Appendix K
Environmental Justice Analysis

K.1 INTRODUCTION

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (59 FR 7629), directs Federal agencies to identify and address, as appropriate, disproportionately high and adverse health or environmental effects of their programs, policies, and activities on minority populations and low-income populations.

The Council on Environmental Quality has oversight responsibility for documentation prepared in compliance with the National Environmental Policy Act (NEPA). In December 1997, the Council released its guidance on environmental justice under NEPA (CEQ 1997). The Council's guidance was adopted as the basis for the analysis of environmental justice contained in this *Programmatic Environmental Impact Statement for Accomplishing Expanded Civilian Nuclear Energy Research and Development and Isotope Production Missions in the United States, Including the Role of the Fast Flux Test Facility* (*Nuclear Infrastructure Programmatic Environmental Impact Statement* [NI PEIS]).

This appendix provides an assessment of the potential for disproportionately high and adverse human health or environmental effects on minority and low-income populations from the implementation of each alternative.

K.2 DEFINITIONS

MINORITY INDIVIDUALS AND POPULATION

The following definitions of minority individuals and population were used in this analysis of environmental justice:

- **Minority individuals—**Individuals who are members of the following populations groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic.

- **Minority population—**Minority populations should be identified where either: (a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis. In identifying minority communities, agencies may consider as a community either a group of individuals living in geographic proximity to one another, or a geographically dispersed and transient set of individuals (such as migrant workers or Native American), where either type of group experiences common conditions of environmental exposure or effect. The selection of the appropriate unit of geographic analysis may be a governing body's jurisdiction, a neighborhood, census tract, or other similar unit that is to be chosen so as to not artificially dilute or inflate the affected minority population. A minority population also exists if there is more than one minority group present and the minority percentage, as calculated by aggregating all minority persons, meets one of the above-stated thresholds.

In the discussions of environmental justice in this NI PEIS, persons self-designated as Hispanic are included in the Hispanic population, regardless of race. For example, the Asian or Pacific Islander population is composed of persons self-designated as Asian or Pacific Islander and not of Hispanic origin. Asian or Pacific Islanders who designated themselves as having Hispanic origins are included in the Hispanic population. Data for the analysis of minority populations in 1990 were extracted from Table P012 of Summary Tape File 3 (DOC 1992). Data for the analysis of minorities and racial populations were extracted for year 2020 from the Census Bureau's World Wide Web site (DOC 1999).

LOW-INCOME INDIVIDUALS AND POPULATION

Executive Order 12898 specifically addresses "disproportionately high and adverse effects" on "low-income" populations. The Council on Environmental Quality recommends that poverty thresholds be used to identify "low-income" individuals.

The following definition of low-income population was used in this analysis:

- **Low-income population—**Low-income populations in an affected area should be identified with the annual statistical poverty thresholds from the U.S. Bureau of the Census' Current Population Reports, Series P–60 on Income and Poverty. In identifying low-income populations, agencies may consider as a community either a group of individuals living in geographic proximity to one another, or a set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effect.

Data for the analysis of low-income populations were extracted from Table P121 of Summary Tape File 3 (DOC 1992).

DISPROPORTIONATELY HIGH AND ADVERSE HUMAN HEALTH EFFECTS

Adverse health effects are measured in risks and rates that could result in latent cancer fatalities, as well as other fatal or nonfatal adverse impacts to human health. Disproportionately high and adverse human health effects occur when the risk or rate of exposure to an environmental hazard for a minority population or low-income population is significant and exceeds the risk of exposure rate for the general population or, where available, for another appropriate comparison group (CEQ 1997).

DISPROPORTIONATELY HIGH AND ADVERSE ENVIRONMENTAL IMPACTS

A disproportionately high environmental impact refers to an impact (or risk of an impact) in a low-income or minority community that is significant and exceeds the environmental impact on the larger community. An adverse environmental impact is an impact that is determined to be both harmful and significant. In assessing cultural and aesthetic environmental impacts, impacts that uniquely affect geographically dislocated or dispersed or minority low-income populations are considered (CEQ 1997).

Potentially affected areas examined in this NI PEIS include areas defined by an 80-kilometer (50-mile) radius centered on candidate facilities for plutonium-238 production, radioisotope production, or processing activities located at the Idaho National Engineering and Environmental Laboratory (INEEL), the Oak Ridge Reservation (ORR), and the Hanford Site (Hanford). Potentially affected areas used in the analysis of environmental justice are the same as those used in the analysis of radiological health effects described in Chapter 4.

K.3 METHODOLOGY

K.3.1 Spatial Resolution

For the purposes of enumeration and analysis, the Census Bureau has defined a variety of areal units (DOC 1992). Areal units of concern in this document include (in order of increasing spatial resolution) states, counties, census tracts, block groups, and blocks. The "block" is the smallest of these entities and offers the finest spatial resolution. This term refers to a relatively small geographical area bounded on all sides by visible features such as streets and streams or by invisible boundaries such as city limits and property lines. During the 1990 census, the Census Bureau subdivided the United States and its territories into 7,017,425 blocks. For

comparison, the number of counties, census tracts, and block groups used in the 1990 census were 3,248; 62,276; and 229,192; respectively. While blocks offer the finest spatial resolution, economic data required for the identification of low-income populations are not available at the block-level of spatial resolution. In the analysis below, block groups are used throughout as the areal unit. Block groups generally contain between 250 and 500 housing units (DOC 1992).

During the decennial census, the Census Bureau collects data from individuals and aggregates the data according to residence in a geographical area, such as a county or block group. This NI PEIS uses data from the 1990 census as a baseline. The Census Bureau has not yet published results of the year 2000 census. Boundaries of the areal units are selected to coincide with features such as streams and roads or political boundaries such as county and city borders. Boundaries used for aggregation of the census data usually do not coincide with boundaries used in the calculation of health effects. As discussed in Chapter 4, radiological health effects due to an accident at each of the sites considered for the proposed actions are evaluated for persons residing within a distance of 80 kilometers (50 miles) of an accident site. In general, the boundary of the circle with an 80-kilometer (50-mile) radius centered at the accident site will not coincide with boundaries used by the Census Bureau for enumeration of the population in the potentially affected area. Some block groups lie completely inside or outside of the radius for health effects calculation. However, other block groups are only partially included. As a result of these partial inclusions, uncertainties are introduced into the estimate of the population at risk from the accident.

To estimate the populations at risk in partially included block groups, it was assumed that populations are uniformly distributed throughout the area of each block group. For example, if 30 percent of the area of a block group lies within 80 kilometers (50 miles) of the accident site, it was assumed that 30 percent of the population residing in that block group would be at risk.

K.3.2 Population Projections

Health effects were calculated for populations projected to reside in potentially affected areas during the year 2020. Extrapolations of the total population for individual states are available from both the Census Bureau and various state agencies (Campbell 1996). The Census Bureau also projects populations by ethnic and racial classification in 1-year intervals for the years from 1995 to 2025 at the state level. State agencies project total populations for individual counties. No Federal or state agency projects block group or low-income populations. Data used to project minority populations were extracted from the Census Bureau's World Wide Web site (DOC 1999). To project minority populations in potentially affected areas, minority populations determined from the 1990 census data were taken as a baseline for each block group. Then it was assumed that percentage changes in the minority population of each block group for a given year (compared to the 1990 baseline data) will be the same as percentage changes in the state minority population projected for the same year. An advantage to this assumption is that the projected populations are obtained using a consistent method, regardless of the state and associated block group involved in the calculation. A disadvantage is that the method is insensitive to localized demographic changes that could alter the projection in a specific area.

The Census Bureau uses the cohort-component method to estimate future populations for each state (Campbell 1996). The set of cohorts is comprised of: (1) age groups from 1 year or less to 85 years or more, (2) male and female populations in each age group, and (3) the following racial and ethnic groups in each age group: Hispanic, non-Hispanic Asian, non-Hispanic Black, non-Hispanic Native American, and non-Hispanic White. Components of the population change used in the demographic accounting system are births, deaths,

net state-to-state migration, and net international migration. If P(t) denotes the number of individuals in a given cohort at time "t," then:

$$P(t) = P(t_0) + B - D + DIM - DOM + IIM - IOM$$

where:

$P(t_0)$	=	Cohort population at time $t_0 \leq t$. For this analysis, t_0 denotes the year 1990.
B	=	Births expected during the period from t_0 to t.
D	=	Deaths expected during the period from t_0 to t.
DIM	=	Domestic migration into the state expected during the period from t_0 to t.
DOM	=	Domestic migration out of the state expected during the period from t_0 to t.
IIM	=	International migration into the state expected during the period from t_0 to t.
IOM	=	International migration out of the state expected during the period from t_0 to t.

Estimated values for the components shown on the right side of the equation are based on past data and various assumptions regarding changes in the rates for birth, mortality, and migration (Campbell 1996). Persons of Hispanic origin are included in the Hispanic population regardless of race. It should be noted that the Census Bureau does not project populations of individuals who identified themselves as "other race" during the 1990 census. This population group is less than 2 percent of the total population in each of the states. However, to project total populations in the environmental justice analysis, population projections for the "other race" group were made under the assumption that the growth rate for the "other race" population will be identical to the growth rate for the combined minority and white populations.

K.4 ENVIRONMENTAL JUSTICE ASSESSMENT

The analysis of environmental justice concerns was based on an assessment of the impacts reported in Chapter 4. This analysis was performed to identify any disproportionately high and adverse human health or environmental impacts on minority or low-income populations surrounding the candidate sites. Demographic information obtained from the Census Bureau was used to identify the minority populations and low-income communities in the zone of potential impact surrounding the sites (DOC 1992).

K.5 RESULTS FOR THE SITES FOR THE NO ACTION ALTERNATIVE, ALTERNATIVE 1, ALTERNATIVE 2, AND ALTERNATIVE 5

As discussed in Chapter 2, the Advanced Test Reactor (ATR) at INEEL, the High Flux Isotope Reactor (HFIR) at ORR, and the Fast Flux Test Facility (FFTF) at Hanford are candidate reactors for DOE's nuclear infrastructure programs. Candidate processing facilities include the Fluorinel Dissolution Process Facility (FDPF) at INEEL, the Radiochemical Engineering Development Center (REDC) at ORR, and the Fuels and Materials Examination Facility (FMEF) at Hanford. This section describes the analysis of potentially affected minority and low-income populations residing near those facilities. Projections of the total population provided in this appendix differ from the projected total populations used in the health effects calculations described in Chapter 4. This is because the projections used in the analysis of environmental justice are based on projections for the states provided by the Census Bureau (Campbell 1996). Projections used in the analysis of health effects are based on county-wide projections provided by state agencies. As discussed above, the county projections are more sensitive to localized demographic changes. However, the states do not provide projections for minority populations. Therefore, the Census Bureau's projections were used in the analysis of environmental justice. Population projections obtained with the two approaches differ by 14 percent or less and have essentially no effect on the results of the analyses.

K.5.1 Results for INEEL

As discussed in Chapter 2, three of the candidate facilities for participation in DOE's program for the supply of isotope products and services are located at INEEL: ATR, FDPF, and CPP–651. **Figure K–1** shows the racial and Hispanic composition of the minority population residing within 80 kilometers (50 miles) of ATR in 1990 (DOC 1992) and those projected to reside in the potentially affected area in the year 2020. In the interval between 1990 and 2020, the percentage of the total population composed of minorities is projected to increase from 10 percent to 18 percent. ATR and FDPF are within approximately 3 kilometers (1.9 miles) of one another, and the populations in potentially affected areas for the two facilities are similar.

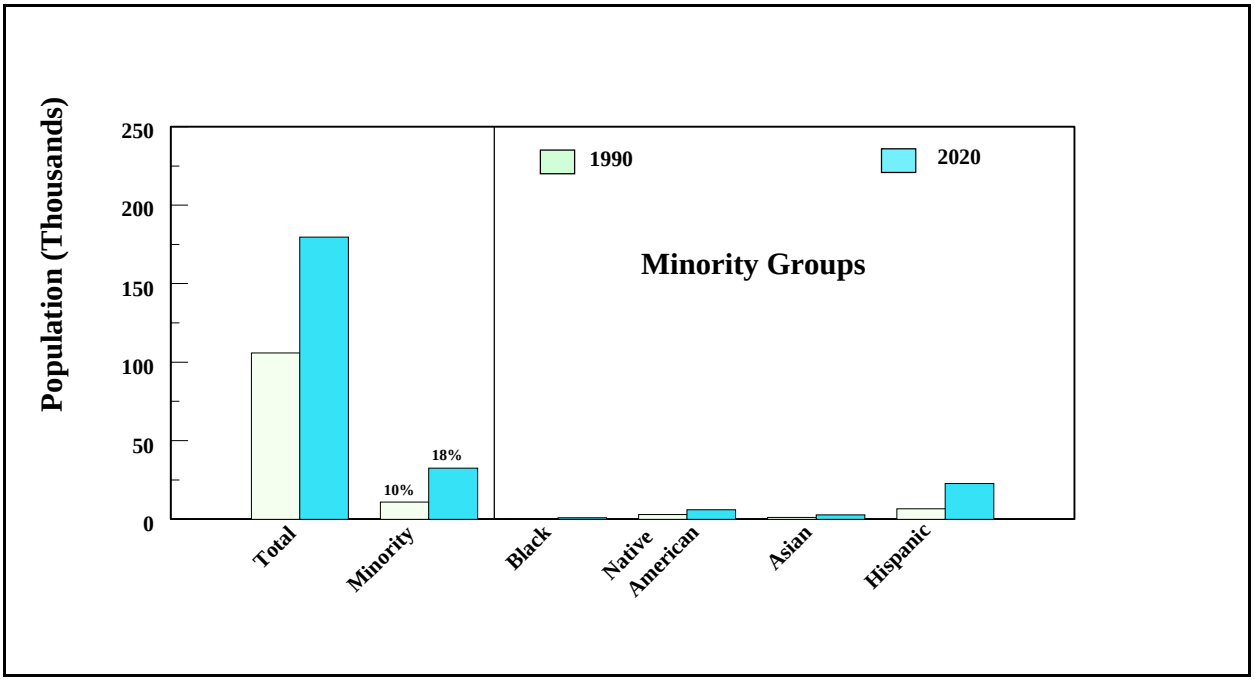

Figure K–1 Racial and Hispanic Composition of the Population Residing Within 80 Kilometers (50 Miles) of ATR at INEEL

For comparison, during the 1990 census, minorities were found to comprise approximately one-quarter of the total national population. By the year 2020, minorities are projected to comprise approximately one-third of the total national population. The percentage of the minority population residing in the potentially affected areas surrounding the INEEL site was less than the corresponding national percentage in 1990, and is expected to remain so through the year 2020. Hispanics are the largest minority group residing in the potentially affected area, and both Asian and Hispanic populations are projected to show the largest growth rates.

During the 1990 census, approximately 13 percent of the residents within the potentially affected area surrounding the INEEL site reported incomes below the poverty threshold. Slightly over 13 percent of the national population reported incomes below the poverty threshold, and approximately 13 percent of the residents of Idaho reported incomes below the poverty threshold during the same year. Thus, the percentage of low-income population residing within the potentially affected area in 1990 was equal to that for the Nation and the State of Idaho.

Figures K–2 and **K–3** show the geographical distribution of minority and low-income populations residing near INEEL in 1990. As indicated in Figure K–2, block groups for which the percentage of minority residents exceeds the corresponding national percentage (approximately 24 percent in 1990) are concentrated in the area

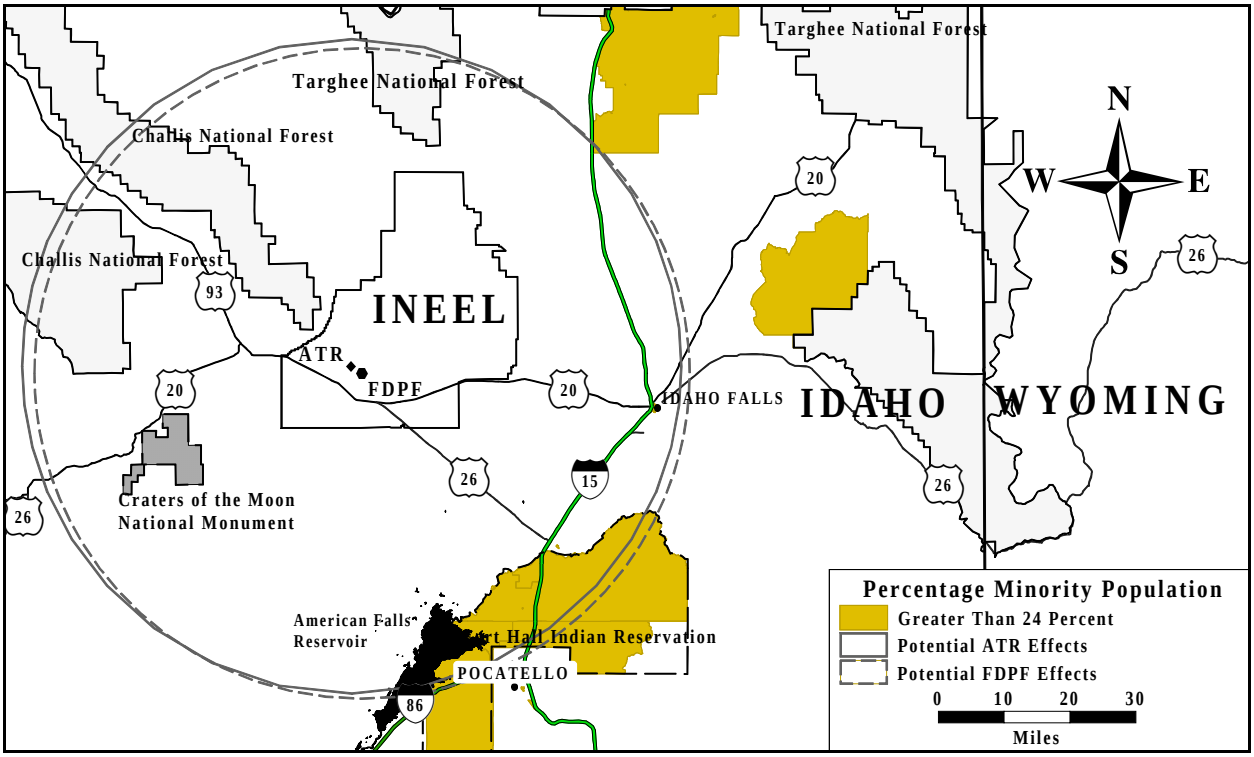

Figure K–2 Geographical Distribution of Minority Populations Residing Within 80 Kilometers (50 Miles) of ATR and FDPF at INEEL

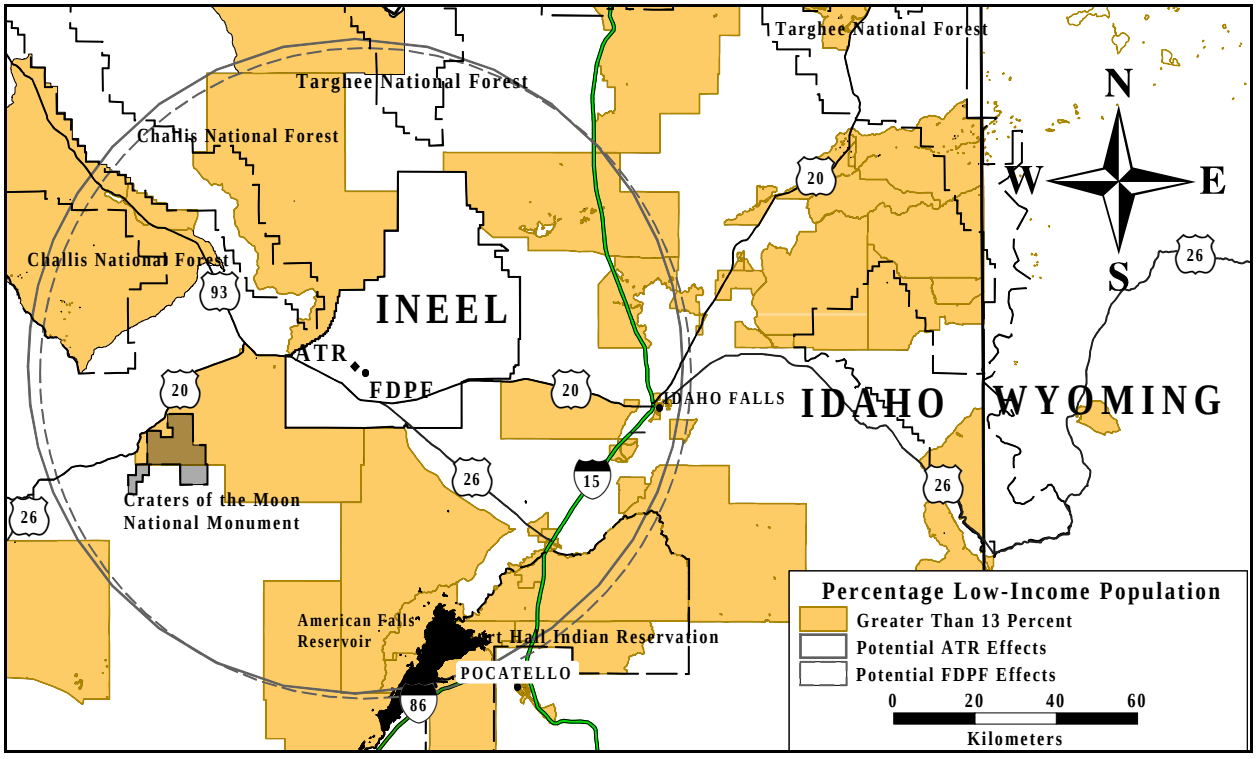

Figure K–3 Geographical Distribution of Low-Income Populations Residing Within 80 Kilometers (50 Miles) of ATR and FDPF at INEEL

of the Fort Hall Reservation. Block groups for which the percentage of the low-income population exceeds the national percentage (approximately 13 percent in 1990) are located throughout the potentially affected area. Thus, estimates of the effects of radiological or chemical releases to the atmosphere on minority populations could be noticeably influenced by assumptions concerning weather conditions existing during a given release. Low-income populations are located more uniformly throughout the potentially affected area, and estimates of the radiological effects on low-income populations would be less sensitive to assumptions concerning prevailing wind direction, wind speed, and atmospheric stability class. Appendix H discussed the radiological and nonradiological release models used in this NI PEIS.

As discussed in Chapter 4, normal operations that would result from implementation of the alternatives at INEEL would pose no significant incremental health or other risks to persons residing within the potentially affected area. Environmental justice concerns in the INEEL area include food consumption patterns of minority communities, such as the Fort Hall Indian Reservation, and low-income communities that are located throughout the potentially affected area. In order to assess potential health risks to minority and low-income populations, the health impacts due to ingestion of contaminated food in the potentially affected area were evaluated with the GENII computer model (see Appendix H). Health risks due to normal operations were evaluated under the assumption that all food consumed by residents in the potentially affected area during the 35-year operational period would be obtained locally and would be subject to radiological contamination that could result from normal operations. The maximum population dose to populations at risk near INEEL due to ingestion of radiologically contaminated food would be approximately 2.6×10^{-6} person-rem. The associated risk of a latent cancer fatality would be essentially zero. Thus, no credible pattern of food consumption by minority or low-income populations would result in a significant health risk attributable to radiological contamination of the food supply that could result from normal operations.

In the event of a radiological accident at one of the INEEL facilities, radiological contamination would be directed toward the Fort Hall Indian Reservation if the prevailing winds at the time of the accident were blowing from the northwest (see Figure K–2). However, accidents that could occur at INEEL under implementation of the alternatives would not be expected to result in a latent cancer fatality among the exposed population or the maximally exposed individual residing within the boundaries of the Fort Hall Reservation.

Implementation of the alternatives would thus pose no significant radiological risks to minority or low-income populations residing within the potentially affected area surrounding INEEL.

K.5.2 Results for ORR

As discussed in Chapter 2, HFIR is a candidate reactor for DOE's isotope supply program, and REDC is a candidate processing facility. These facilities are co-located at latitude 35° 55'7" north and longitude 84° 18'14" west. **Figure K–4** shows the racial and Hispanic composition of the minority population residing within 80 kilometers (50 miles) of HFIR and REDC at ORR in 1990 (DOC 1992) and those projected to reside in the potentially affected area in the year 2020. In the interval between 1990 and 2020, the percentage of the total population composed of minorities is projected to increase from approximately 6 to 8 percent. For comparison, during the 1990 census, minorities were found to comprise approximately one-quarter of the total national population. By the year 2020, minorities are projected to comprise approximately one-third of the total national population. The percentage of the minority population residing in the potentially affected area surrounding ORR was less than the corresponding national percentage in 1990, and is expected to remain so through the year 2020. Blacks are the largest minority group residing in the potentially affected area, while the Asian and Hispanic populations are projected to show the largest growth rates.

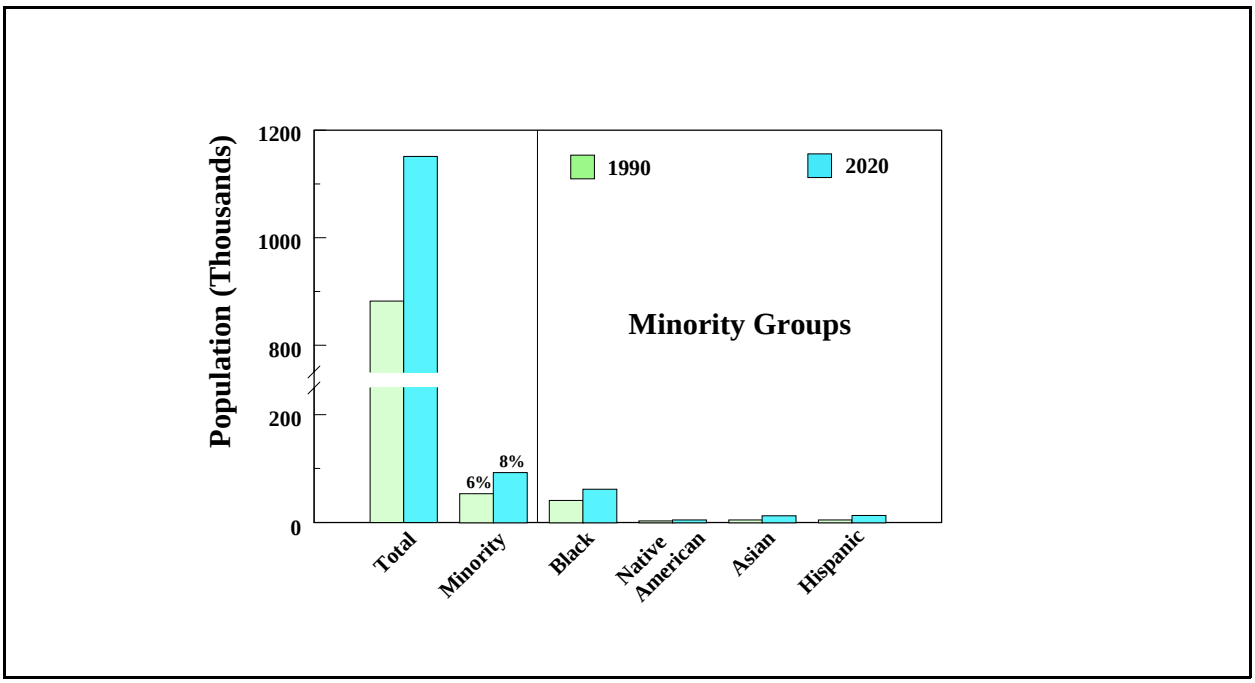

Figure K–4 Racial and Hispanic Composition of Populations Residing Within 80 Kilometers (50 Miles) of HFIR and REDC at ORR

Figure K–5 shows the geographical distribution of the minority population residing near ORR. Minority populations within the potentially affected area are concentrated largely in the area of Knoxville, Tennessee. **Figure K–6** provides an expanded view of the areas surrounding Knoxville and ORR. The minority community of Scarboro is adjacent to the northern boundary of ORR. Approximately 60 percent of the minority populations residing in the potentially affected area surrounding ORR also reside within 16 kilometers (10 miles) of Knoxville. Thus, estimates of the effects of radiological or chemical releases could be noticeably influenced by assumptions concerning weather conditions existing during a given release.

During the 1990 census, 16 percent of the residents within the potentially affected area surrounding ORR reported incomes below the poverty threshold. Slightly over 13 percent of the national population reported incomes below the poverty threshold, and nearly 16 percent of the residents of Tennessee reported incomes below the poverty threshold during the same year. Thus, the percentage of low-income population residing within the potentially affected area exceeded that for the Nation, but is equal to the corresponding percentage for Tennessee. **Figures K–7** and **K–8** show the geographical distribution of low-income residents surrounding ORR and the Knoxville-ORR area, respectively. Block groups for which the percentage of low-income residents exceeds the corresponding national percentage are located throughout the potentially affected area. Thus, estimates of the effects of radiological or chemical releases on low-income populations are less sensitive to assumptions concerning existing weather conditions.

As discussed in Chapter 4, normal operations that would result from implementation of the alternatives at ORR would pose no significant incremental health or other risks to persons residing within the potentially affected area. Environmental justice concerns in the ORR area include food consumption patterns of minority communities, such as those in Scarboro and Knoxville, and low-income communities that are located throughout the potentially affected area. In order to assess potential health risks to minority and low-income populations, the health impacts due to ingestion of contaminated food in the potentially affected area were evaluated with the GENII computer model (see Appendix H). Health risks due to normal operations were evaluated under the assumption that all food consumed by residents in the potentially affected area during the

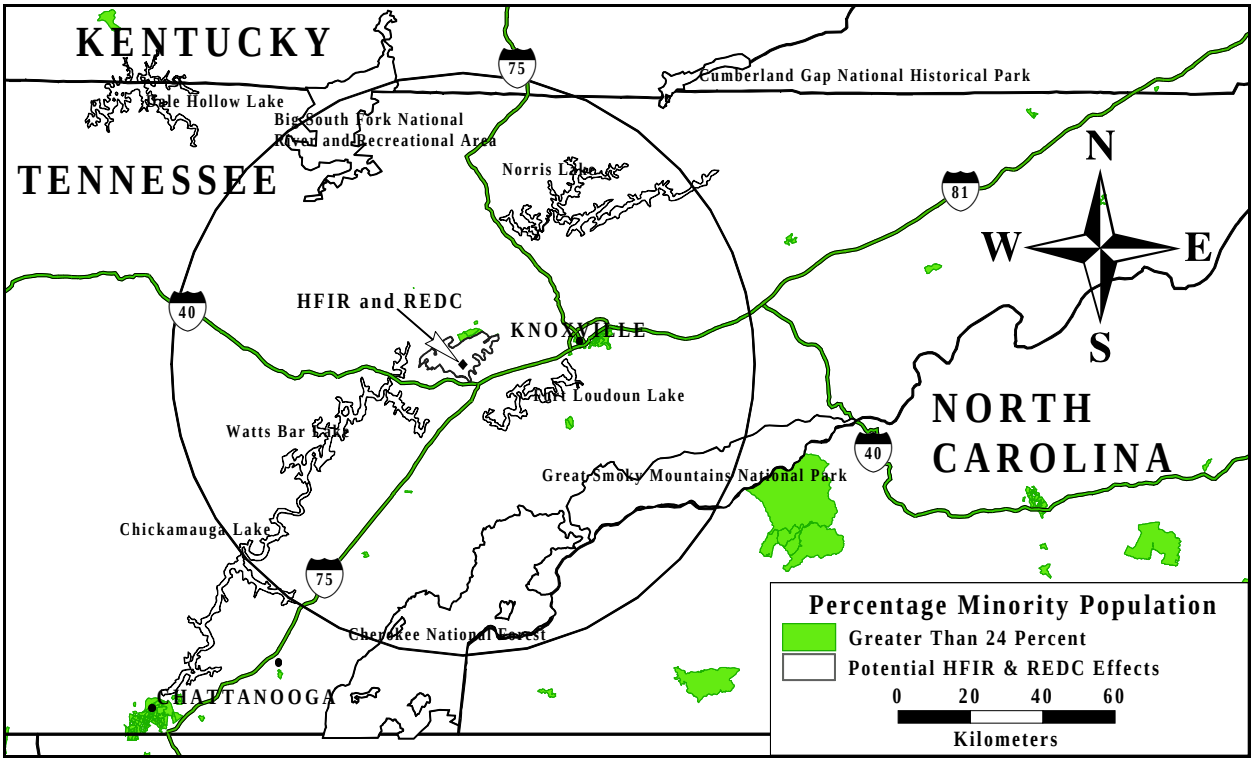

Figure K–5 Geographical Distribution of Minority Populations Residing Within 80 Kilometers (50 Miles) of HFIR and REDC at ORR

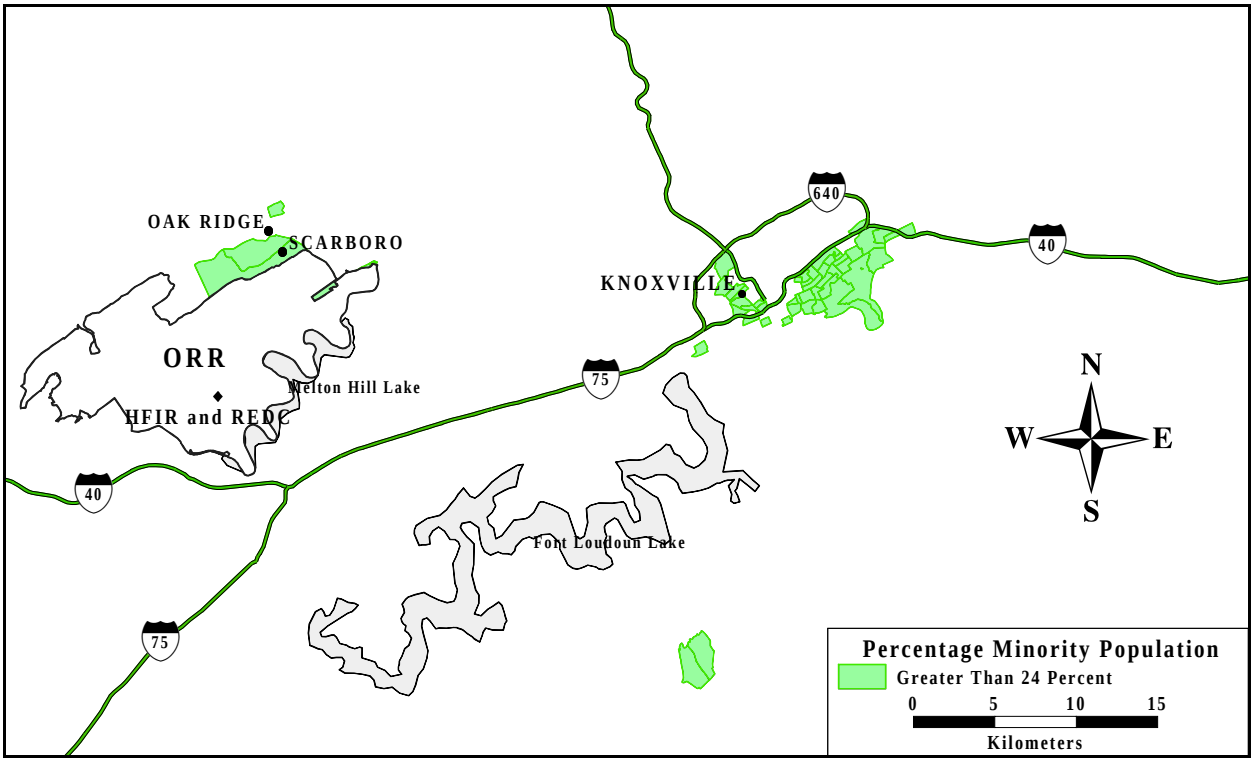

Figure K–6 Geographical Distribution of Minority Populations in the Knoxville, Tennessee Area

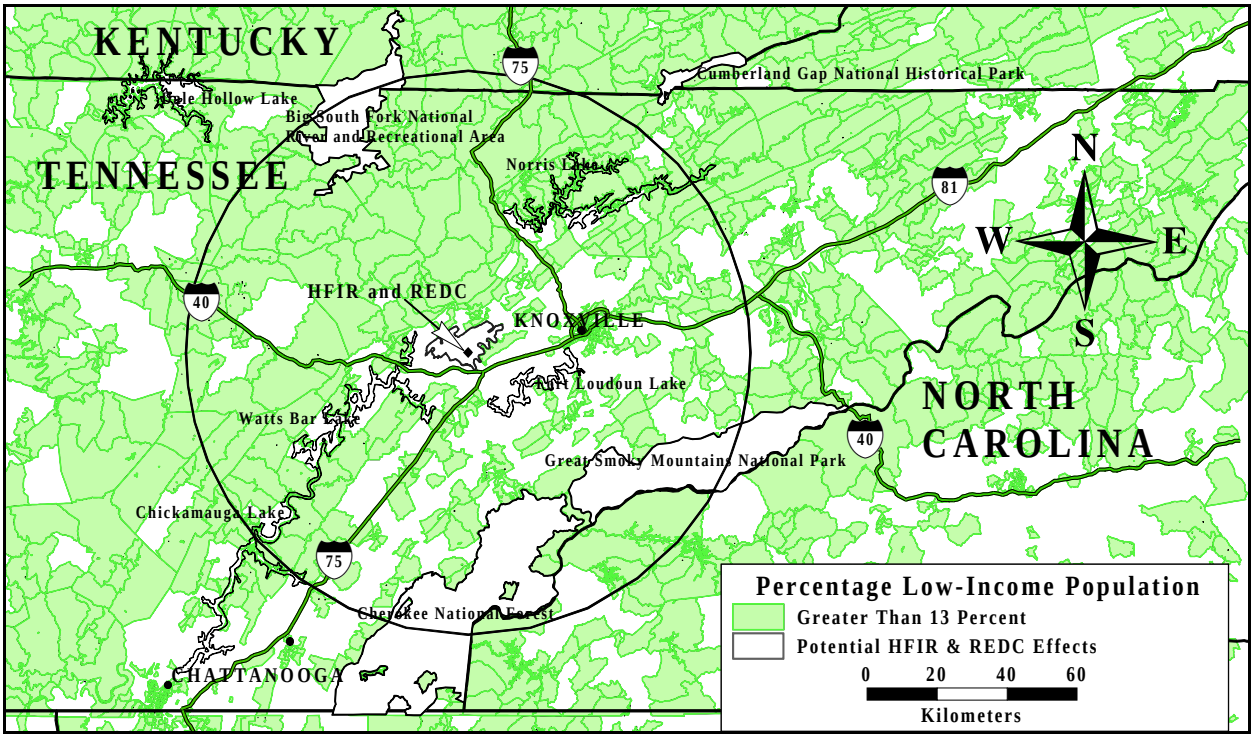

Figure K–7 Geographical Distribution of Low-Income Populations Residing Within 80 Kilometers (50 Miles) of HFIR and REDC at ORR

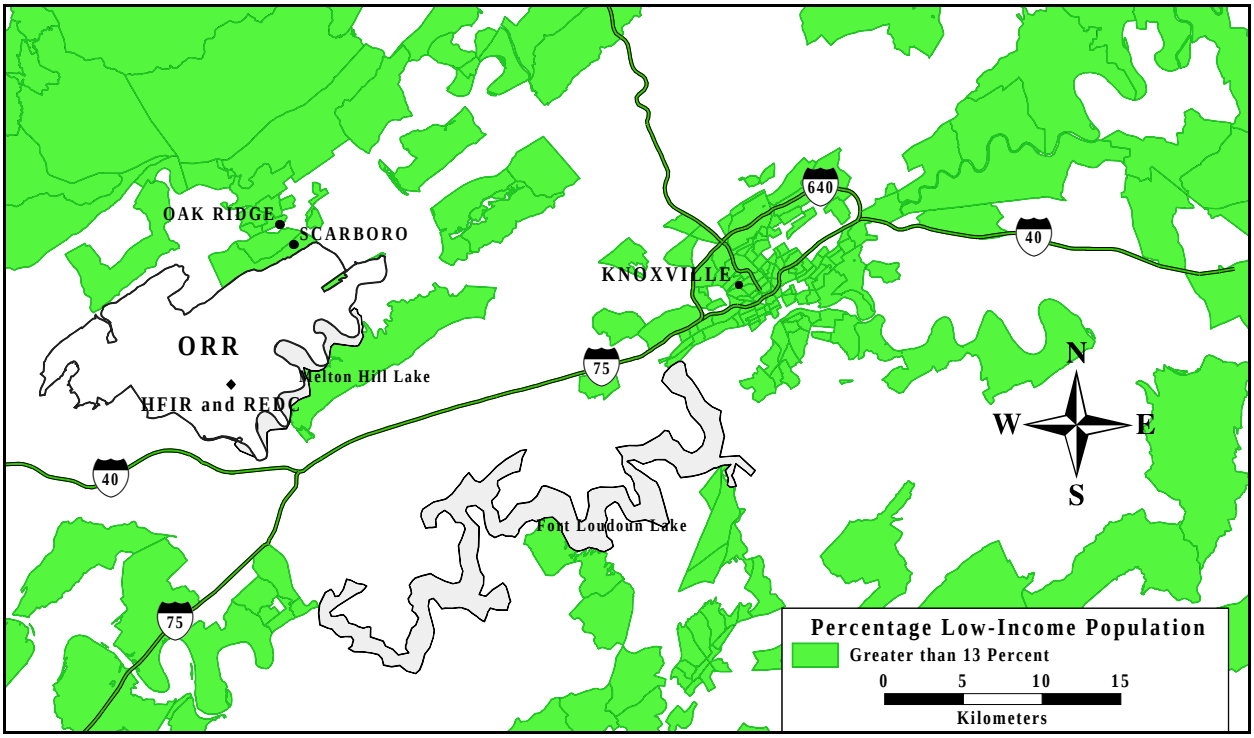

Figure K–8 Geographical Distribution of Low-Income Populations in the Knoxville, Tennessee Area

35-year operational period would be obtained locally and would be subject to radiological contamination that could result from normal operations. The maximum population dose to populations at risk near ORR due to ingestion of radiologically contaminated food would be approximately 2.6×10^{-7} person-rem. The associated risk of a latent cancer fatality would be essentially zero. Thus, no credible pattern of food consumption by minority or low-income populations would result in a significant health risk attributable to radiological contamination of the food supply that could result from normal operations.

As shown in Figure K–6, minorities at risk in the potentially affected area are concentrated in the community of Scarboro adjacent to the northern boundary of ORR and Knoxville, Tennessee. In the event of a radiological accident at one of the ORR facilities, radiological contamination would be directed toward Scarboro if the prevailing winds at the time of the accident were blowing from the south-southwest (see Figure K–6). As discussed in Chapter 4 (e.g., see Section 4.3.1.1.10), the largest radiological risks to the public that could result from implementation of the alternatives are those that could result from accidents at candidate fabrication and processing facilities.

Scarboro is the minority community closest to the boundary of ORR. The residents of Scarboro are among the populations at risk due to radiological accidents that could occur at REDC. Demographic data for Scarboro is contained in the block group designated by Federal Information Processing Standard (FIPS) code 470010201004. Projection of the population of Scarboro to the year 2020 shows that its total population is expected to be approximately 964 in 2020, and the minority population is expected to be approximately 877 in 2020. In order to conservatively estimate the risk of latent cancer fatalities resulting among minority residents of Scarboro from a beyond-design-basis earthquake at REDC, it was assumed that if such an earthquake were to occur, then all minority residents of Scarboro would receive a radiation dose of 26.3 rem. That is the dose that would be received by the maximally exposed individual residing at the ORR boundary in the direction north-northwest from REDC. Under this assumption, the resulting population dose would be approximately 23,065 person-rem. For an accident frequency of 10^{-5} (see Section 4.3.1.1.10), the annual risk to the projected minority population under these conservative assumptions would be 2.3×10^{-4} latent cancer fatality. Over the 35-year program duration, the expected latent cancer fatalities among the minority population would be approximately 0.008. No latent cancer fatalities among the minority population of Scarboro would be expected to result from a beyond-design-basis earthquake at REDC. In addition, if REDC were selected to process plutonium-238 under the nuclear infrastructure alternatives, specific safety analysis documentation would be developed to provide the authorization basis for REDC operations. If DOE site officials deem it necessary, facility and/or operational modification would be used to mitigate the impacts of severe accidents.

Approximately one-third of the residents of Scarboro reported incomes less than the poverty threshold in 1990. Under the assumption that one-third of the residents of Scarboro in 2020 would report incomes less than the poverty threshold, the dose received by low-income residents due to a beyond-design-basis earthquake at REDC would be approximately 8,450 person-rem. The annual risk to low-income residents of Scarboro would then be approximately 8.5×10^{-5} latent cancer fatality. Over the 35-year program duration, the expected latent cancer fatalities among the projected low-income population would be approximately 0.003. No latent cancer fatalities among the low-income population of Scarboro would be expected to result from a beyond-design-basis earthquake at REDC.

If the prevailing winds were blowing from the west-southwest during an accident at REDC, then radiological contamination resulting from the accident would be directed toward minority and low-income communities residing in the Knoxville area. The closest of these communities is approximately 30 kilometers (18.8 miles) from HFIR and REDC (see Figures K–6 and K–8), and therefore accidents at the reactor or fabrication and processing facilities would not be expected to pose a significant risk to the minority or low-income populations in the Knoxville area.

Implementation of the alternatives would thus pose no significant radiological risks to minority or low-income populations residing within the potentially affected area surrounding ORR.

K.5.3 Results for Hanford

As discussed in Chapter 2, candidate facilities at Hanford include the FFTF reactor, the FMEF processing and storage facility, and storage facilities in the Radiochemical Processing Laboratory (RPL) and Building 306–E. FFTF is located at latitude 46° 26′8″ north and longitude 119° 21′32″ west. FMEF is located at latitude 46º 26'7.0" north and longitude 119º 21'55.0" west. RPL is located at latitude 46° 22′7.7″ north and longitude 119° 16′43.7″ west. **Figure K–9** shows the racial and Hispanic composition of the minority population residing within 80 kilometers (50 miles) of FMEF in 1990 and those projected to reside in the potentially affected area in 2020. In the interval from 1990 to 2020, the percentage of the total population composed of minorities is projected to increase from approximately 25 percent to 44 percent. For comparison, during the 1990 census, minorities were found to comprise nearly one-quarter of the total national population. By the year 2020, minorities are projected to comprise approximately one-third of the total national population. The percentage of the minority population residing in the potentially affected area surrounding Hanford and FMEF was approximately equal to the corresponding national percentage in 1990, but is projected to exceed the corresponding national percentage by the year 2020. As indicated in Figure K–9, Hispanics are the largest minority group residing in the potentially affected area. The population at risk near FMEF is typical of populations at risk surrounding FFTF and RPL/306–E in the 300 Area. Total and minority populations residing in potentially affected areas surrounding FMEF, FFTF, and RPL differ by less than 1 percent.

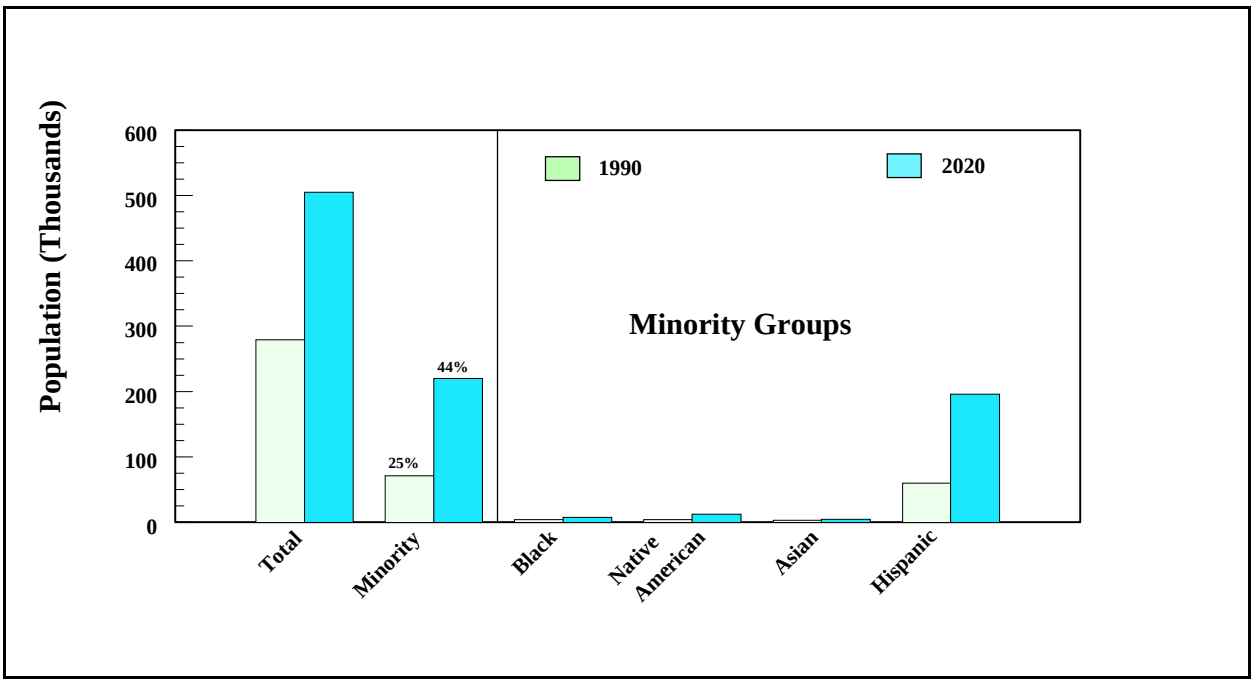

Figure K–9 Racial and Hispanic Composition of Populations Residing Within 80 Kilometers (50 Miles) of FFTF and RPL/306–E at Hanford

During the 1990 census, approximately 17 percent of the residents within the potentially affected area surrounding Hanford reported incomes below the poverty threshold. Slightly over 13 percent of the national population reported incomes below the poverty threshold, and approximately 11 percent of the residents of the State of Washington reported incomes below the poverty threshold during the same year. Thus, the percentage

of low-income population residing within the potentially affected area in 1990 exceeded both the national percentage and that for the State of Washington.

Figures K–10 and **K–11** show the geographical distribution of minority and low-income populations residing near the Hanford site in 1990. As indicated in the figures, block groups for which the percentage of minority residents exceeds the corresponding national percentage (approximately 24 percent in 1990) or for which the percentage low-income population exceeds the corresponding national percentage (approximately 13 percent in 1990) are located throughout the potentially affected area.

As discussed in Chapter 4, normal operations that would result from implementation of the alternatives at Hanford would pose no significant incremental health or other risks to persons residing within the potentially affected area. Environmental justice concerns in the Hanford area include food consumption patterns of minority communities, such the Yakama Indian Reservation, and low-income communities that are located throughout the potentially affected area. In order to assess potential health risks to minority and low-income populations, the health impacts due to ingestion of contaminated food in the potentially affected area were evaluated with the GENII computer model (see Appendix H). Health risks due to normal operations were evaluated under the assumption that all food consumed by residents in the potentially affected area during the 35-year operational period would be obtained locally and would be subject to radiological contamination that could result from normal operations. The maximum population dose to populations at risk near Hanford due to ingestion of radiologically contaminated food would be approximately 2.0 person-rem due to normal operations at FMEF and 4.6 person-rem due to normal operations at RPL. The associated risk would be approximately 0.001 latent cancer fatality due to normal FMEF operations and approximately 0.0023 latent cancer fatality due to normal operations at RPL. Thus, no credible pattern of food consumption by minority or low-income populations would result in a significant health risk attributable to radiological contamination of the food supply that could result from normal operations.

In the event of a radiological accident at one of the Hanford facilities, radiological contamination would be directed toward the Yakama Indian Reservation if the prevailing winds at the time of the accident were blowing from the northeast (see Figure K–11). However, accidents that could occur at Hanford under implementation of the alternatives would not be expected to result in a latent cancer fatality among the exposed population or the maximally exposed individual residing within the boundary of the Yakama Indian Reservation.

Implementation of the alternatives would thus pose no significant radiological risks to minority or low-income populations residing within the potentially affected area surrounding Hanford.

K.6 RESULTS FOR REPRESENTATIVE TRANSPORTATION ROUTES

As discussed in Chapter 4 and Appendix J, selection of the No Action Alternative or Alternative 5 would pose no significant radiological or nonradiological risks to the public. Hence, selection of the No Action Alternative would not be expected to result in disproportionately high and adverse risks for any group within the general population, including minority and low-income groups.

The highest transportation risks to the public would occur if Alternative 1, 3, or 4 were selected for implementation. Due largely to the radiological risks that could result from accidents during the air transportation of isotopes under these alternatives, the number of latent cancer fatalities over the 35-year program would be approximately 0.5. Because air transportation accidents could occur anywhere along the flight path, the associated radiological risks would not disproportionately fall on any particular population regardless of the racial, ethnic, and economic composition of that population.

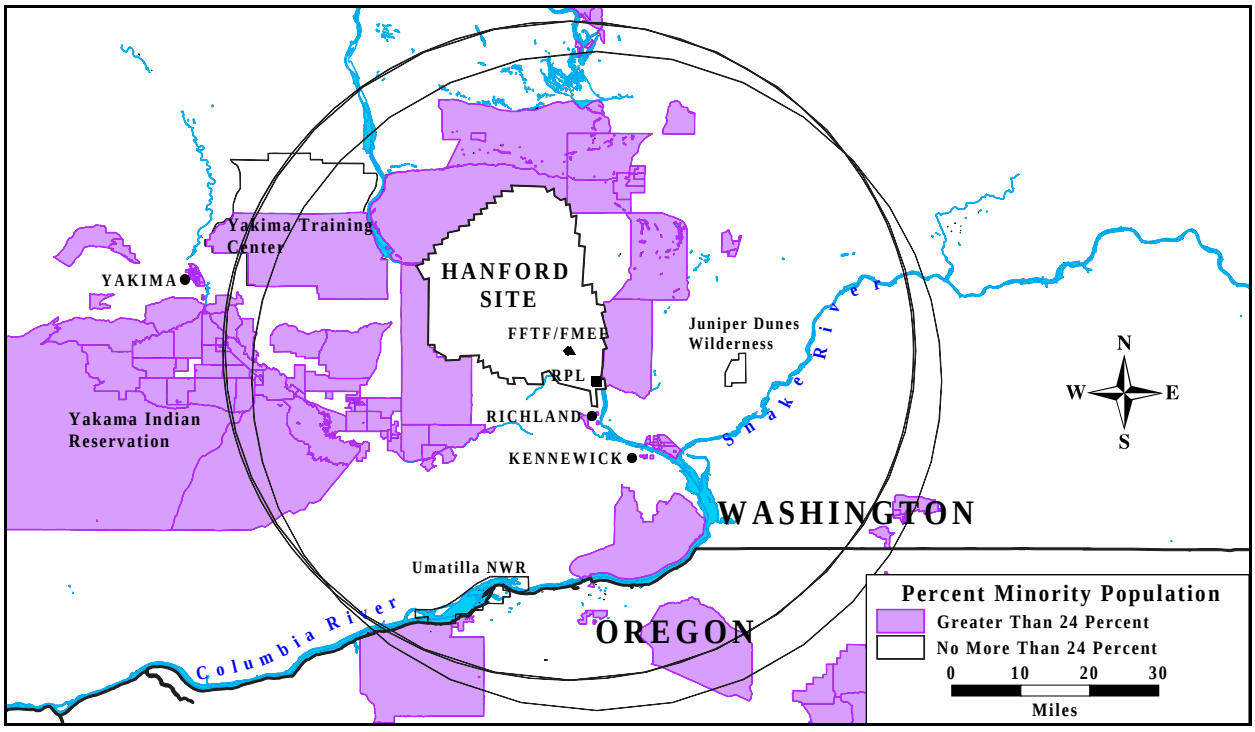

Figure K–10 Geographical Distribution of Minority Populations Residing Within 80 Kilometers (50 Miles) of FFTF and RPL/306–E at Hanford

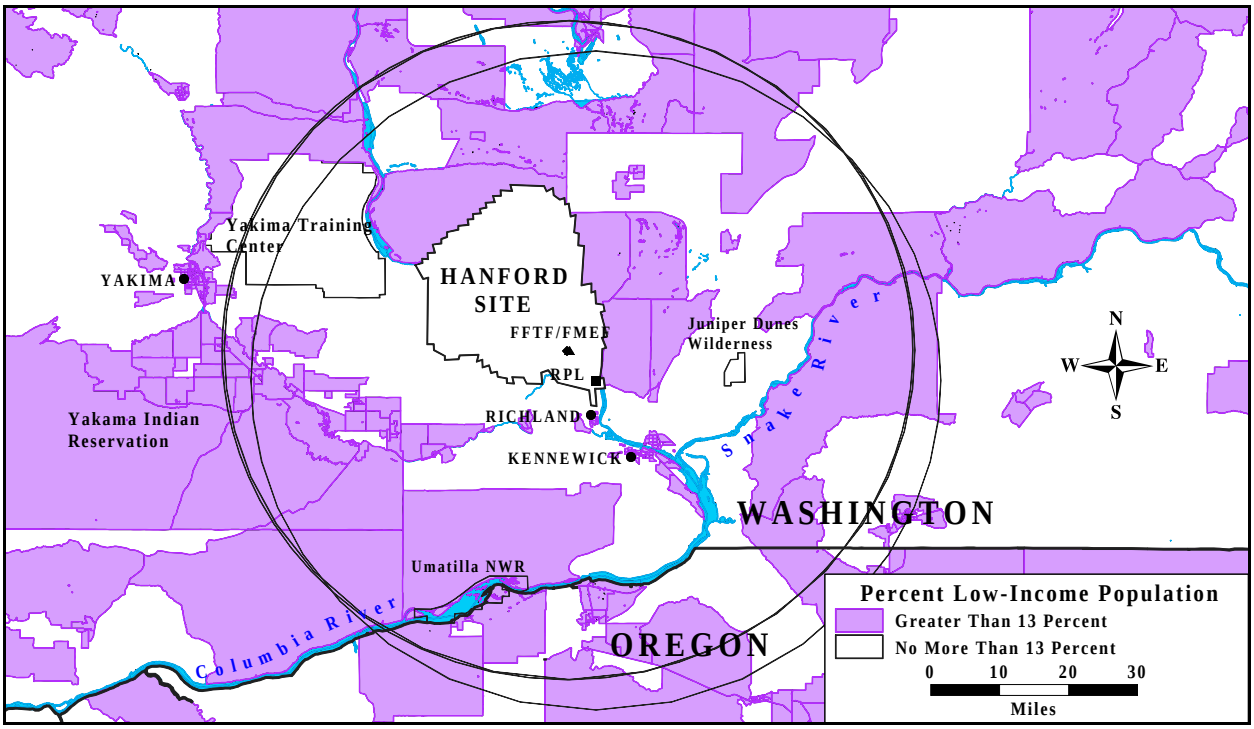

Figure K–11 Geographical Distribution of Low-Income Populations Residing Within 80 Kilometers (50 Miles) of FFTF, FMEF, and RPL/306–E at Hanford

Under Alternative 2, the highest transportation risks to the public result from vehicular collisions (without radiological consequences). No traffic fatalities would be expected. Traffic accidents could occur anywhere along the highway routes, and no identifiable group within the general population would be subject to disproportionate risks.

K.7 ENVIRONMENTAL JUSTICE FOR ALTERNATIVES 3 AND 4

As discussed in Chapter 2, under Alternatives 3 and 4, DOE would construct one or more new facilities for isotope production at sites yet to be selected. Environmental effects described in Chapter 4 for these alternatives are intended to be representative of the impacts on total populations that could occur for generic populations. However, the characterization of minority and low-income populations is site-specific. If Alternative 3 or Alternative 4 were selected for implementation at a specific site, an additional environmental justice analysis for that site would be conducted prior to implementation.

K.8 CUMULATIVE IMPACTS

As discussed in Section 4.8, implementation of the alternatives would be expected to have no significant impact on existing environments at INEEL, ORR, and Hanford. Cumulative radiological risks to the maximally exposed individual in the general population are essentially zero. Radiological impacts on the public that could result from implementation of the No Action Alternative, Alternative 1, Alternative 2, or Alternative 5 at these sites are small. No credible pattern in food consumption would result in significant risks to the public residing within potentially affected areas surrounding INEEL, ORR, and Hanford due to implementation of these alternatives.

Evaluations of environmental justice are site specific, and if Alternative 3 or Alternative 4 were selected for implementation, an analysis of the cumulative impacts on minority and low-income populations would be performed prior to implementation.

K.9 REFERENCES

Federal Register

59 FR 7629, Executive Office of the President, 1994, "Executive Order 12898 - Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations," February 11.

Other References

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