except the pillar and panel tanks) would be full of mixed transuranic waste in approximately 2017. Other facilities depending on the capacity of the Tank Farm for operation eventually would be shut down due to their inability to discharge liquid waste. Under this alternative, DOE would not meet its commitment to cease use of the Tank Farm by 2012 ***or*** to make its mixed HLW road ready by 2035.

Facilities required for the No Action Alternative include the bin sets, which would continue to store the mixed HLW; the Tank Farm, which would continue to store the mixed transuranic waste; the High-Level Liquid Waste Evaporator, which would continue to concentrate mixed transuranic waste/SBW; and the Process Equipment Waste Evaporator and the Liquid Effluent Treatment and Disposal Facility which would continue to evaporate mixed transuranic waste (newly generated liquid waste). The major facilities and projects required to implement the No Action Alternative are listed in Appendix C.6.

3.1.2 CONTINUED CURRENT OPERATIONS ALTERNATIVE

Under this alternative (Figure 3-2), current operations of all existing waste facilities and processes would continue, including the New Waste Calcining Facility, High-Level Liquid Waste Evaporator, Process Equipment Waste Evaporator, Liquid Effluent Treatment and Disposal Facility, Remote Analytical Laboratory, Tank Farm, ***and*** bin sets. The New Waste Calcining Facility calciner ***which was*** placed in standby in ***May*** 2000, in accordance with the Notice of Noncompliance Consent Order, ***would be*** upgraded to comply with the Maximum Achievable Control Technology air emissions requirements. The upgrades would be completed by 2010. The ***Process Equipment Waste and*** High-Level Liquid Waste Evaporators would continue to operate to allow the pillar and panel tanks to be taken out of service in 2003. The upgraded New Waste Calcining Facility calciner would operate from 2011 through 2014 to process the remaining liquid mixed transuranic waste/SBW.

After 2014, the New Waste Calcining Facility calciner would operate as needed until the end of 2016. Beginning in 2015, the mixed transuranic waste (newly generated liquid waste) would be processed through a cesium ion exchange column, evaporated, and grouted for disposal. The cesium-loaded resin would be dried and stored in the bin sets.

Mercury ***removed directly from the offgas system and treated would be disposed of as mixed low-level waste. Mercury returned to the Tank Farm from the offgas system during operation of the calciner would be treated with*** the tank heels and sent to the Waste Isolation Pilot Plant for disposal.

As described for the No Action Alternative, the calcine in bin set 1 would be transferred to bin set 6 or 7, or modifications would be made to mitigate stress on bin set 1. The requirement to treat all the HLW so that it would be ready for shipment out of Idaho by 2035 would not be met since the calcine would remain indefinitely in the bin sets.

The major facilities and projects required to implement the Continued Current Operations Alternative are listed in Appendix C.6, except for transportation projects, which are addressed in Appendix C.5.

3.1.3 SEPARATIONS ALTERNATIVE

The fundamental feature of the Separations Alternative is the use of chemical separation methods to divide the HLW into two primary final waste streams: a high-level waste fraction suitable for disposal in a geologic repository and a low-level waste fraction suitable for near-surface disposal at the INEEL or another permitted facility. Separating the waste decreases the amount of waste that has to be shipped to a geologic repository, saving needed space and reducing disposal costs. Also, some costs and risks associated with transportation of radioactive materials to a repository would be decreased. The characteristics and classification of the high-level and low-level waste fractions would vary with the type of separations processes that are used. Because HLW would be separated into fractions, DOE would need to ***perform a*** waste incidental to reprocessing ***citation or evaluation determination, before undertaking the separations process, to determine if the waste frac-***

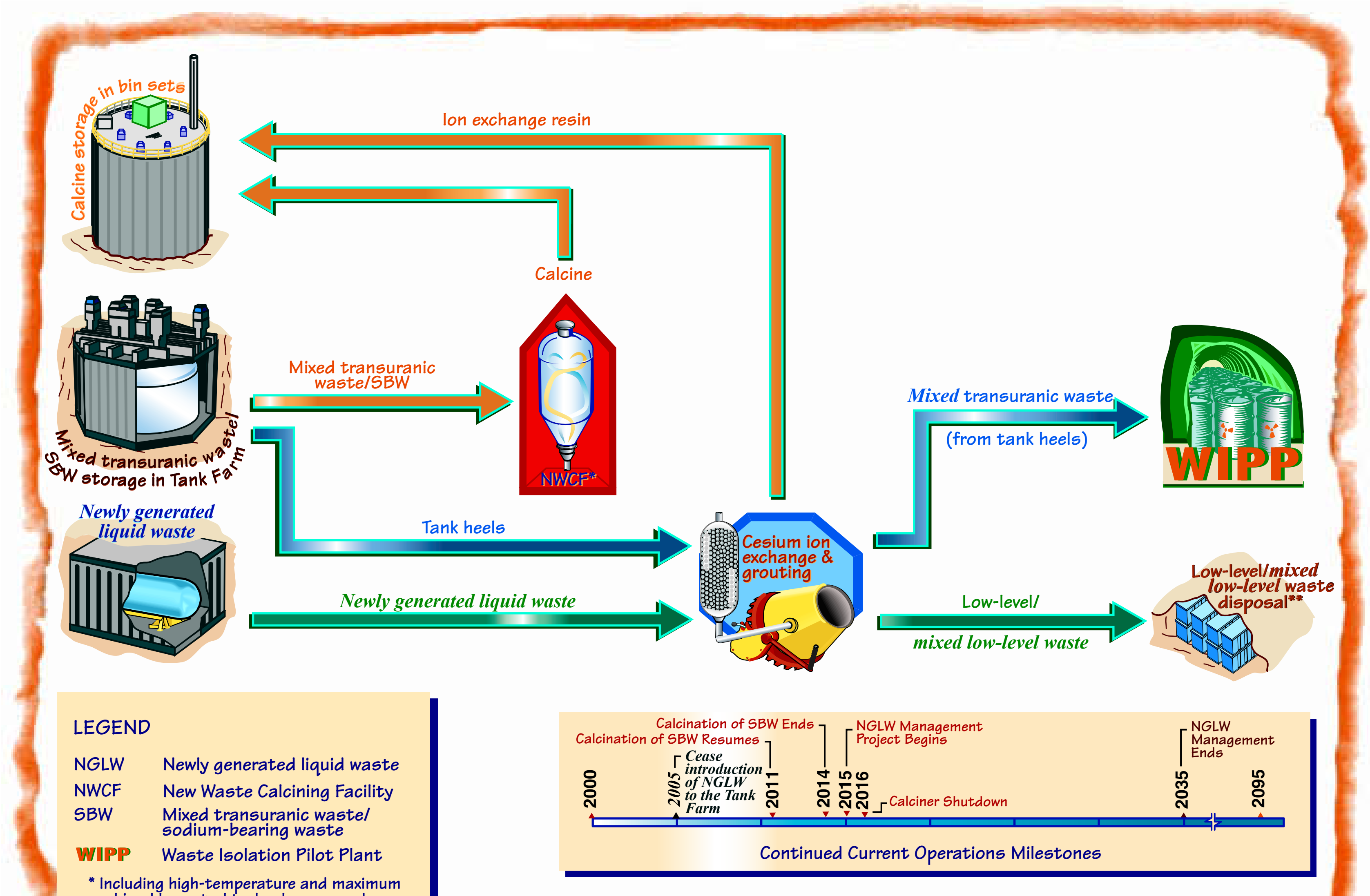


FIGURE 3-2.
Continued Current Operations Alternative.

tions could be managed as low-level or transuranic waste. For a discussion of the waste incidental to reprocessing procedure see Section 6.3.2.2.

DOE has selected three options for implementing the Separations Alternative: ***Full Separations***, Planning Basis, and Transuranic Separations. The Planning Basis Option closely resembles planning initiatives discussed in *Accelerating Cleanup: Paths to Closure* (DOE 1998b) and is fully consistent with Settlement Agreement/Consent Order milestones and the SNF and INEL EIS Record of Decision (60 FR 28680; June 1, 1995). This alternative is similar to the Full Separations Option discussed below but includes calcination of liquid mixed transuranic waste/SBW by 2012 followed by dissolution of the calcine for radionuclide partitioning and immobilization. The Full Separations Option provides an opportunity to directly treat the mixed HLW calcine and mixed transuranic waste/SBW to their final waste forms by eliminating the intermediate processing step of calcination. This option also offers the advantages of a reduced final waste form volume (because the inert additives associated with conversion of the liquid mixed transuranic waste/SBW to calcine would not be used) and decreased waste processing impacts. A third option, the Transuranic Separations Option, was included because of the uncertainty of availability of a geologic repository for disposal of INEEL HLW. This option would separate the INEEL waste into its transuranic and low-level waste fractions for disposal at the Waste Isolation Pilot Plant and a low-level waste disposal facility, respectively, eliminating the need for road-ready storage.

The Separations Alternative includes a small Separations Organic Incinerator for the treatment of radioactively contaminated spent organic solvents that would result from the separations process. A description of the Separations Organic Incinerator (Project 118) is in Appendix C.6.

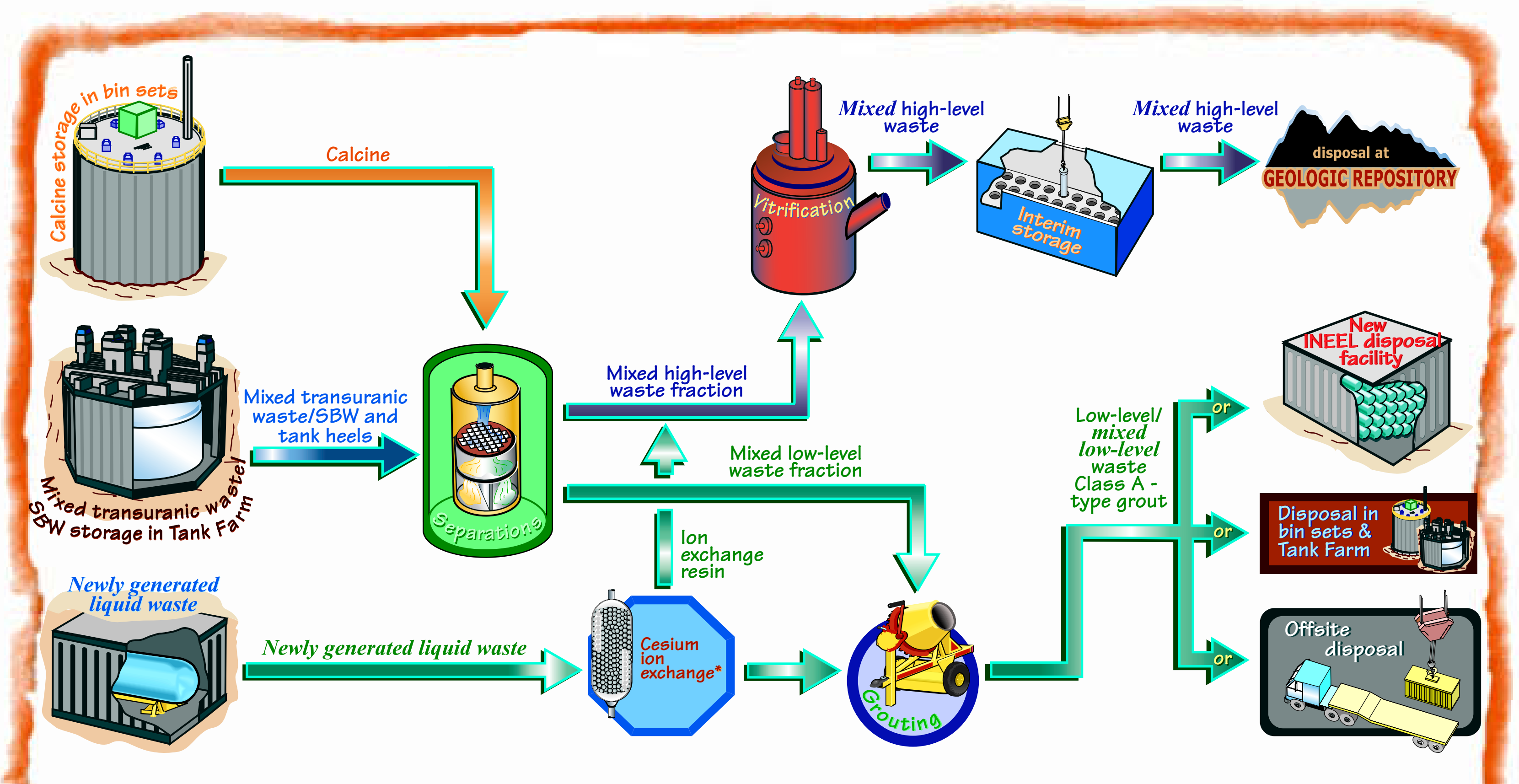
3.1.3.1 Full Separations Option

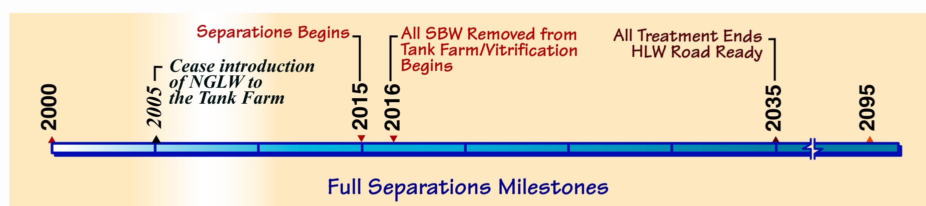
The Full Separations Option would retrieve and dissolve the calcine and separate it into high-level and low-level waste fractions. Mixed transuranic waste/SBW and tank heels flushed out of the tanks would be subjected to the same separations process. This option would use a chemical separations facility to remove cesium, transuranics, and strontium from the process stream. These constituents, termed the HLW fraction, account for most of the radioactivity and long-lived radioactive characteristics of HLW and mixed transuranic waste/SBW. The HLW fraction then would be vitrified, packaged in Savannah River Site-type stainless steel canisters, and stored onsite (road ready) until shipped to a geologic repository.

The process stream remaining after separating out the HLW fraction would be low-level waste. After some pretreatment, the low-level waste fraction would be solidified into a grout in a grouting facility. The concentrations of radioactivity in the grout would result in its classification as a Class A type low-level waste, which is suitable for disposal in a near-surface landfill.

Figure 3-3 illustrates the Full Separations Option. Although not depicted on the figure, the High-Level Liquid Waste Evaporator, Liquid Effluent Treatment and Disposal Facility, and Process Equipment Waste Evaporator would continue to operate to reduce the volume of mixed transuranic waste/SBW and enable DOE to cease use of the pillar and panel tanks in 2003.

DOE has analyzed three potential methods for disposing of the low-level waste Class A type grout: (1) in the empty vessels of the closed Tank Farm and bin sets (see Section 3.2.1), (2) in a new INEEL Low-Activity Waste Disposal Facility, and (3) in an offsite low-level waste disposal facility. DOE acknowledges that the Radioactive Waste Management Complex is ***expected*** to ***stop accepting*** contact-handled low-level waste and remote-handled low-level waste in ***2020 (Seitz 2002)***. The Waste Management Programmatic EIS record of decision ***provides*** a path forward for low-level waste disposal, with the exception of waste destined for a CERCLA soil repository. For purposes of analysis, this alternative assumes that a new INEEL facility for disposal of low-level waste ***referred to in this EIS*** as the Low-Activity Waste Disposal Facility would be located approximately 2,000 feet east of the INTEC Coal-Fired Steam Generating Facility. The actual location would depend on further site evaluations and National





LEGEND

NGLW Newly generated liquid waste

SBW Mixed transuranic waste/ sodium-bearing waste

* Some newly generated liquid waste may not need to be treated with ion exchange and could be sent directly to the grouting facility.

FIGURE 3-3.
Full Separations Option.

Environmental Policy Act analysis. ***Transportation for this option includes shipping vitrified HLW to a geologic repository and potentially shipping the low-level waste Class A type grout to an offsite facility.***

For purposes of the transportation analysis, DOE used the commercial radioactive waste disposal site operated by Envirocare of Utah, Inc., located 80 miles west of Salt Lake City. The inclusion of this facility in this EIS is for illustrative purposes only.

In addition, DOE has analyzed in Section 5.2.9, the impacts of several stand-alone projects involving transportation of the solidified HLW fraction to DOE's Hanford Site in Richland, Washington and return of vitrified HLW to INEEL, to offer DOE decisionmakers the flexibility to select Hanford as an offsite location for vitrification (see Section 3.1.5). The Hanford options are not considered part of the base Full Separations Option.

The major facilities and projects required to implement the Full Separations Option, including the variations in implementation, are listed in Appendix C.6, except for transportation projects that are addressed in Appendix C.5.

3.1.3.2 Planning Basis Option

The Planning Basis Option is similar to the Full Separations Option, the primary difference being that the liquid mixed transuranic waste/SBW would not be processed (separated) directly but would be calcined in the New Waste Calcining Facility. The calciner ***was placed in standby in May*** 2000, as required by the Notice of Noncompliance Consent Order with the State of Idaho. The calciner would be upgraded to comply with the Maximum Achievable Control Technology air emission requirements. Following upgrades, the calciner would be restarted to treat the liquid mixed transuranic waste/SBW. The mixed transuranic calcine would be added to the mixed HLW calcine already in the bin sets and later retrieved for dissolution and separation. This option would use a chemical separations facility to remove cesium, transuranics, and strontium, as in the Full Separations Option. These constituents, termed the mixed HLW fraction, account for most of the radioactivity and long-lived radioactive characteristics found in the HLW calcine and mixed transuranic waste***/SBW***. The HLW fraction would then be vitrified, packaged in Savannah River Site-type stainless steel canisters and stored onsite until shipped to a geologic repository.

It is assumed the process stream remaining after separating out the HLW fraction could be managed as a low-level waste. The low-level waste would be solidified in a grouting facility. Concentrations of radioactivity in the grout would result in its classification as a Class A type low-level waste, which is suitable for disposal in a near-surface landfill. Under this option, the low-level waste Class A type grout would be transported to a disposal facility outside of Idaho. For purposes of the transportation analysis, DOE used the commercial radioactive waste disposal site operated by Envirocare of Utah, Inc., located 80 miles west of Salt Lake City. However, this disposal operation is currently not licensed to accept INTEC low-level waste and the inclusion of this facility in this EIS is for illustrative purposes only.

Mercury ***removed directly from the offgas system and treated would be disposed of as mixed low-level waste. Mercury returned to the Tank Farm from the offgas system during operation of the calciner would be treated with*** the tank heels and sent to the Waste Isolation Pilot Plant for disposal.

DOE devised the Planning Basis Option to reflect the major commitments made through agreement with the State of Idaho, prior Records of Decision, and ***the*** DOE plan *Accelerating Cleanup: Paths to Closure* (DOE 1998b). This implies that calcining of the liquid mixed transuranic waste/SBW would be completed by 2012, as agreed to in the Settlement Agreement/Consent Order. However, the baseline schedule reevaluation prepared for this EIS estimates that a more realistic calcine completion date would be 2014. In order to meet the 2012 date, a number of processes would have to be accelerated. First, funding would have to be available, so that conceptual design could begin for upgrades to meet Maximum Achievable Control Technology requirements. Second, assuming 75 percent operating efficiency, the calciner would have to be able to resume processing liquid mixed transuranic waste/SBW by

2010 if the 2012 deadline were to be met. Delays in obtaining the RCRA permit or some other interruption could also stress an already tight and optimistic schedule.

Figure 3-***4*** illustrates the Planning Basis Option. Although not depicted on the figure, the High-Level Liquid Waste Evaporator, Liquid Effluent Treatment and Disposal Facility, and Process Equipment Waste Evaporator would continue to operate to reduce the volume of mixed transuranic waste/SBW and enable DOE to cease use of the pillar and panel tanks in 2003.

Transportation for this option includes shipping vitrified HLW to a geologic repository and shipping the low-level waste Class A type grout to an offsite facility.

The major facilities and projects required to implement the Planning Basis Option are listed in Appendix C.6, except for transportation projects, which are addressed in Appendix C.5.

3.1.3.3 Transuranic Separations Option

The Transuranic Separations Option would retrieve and dissolve the calcine and would treat the dissolved calcine, the mixed transuranic waste/SBW, and the tank heels flushed out of the tanks with the same process. The process would use a chemical separations facility to remove transuranics from the process stream. The transuranic fraction accounts for most of the long-lived radioactive constituents of HLW and mixed transuranic waste/SBW. The transuranic fraction would then be dried to a powder using a wiped film evaporator or with the addition of a drying additive, then packaged, loaded, and shipped to the Waste Isolation Pilot Plant for disposal.

The process stream remaining after removing the transuranics would be managed as low-level waste. The low-level waste fraction would be solidified in a grouting facility. Because the low-level waste fraction would contain both cesium and strontium components, the concentrations of radioactivity in the grout would be higher than that in the Full Separations Option and would result in its classification as a Class C type low-level waste, suitable for disposal in a near-surface landfill. In addition to the low-level waste fraction from the transuranic separations facility, the grouting facility would receive newly generated liquid waste.

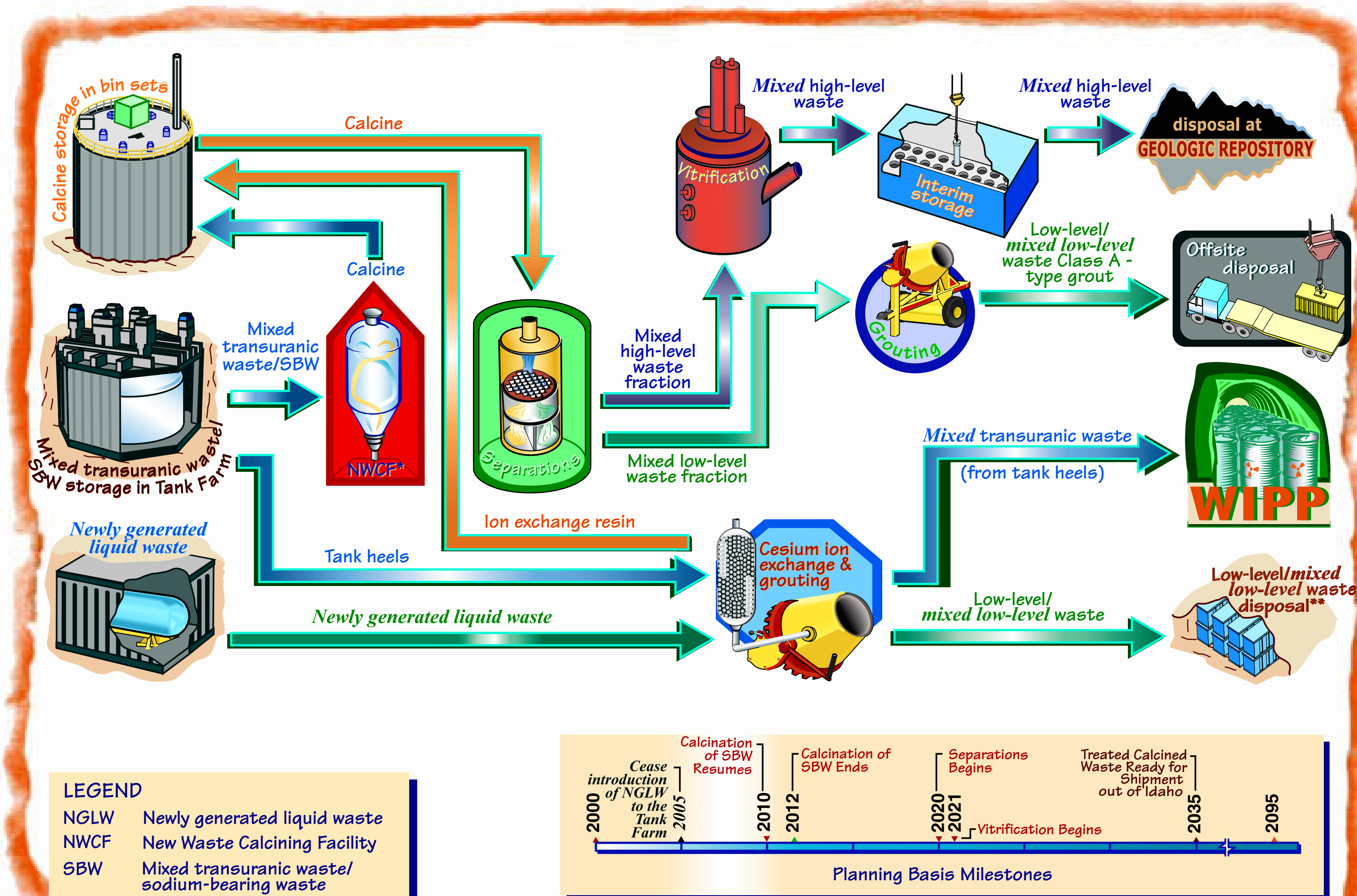
Figure 3-***5*** illustrates some of the details of the Transuranic Separations Option. Although not depicted on the figure, the High-Level Liquid Waste Evaporator, Liquid Effluent Treatment and Disposal Facility, and Process Equipment Waste Evaporator would continue to operate to reduce the volume of liquid mixed transuranic waste/SBW and enable DOE to cease use of the pillar and panel tanks in 2003.

DOE analyzed three potential methods for disposing of the low-level waste Class C type grout: (1) in the empty vessels of the closed Tank Farm and bin sets (see Section 3.2.1); (2) in a new INEEL Low-Activity Waste Disposal Facility; and (3) in an offsite low-level waste disposal facility. For purposes of analysis, this option assumes that the new INEEL Low-Activity Waste Disposal Facility would be located approximately 2,000 feet east of the INTEC Coal-Fired Steam Generating Facility. The actual location would depend on further evaluation. For purposes of the transportation analysis, DOE used the commercial radioactive waste disposal site operated by Chem-Nuclear Systems in Barnwell, South Carolina. The inclusion of this facility in this EIS is for illustrative purposes only.

The major facilities and projects required to implement the Transuranic Separations Option, including the variations in implementation are listed in Appendix C.6, except for transportation projects which are addressed in Appendix C.5.

3.1.4 NON-SEPARATIONS ALTERNATIVE

The Non-Separations Alternative would not separate the waste into high-level and low-level fractions, but would process all the waste by the year 2035 for subsequent shipment to a geologic repository. The ***four*** options considered in the Non-Separations Alternative are: (1) Hot Isostatic Pressed Waste Option, (2) Direct Cement Waste Option, (3) Early Vitrification Option***, and (4) Steam Reforming Option***. ***In the Hot Isostatic Pressed Waste and Direct Cement Waste Options***, all liquid mixed transuranic waste/SBW would be calcined



LEGEND

NGLW	Newly generated liquid waste
NWCF	New Waste Calcining Facility
SBW	Mixed transuranic waste/ sodium-bearing waste
WIPP	Waste Isolation Pilot Plant

* Including high-temperature and maximum achievable control technology upgrades.

** Location determined by Waste Management Programmatic EIS decision and may be on or off the INEEL.

FIGURE 3-4.
Planning Basis Option.

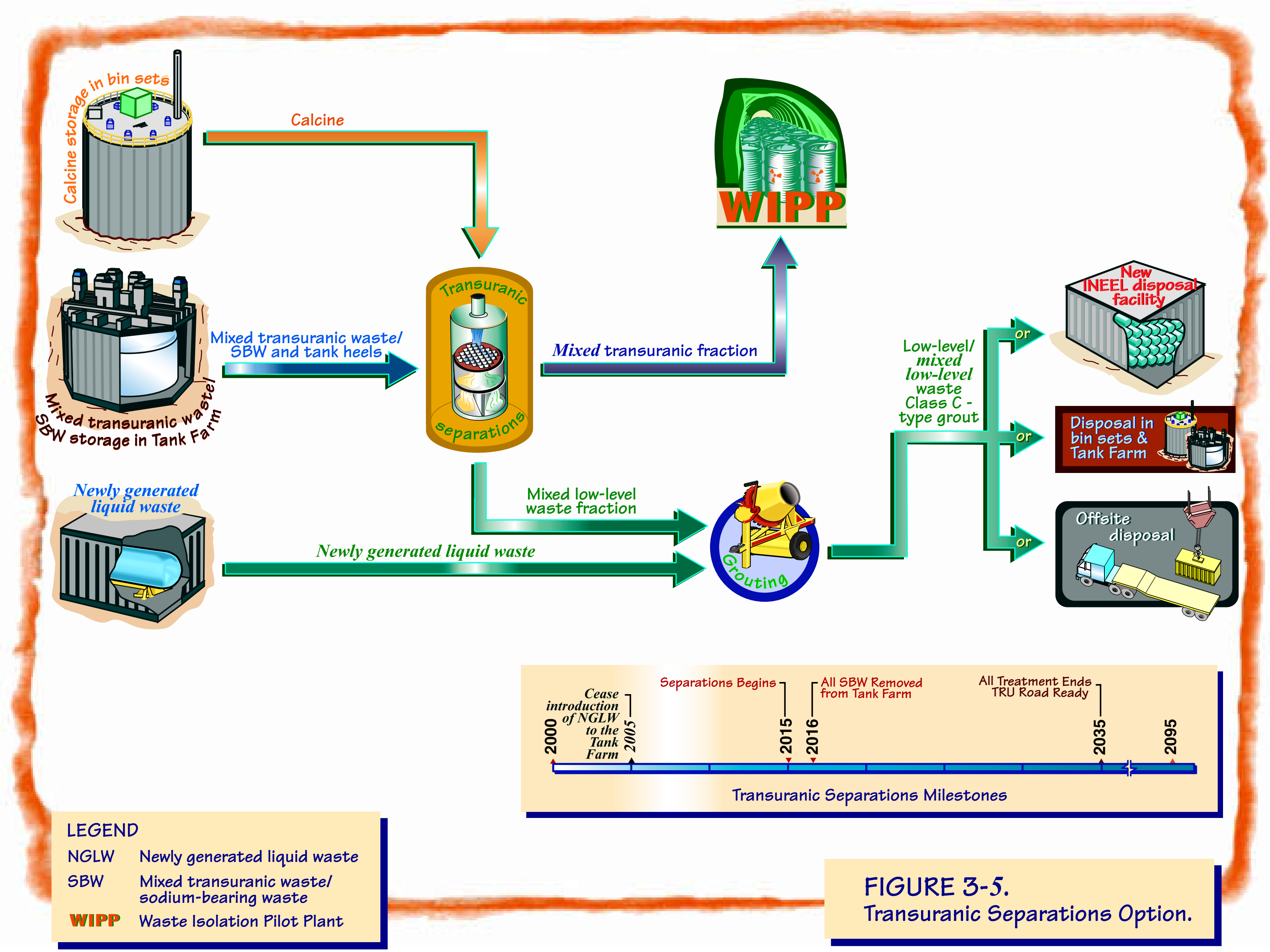


FIGURE 3-5.
Transuranic Separations Option.

before the end of 2014 in the New Waste Calcining Facility with the high-temperature and Maximum Achievable Control Technology upgrades. In the Early Vitrification Option, the mixed transuranic waste/SBW would be retrieved from the Tank Farm and sent directly to a vitrification facility, bypassing calcination. ***In the Steam Reforming Option, the mixed transuranic waste/SBW would be sent directly to the steam reformer.***

The ***four*** options would use different technologies to treat the INEEL waste to produce an immobilized waste form.

- The Hot Isostatic Pressed Waste Option ***would*** use a treatment method that has been studied at INEEL for several years. Like vitrification, it is a high temperature process. The mixed transuranic waste/SBW would be calcined, then a combination of high temperature and pressure ***would be*** used to immobilize the mixed HLW and mixed transuranic waste calcine. The hot isostatic press technology differs from vitrification in that waste ***would be*** treated in individual containers rather than melted in batches and then containerized and allowed to harden.
- ***In*** the Direct Cement Waste Option, ***the mixed transuranic waste/SBW would be calcined and a*** non-thermal process ***would be used*** to immobilize the mixed HLW and mixed transuranic waste calcine. The calcine ***would be*** blended with additives (i.e., clay, slag, and caustic soda), poured into canisters, and cured. The material ***would*** then ***be*** baked to remove any free water prior to sealing the containers. Although heat ***would be*** used in the curing and water removal processes, the temperatures involved (around 250ºC) ***would be*** much lower than those associated with vitrification or hot isostatic press. The resulting waste form ***would be*** structurally sound but of considerably greater volume than the waste forms produced under the other options.
- The Early Vitrification Option would use the same technology (vitrification) as the Separations Alternative. Rather than separating the mixed HLW calcine and mixed transuranic waste/SBW into high-level and low-level ***waste*** fractions, the two wastes would be treated separately by processing first mixed transuranic waste/SBW and then mixed HLW calcine in a vitrification facility.
- ***In the Steam Reforming Option, all of the existing mixed transuranic waste/SBW would be converted to a solid form using steam reforming. The steam-reformed product would be managed as remote-handled transuranic waste. The mixed HLW calcine would be retrieved from the bin sets and packaged in Savannah River Site-type stainless steel canisters for disposal in a geologic repository.***

The hot isostatic pressed and hydroceramic cemented waste forms ***presumed containerized calcine*** would not meet EPA's treatment standard for disposal of HLW. DOE would have to demonstrate that these technologies produce waste forms with equivalent long-term performance to borosilicate glass vitrification, which is ***approved*** for disposal in a HLW geologic repository. DOE would also need to conduct testing and evaluation to qualify any non-vitrified waste forms under the waste acceptance criteria for a HLW geologic repository (DOE 1996a; 1999).

Except for Steam Reforming, the ***non-separations*** treatment ***processes*** would produce a glass-ceramic, cement, or glass form. ***The steam reforming process would produce a calcine-like waste form, which as with HLW calcine would be containerized.*** The waste would be stored in a road-ready condition at an INEEL storage facility before shipment to a geologic repository. The High-Level Liquid Waste Evaporator, the Liquid Effluent Treatment and Disposal Facility, and the Process Equipment Waste Evaporator would continue to operate to allow the pillar and panel tanks to be taken out of service in 2003. The following sections describe the ***four*** options of the Non-Separations Alternative.

3.1.4.1 Hot Isostatic Pressed Waste Option

Under the Hot Isostatic Pressed Waste Option, all of the existing mixed transuranic waste/SBW stored at the Tank Farm would be calcined by the end of 2014 and added to the blended HLW calcine presently stored in the bin sets. The calcine then would be mixed with amorphous silica and titanium powder and subjected to high temperature and pressure in special cans to form a glass-ceramic product ***with a waste volume reduction of about 50 percent. After cooling, the Hot Isostatic Pressed Waste cans would be loaded into Savannah River Site-type stainless steel canisters, which would be welded closed and placed in an INEEL interim storage facility for*** subsequent disposal in a geologic repository. For the final waste form, this option would require an equivalency determination from the U.S. Environmental Protection Agency as discussed in Section 6.3.2.3.

Figure 3-***6*** illustrates the Hot Isostatic Pressed Waste Option. Beginning in 2015, the mixed transuranic waste (newly generated liquid wastes) would be processed through an ion exchange column, evaporated, and grouted for disposal at INEEL or offsite.

Mercury ***removed directly from the offgas system and treated would be disposed of as mixed low-level waste. Mercury returned to the Tank Farm from the offgas system during operation of the calciner would be treated with*** the tank heels and sent to the Waste Isolation Pilot Plant for disposal.

The major facilities and projects required to implement the Hot Isostatic Pressed Waste Option are listed in Appendix C.6, except for transportation projects, which are addressed in Appendix C.5.

3.1.4.2 Direct Cement Waste Option

Under the Direct Cement Waste Option all of the existing liquid mixed transuranic waste/SBW stored at the Tank Farm would be calcined at the New Waste Calcining Facility by the end of 2014 and added to the mixed HLW calcine presently stored in the bin sets. Beginning in 2015 the calcine would be mixed with ***a grout mixture consisting of*** clay, blast furnace slag, caustic soda, and water and would be poured into Savannah River Site-type stainless-steel canisters. The grout would be cured at elevated temperature and pressure. The cementitious waste form (a hydroceramic) produced under this option requires an equivalency determination from the U.S. Environmental Protection Agency as described in Section 6.3.2.3. Figure 3-*7* ***shows*** the Direct Cement Waste Option.

Beginning in 2015, the mixed transuranic waste (newly generated liquid wastes) would be processed through an ion exchange column, evaporated, and grouted for disposal at INEEL or offsite.

Mercury ***removed directly from the offgas system and treated would be disposed of as mixed low-level waste. Mercury returned to the Tank Farm from the offgas system during operation of the calciner would be treated with*** the tank heels and sent to the Waste Isolation Pilot Plant for disposal.

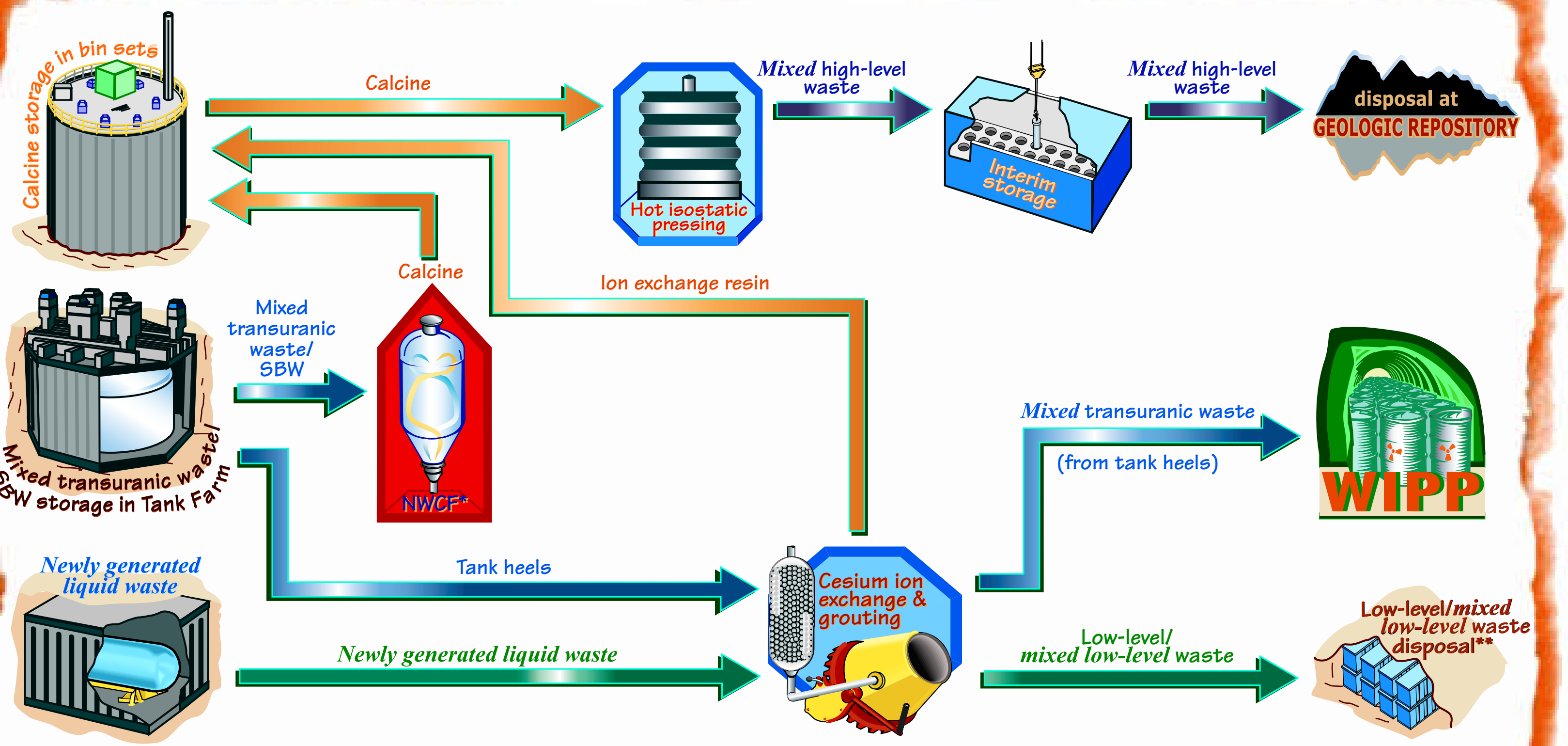
The major facilities and projects necessary to implement the Direct Cement Waste Option are listed in Appendix C.6, except for transportation projects, which are addressed in Appendix C.5.

3.1.4.3 Early Vitrification Option

This option would require the construction of a vitrification facility to process the mixed transuranic waste (SBW, newly generated liquid waste, and tank heels) from the INTEC Tank Farm and the mixed HLW calcine stored in the bin sets into a borosilicate glass suitable for disposal in a geologic repository. The glass produced from vitrifying the waste would be remote-handled ***mixed*** transuranic waste that would be disposed of at the Waste Isolation Pilot Plant. The glass produced from vitrifying the calcine would be classified as HLW that would be disposed of at a geologic repository.

The mixed transuranic waste/SBW and calcine would be treated in separate vitrification operations. The mixed transuranic waste/SBW would be processed from early 2015 through 2016. The waste would be blended with glass frit to form a slurry that would be fed to the melter at the Early Vitrification Facility. Glass would be poured into standard transuranic waste remote-handled containers for disposal at the Waste Isolation Pilot Plant.

The HLW calcine would be processed from 2016 through 2035. ***The calcine would be blended with glass frit and fed to the melter in a dry state.*** Glass from the HLW calcine would be



LEGEND

NGLW	Newly generated liquid waste
NWCF	New Waste Calcining Facility
SBW	Mixed transuranic waste/ sodium-bearing waste
WIPP	Waste Isolation Pilot Plant

* Including high-temperature and maximum achievable control technology upgrades.

** Location determined by Waste Management Programmatic EIS decision and may be on or off the INEEL.

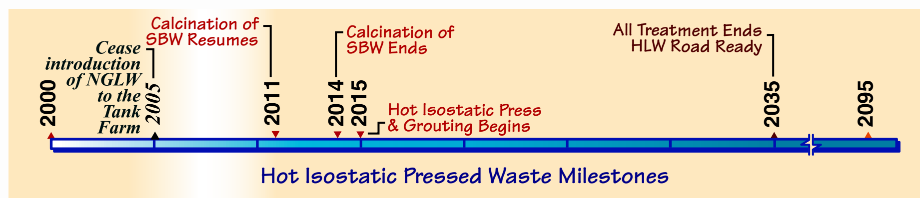
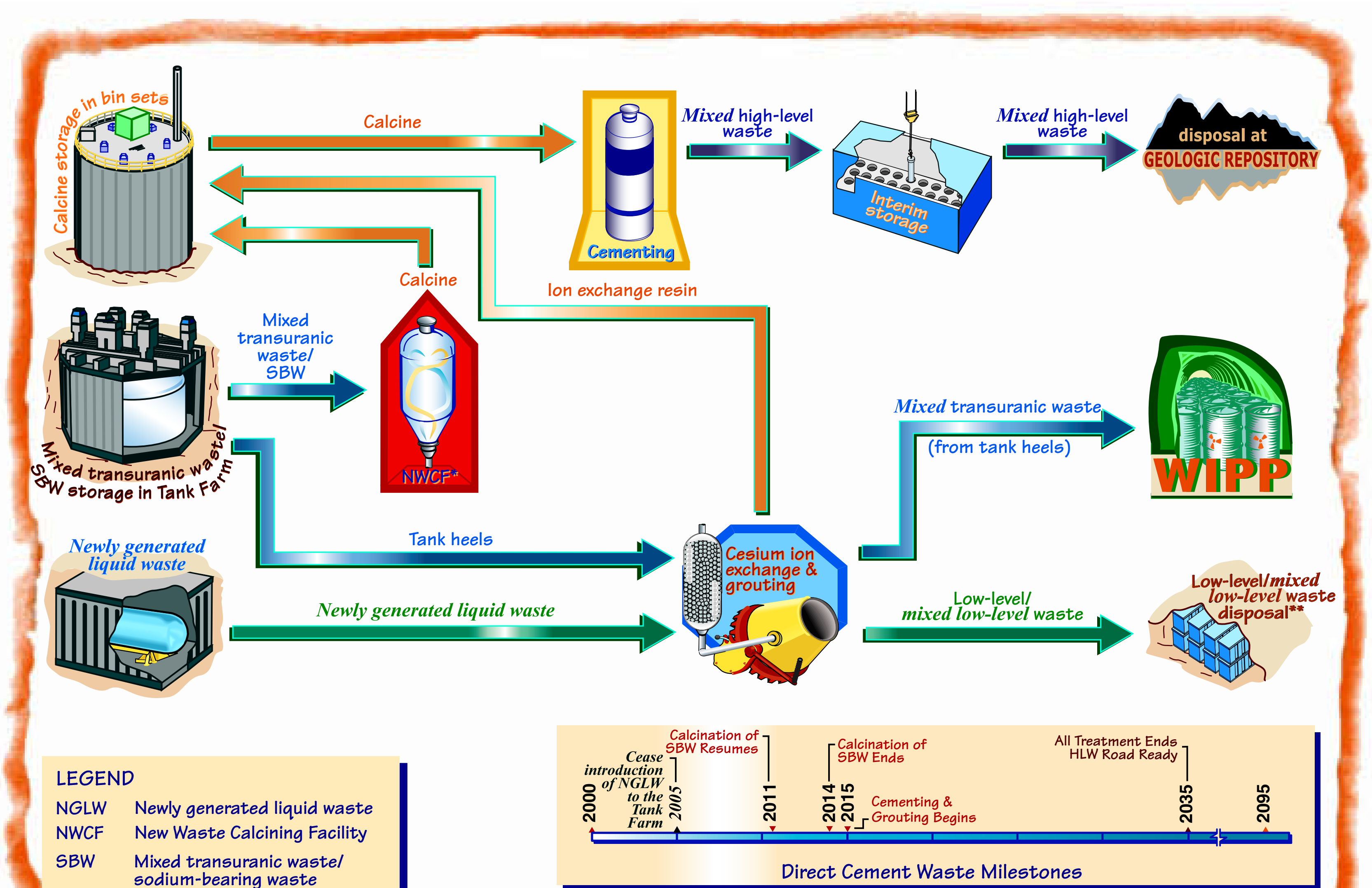


FIGURE 3-6.
Hot Isostatic Pressed Waste Option.



LEGEND

NGLW	Newly generated liquid waste
NWCF	New Waste Calcining Facility
SBW	Mixed transuranic waste/ sodium-bearing waste
WIPP	Waste Isolation Pilot Plant

* Including high-temperature and maximum achievable control technology upgrades.

** Location determined by Waste Management Programmatic EIS decision and may be on or off the INEEL.

FIGURE 3-7.
Direct Cement Waste Option.