and 48 beams. The Conference Report language discussed in Section 1.2 specifies consideration of 48-beam and 96-beam lasers. DOE has chosen also to include a 120-beam option as an intermediate configuration because it provides the best path to full 192-beam deployment while supporting the Stockpile Stewardship Program with high-quality, integrated, convergent experiments (96 symmetric beams) and while supporting early weapons physics tests with 48 beams. The 48-beam configuration would employ only one of the two laser bays in the original design. All configurations with a greater number of beams would use both laser bays. Increasing the number of beams would allow commensurately increasing degrees in symmetry in arrangement about the target. This would result in high-quality implosions providing more rigorous tests of ignition physics. However, for all configurations employing less than the full design 192 beams, fusion ignition of tritium targets would be either highly unlikely or impossible. If ignition were achieved with fewer than 192 beams, the environmental impacts would be bounded by those for the full NIF 192-beam configuration evaluated in the SSM PEIS.

Table 2.1 provides operational levels, material uses, estimated emissions, and associated potential impacts on public health and the size of the NIF work force for various beam configurations. The values for the full 192-beam design evaluated in the SSM PEIS represent the maximum values expected for the fullest operation of the NIF. From Table 2.1, it can be seen that health and environmental impacts from options employing a reduced number of beams would be less than or equal to those from the full option. Further, since the absolute impacts from the full NIF would be very low, as indicated in the SSM PEIS, any differences between such impacts of the reduced options would be inconsequential, irrespective of their relative magnitudes. Employment levels would be reduced modestly under the reduced options.

TABLE 2.1 Comparison of Energy Levels, Material Use, Emissions, and Estimated Impacts for Operation of NIF with 192 Beams and with Reduced Numbers of Beams

Parameter	SSM PEIS 192 beams	120 beams	96 beams	48 beams
Configuration	Full NIF, 192 beams in two laser bays	1 cluster and 8-fold, 2-cone target symmetry using both laser bays	1 cluster and 8-fold, 1-cone target symmetry using both laser bays	1 cluster (48 beams) no symmetry using a single Laser Bay
Ignition	Robust ignition	Ignition highly unlikely	No ignition	No ignition
Maximum energy yield per shot	20 MJ (45 MJ max. credible)	100 kJ	10 kJ	<200 J
Annual energy yield	1,200 MJ/yr	12 MJ/yr	1 MJ/yr	<30 kJ/yr
Maximum tritium inventory	500 Ci (0.05 g)	300 Ci (0.03 g)	300 Ci (0.03 g)	10 Ci (0.001 g)
Annual tritium throughput	1,750 Ci/yr (0.175 g/yr)	500 Ci/yr (0.05 g/yr)	300 Ci/yr (0.03 g/yr)	10 Ci/yr (0.001 g/yr)
Annual tritium emission (stack)	30 Ci/yr (0.003 g/yr)	Same as 192-beam case	Same as 192-beam case	10 Ci/yr (0.001 g/yr)
Radiation dose[a] normal operation:				
MEI	0.1 mrem/yr	0.02 mrem/yr	0.02 mrem/yr	0.006 mrem/yr
Public collective dose	0.2 person-rem/yr	0.2 person-rem/yr	0.2 person-rem/yr	0.1 person-rem/yr
Non-NIF worker on-site	0.2 person-rem/yr	<0.03 person-rem/yr	<0.003 person-rem/yr	<0.001 person-rem/yr
NIF workers	10 person-rem/yr	<5 person-rem/yr	<3 person-rem/yr	<1 person-rem/yr
Fatal cancers	No fatal cancers expected	No fatal cancers expected	No fatal cancers expected	No fatal cancers expected
Annual emissions[b]				
PM_{10}	0.16 t/yr	Same as 192-beam case	Same as 192-beam case	0.11 t/yr
VOC	0.56 t/yr	0.46 t/yr	0.42 t/yr	0.26 t/yr
CO	0.43 t/yr	Same as 192-beam case	Same as 192-beam case	0.26 t/yr
NO_2	1.79 t/yr	Same as 192-beam case	Same as 192-beam case	1.19 t/yr
SO_2	0.03 t/yr	Same as 192-beam case	Same as 192-beam case	0.02 t/yr
Lead	Negligible	Same as 192-beam case	Same as 192-beam case	Same as 192-beam case
Water supply[c]	152 MLY	140 MLY	135 MLY	120 MLY
Wastewater treatment[c]	18 MLY	17 MLY	17 MLY	16 MLY
Energy[d]				
Electricity	NE	Same as 192-beam case	Same as 192-beam case	80% of 192-beam case
Gas	4.06×10^7 MJ	Same as 192-beam case	Same as 192-beam case	80% of 192-beam case
Diesel	5,820 L	Same as 192-beam case	Same as 192-beam case	Same as 192-beam case
Annual waste[e] (all amts. in m^3/yr)				
LLW	Solid: 1.71 Liquid: 1.56	Solid: 0.94 Liquid: 1.03	Solid: 0.75 Liquid: 0.83	Solid: 0.24 Liquid: 0.45
Mixed	Solid: 0.88 Liquid: 4.98	Solid: 0.58 Liquid: 2.46	Solid: 0.47 Liquid: 1.83	Solid: 0.26 Liquid: 0.64
Hazardous	Solid: 8.00 Liquid: 4.60	Solid: 5.00 Liquid: 3.64	Solid: 4.00 Liquid: 3.27	Solid: 2.01 Liquid: 2.30
Facility accidents[f]				
Radiological	Dose to public: 440 person-rem (no fatal cancers expected) Dose to MEI: 0.2 rem	Dose to public: 264 person-rem (no fatal cancers expected) Dose to MEI: 0.1 rem	Dose to public: 264 person-rem (no fatal cancers expected) Dose to MEI: 0.1 rem	Dose to public: 9 person-rem (no fatal cancers expected) Dose to MEI: 0.003 rem
Hazardous chemical release (radius)	Highest threat zone 237 m (within site boundary)	Same as 192-beam case	Same as 192-beam case	Same as 192-beam case
No. of lost jobs (direct/indirect)[g]				
Peak construction in 2007	NA/NA	50/1,300	50/1,350	50/1,400
Annual operations in 2009	NA/NA	30/50	40/70	60/100

Footnotes appear on next page.

TABLE 2.1 (Cont.)

[a] The regulatory limit for individual exposure from airborne emissions is 10 mrem/yr, as required by the Clean Air Act. The occupational limit for workers is 5,000 mrem/yr from all pathways (10 CFR 835). There is no regulatory limit for collective population dose. The dose limit for individual members of the public is 100 mrem/yr (10 CFR 835; 10 CFR 20). However, the maximum collective public dose from operations of 0.2 person-rem/yr represents only 8×10^{-6} % of the dose the affected population receives from local background radiation.

[b] Values are given in metric tons (t). Maximum annual air emissions (192-beam case) represent from 4 to 11% of total LLNL air emissions. The SSM PEIS concluded that NIF operations would have no adverse impact on air quality and would not contribute to a violation of ambient air quality standards.

[c] Values for water are in million liters per year (MLY). Water supply requirements for NIF would amount to about 16% of the total LLNL requirement. Wastewater treatment volumes would increase about 4.5% as a result of NIF operations, according to the SSM PEIS.

[d] NE = not evaluated. Electricity was not evaluated in the SSM PEIS because a new power source was not required for NIF. Natural gas requirements are due almost entirely to the heating requirements of the NIF building and support facilities. Diesel fuel is needed for backup power for the same facilities (SSM PEIS).

[e] Wastes generated from NIF operations would not exceed current treatment and/or storage capacities at LLNL (SSM PEIS).

[f] Postulated facility or transportation accidents involving the release of radiological (tritium targets) materials result in a maximum estimated dose to the public of 440 person-rem. No cancer fatalities would be expected to occur among the public as a result of such accidents. Four hazardous chemical accident scenarios were examined in the SSM PEIS. Dispersion modeling indicated that a release of mercury from ignition switches would have effects over the greatest distance. Mercury levels would fall below Emergency Response Planning Guidelines-2 at a distance of 237 m (778 ft). This distance is within the LLNL site boundary.

[g] Number of jobs lost relative to the 192-beam NIF. Direct jobs are those dedicated to NIF operations. Indirect jobs are those created to support NIF operations. Peak construction year refers to peak construction year for that particular beam option. Peak construction year direct job impacts include only reductions in the construction management and project management work force and do not include reductions in installation and assembly labor. NA = not applicable.

The energy yield for a given experiment (single shot) is the difference between the energy directed to the target in the form of laser light and the energy emitted from the target in response to this input. Only when ignition or partial ignition is achieved is the energy output substantially greater than the input. However, even with full ignition using 192 laser beams, the energy yield of 20 MJ is not great in absolute terms. It is roughly equivalent to 5,000 food calories. The annual yield listed in Table 2.1 is simply the sum of the yield of all shots over the course of a year, many of which would not achieve ignition. Tritium inventory is the quantity of tritium that would be in the building at any given time to provide a continuous supply of targets for experiments. Annual tritium throughput is the quantity of tritium consumed in experiments over the course of a year. Greater inventories would be needed and throughputs reached when ignition is achievable. Estimated annual tritium stack emissions represent a small fraction of the tritium throughput that is not captured by the tritium collection system, which captures tritium emissions from the test chamber.

Radiological health impacts estimates for the maximally exposed individual (MEI) and on-site NIF and non-NIF workers under the reduced beam number options would be less than the already low levels under the full option. This reduction in MEI health impacts would result primarily from the reduction in the generation and release of short-lived activation products (e.g.,

N-13 and Ar-41) of components of air and neutron skyshine[4] for options that do not achieve ignition. Doses to the public would be reduced to a lesser extent, because they are due to exposure to longer-lived tritium. Tritium emissions would be 30 Ci/yr (0.003 g/yr) for all options except 48 beams, for which they would be 10 Ci/yr (0.001 g/yr).

Similarly, air emission of VOCs used for cleaning the target chamber would be reduced when ignition is not achieved. VOC emissions from wipe cleaning of optics would be proportional to the number of beams. Emissions of other criteria air pollutants such as CO, NO_2, and SO_2, which make up boiler house emissions from water heating would be about the same for all options using both laser bays. Emissions for the 48-beam case would be roughly two-thirds of the other cases as a result of reduced energy use for a single bay. Water supply and wastewater treatment requirements would be expected to fall modestly as a function of the number of laser beams operated.

The NIF energy use would be dominated by the environmental control of a large building (each laser bay is the size of a football field) to stringent clean room conditions with tight temperature controls. The charging of capacitors for each shot would be a small percentage of the annual electrical use. Therefore, the annual energy use for the 120- and 96-beam cases, which would use the entire facility, would be the same as that for the 192-beam NIF evaluated in the SSM PEIS. In the 48-beam case, where only one of the two laser bays would be used, the annual energy consumption would be reduced by 20%.

Quantities of hazardous, low-level, and mixed wastes generated from operations are estimated to fall generally as a function of reduced tritium throughput or yield. Impacts of facility accidents involving radiological materials would be expected to fall as the quantities of materials used and potentially released would fall correspondingly with the number of beams operated. Impacts from hazardous chemical accidents would be approximately the same for all cases as the quantity of the chemical (mercury) used in the hypothetical bounding accident could be as great as that used for the full NIF. Such impacts would not extend beyond the site boundary.

Socioeconomic impacts arising from a reduced facility would be expected to be mixed. Construction of a 120-beam, 96-beam, or 48-beam facility would result in a reduction in capital expenditures of between 8% and 15% when compared with the 192-beam facility. These expenditure reductions would result in lower levels of employment in the various local industries that manufacture equipment that would be used in the facility; these lower levels would, in turn, affect the overall level of employment in the Bay Area economy (Table 2.1). A smaller impact would be expected from the reduction in the number of installation and assembly workers and other facility site personnel associated with construction of a reduced facility. Operation of a smaller beam configuration facility would also be likely to impact the local economy, since

[4] Skyshine is radiation at the receptor location arising from collisions with air nuclei by radiation transmitted into the atmosphere through the target and optical switchyard roofs. The magnitude of this dose would diminish rapidly with distance from the facility.

expenditures associated with employee wages and salaries would be slightly reduced. Although the construction and operation of a reduced facility would create fewer jobs than would be created for the 192-beam facility, the robustness and size of the economy of the Bay Area mean that it is unlikely that these employment impacts would be of any overall significance.

A reduced facility would be likely to have a small positive effect on local public services, such as public safety and other local government services, and on education in the region of influence, because fewer workers and their families would migrate into the area during facility construction and operation.

If the construction of the 192-beam configuration would simply be delayed, total project costs would be likely to increase relative to the cost under the original schedule as a result of inflation and disruption to suppliers.

The analysis summarized in Table 2.1 indicates that the impacts of the full 192-beam NIF create an envelope bounding the impacts of the smaller number of beam lines. In addition, the SSM PEIS documented that the impacts of constructing and operating the full NIF would be minor, including a very low radiation dose to the public during operation and an extremely low potential for an accident resulting in a radiation release. The analysis of a reduced number of beam lines and lower energy operations indicates that these potential impacts would be even smaller.

2.2.3 Constructing NIF at Another Site

Constructing NIF at another site at this time is not a reasonable option from a technical perspective. The conventional construction of the NIF facility is now more than 94% complete. The NIF requires large-scale laser research, development, and support facilities that are present only at LLNL. In order to meet the purpose and need for NIF, the required scientific infrastructure and facilities that are now present at LLNL would have to be developed at another site. The impacts of this option are not addressed further in this SEIS, in part because the site conditions and impacts of construction are not changed by the discovery of PCB-containing buried capacitors at the NIF site or residual contamination at the ETC. The impacts of constructing and operating NIF at other sites and of not constructing or operating the facility at LLNL were analyzed in detail in the SSM SEIS, the NIF PSA, and the technical basis and site comparison report (DOE 1996b).

Moving NIF to another site might be reasonable to consider only if the characterization studies identified additional major sources of further contamination from buried hazardous, toxic, or radioactive materials. As highlighted in Section 2.3 and discussed in Chapter 4, no additional previously unknown or undiscovered sources of contaminated objects were found at the NIF Construction Area as a result of Phase I and Phase II characterization activities, including a magnetometer survey (SSPORTS 1997, 1998a-b), and the impacts of cleanup were

minor — below levels of concern for human health. The residual contamination found at the ETC Area is not in the area of NIF and would not affect NIF construction or operation. Moving NIF to another site would not provide the public substantial additional protection from buried hazardous or radioactive materials. Any such materials found would be removed under any circumstances.

2.2.4 Abandonment of the NIF Facility

Although suggested in public comment, this option was considered but not evaluated in detail in the SEIS. DOE believes it is unreasonable to stop construction and walk away without further modifications to the site or facility. Abandonment without placing the facility in a safe condition would violate DOE's principles of integrated safety management and good management practices. Abandonment could potentially be in violation of one or more federal regulations, state regulations, or DOE orders and guidelines. The facility would not be protected in any way from degradation by the elements or from unwanted intrusion. Modifications would not be made to control water and wind erosion of the site, and provisions would not be made to control site drainage in excavated areas. For these reasons, this alternative is considered unreasonable and not analyzed further in this SEIS.

2.3 SUMMARY OF IMPACTS

This SEIS summarizes Phase I and Phase II characterization studies (see Section 4) and evaluates the potential impacts (including cumulative impacts) to LLNL workers and to the public from construction and operation of the NIF because of the possible presence of buried hazardous, toxic, or radioactive materials in the areas in the northeastern quadrant of the LLNL as stipulated in the Joint Stipulation and Order.

Results of Phase I and Phase II investigations show that there is a low likelihood that significant quantities of buried hazardous, toxic, or radioactive materials remain in the stipulated areas. On the basis of these findings, DOE has concluded that the only source of buried materials in the NIF Construction Area was the capacitor landfill discovered in September 1997 and subsequently cleaned up. PCB-contaminated soils recently discovered during maintenance work in the ETC Area are believed to represent residual contamination from capacitors previously excavated during the ETCL closure in 1984 (DOE 1999b).

DOE's analysis of recent soil and groundwater data, including data collected in support of the capacitor landfill removal and Phase I and II investigations, concluded that levels of contamination are well below those that would impact human health. Soil contamination at levels measured in the NIF construction area and other stipulated areas does not present a risk of adverse health effects to workers from respiration of dust. Remedial actions addressing PCB-contaminated soil in the NIF Construction Area and in the ETC Area achieved cleanup criteria

approved by the RPMs to be protective of human health and the environment. Analyses of potential health impacts to a hypothetical maximally exposed member of the public from dust-borne PCBs potentially generated during these actions found potential exposures to be well below levels of concern (1×10^{-6} cancer risk or 1.0 hazard quotient for noncancer impacts). Protection of groundwater by soil cleanup levels achieved in the two areas was verified through groundwater sampling and modeling analysis. Levels of PCB contamination in groundwater now and projected into the future are calculated to be well below levels considered to present a risk to the public. Construction and operation of NIF would not directly adversely affect groundwater because no groundwater withdrawals or discharges would occur from this facility. Ongoing remediation activities will continue to improve groundwater quality for both the alternatives — (1) continuing construction and operation of NIF and (2) ceasing construction of NIF. Potential impacts on the human environment at LLNL are below any level of significance.

The impacts of the no action alternative of ceasing NIF construction (see Section 4.3) would depend on whether the facility (1) would be completed and used for another purpose, (2) would be mothballed, or (3) would be demolished and the site restored. For these options, employment at LLNL and the region would not be supported by the direct and indirect jobs from NIF operations. If not replaced by other new regional or local growth, the loss of these jobs would have an adverse socioeconomic impact in the Tri-Valley area. Demolishing the NIF buildings would increase exposure of workers to occupational hazards and increase the risks of transportation accidents from transportation of wastes. The transportation of an estimated 4,400 m^3 (5,800 yd^3) of nonhazardous wastes off-site and delivery of fill for excavated areas would increase truck traffic, potentially prolonging risks of disturbance to nesting white-tailed kites by this traffic. If the building were reused for another purpose, doses from radionuclides and hazardous materials would depend on whether the type of reuse included handling, storage, or experiments with hazardous and radiological materials. If so, the doses from hazardous materials and radionuclides could be less than, the same as, or greater than those for NIF. Since no experiments with radiological materials have occurred in the NIF facility, demolition would not present a risk to workers and the public from radionuclides and hazardous materials. Demolition would result in release of dusts (including PM_{10}); the LLNL area is not in attainment for this criteria pollutant.