NOTE: When completing the table, please list only the page number(s) specific to each Roman numeral Section. If an item isn't applicable to the submitted application, please list NA and include a brief reason why it isn't applicable.

I. STAND ALONE DOCUMENT DEMONSTRATING THE NO MIGRATION STANDARD		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Region 6 reviews all aspects of the no migration demonstration during the initial petition review and requests for petition reissuance.		
	1. Incorporate any deficiency responses into one document.	
	a. Required for initial petition submissions.	
	b. Recommended for applications for reissuance of a petition.	

II. PETITION TABLE OF CONTENTS		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Each application should include a Master Table of Contents located in the front of Volume 1.		
	1. Listing should also identify the volume number where the topic is located.	
	2. The subsections contained in each section should be included in the Table of Contents.	
	3. A list of tables, figures, and appendices should be included in the Table of Contents.	
	4. Adding a Table of Contents for the specific section or appendix to the front of that specific section or appendix in the document is suggested for expediting the review process.	
B. Any appendices containing multiple documents should include a content listing to identify the items if they are not individually labeled or tabbed.		

III. ADMINISTRATIVE		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Applicant		
	1. Facility name	
	2. Well numbers and corresponding state UIC permit numbers	
	3. Addresses	
	4. Mailing address	
	5. Facility and well physical address	
	6. Telephone and facsimile numbers	
B. Facility Contact Information		
	1. Person(s) or firm(s) authorized to act on behalf of the applicant during the processing of the application	
	a. Address	
	b. Phone numbers	
	c. E-mail address	
C. Include A Signed Certification Statement As Listed In 40 CFR §148.22(a)(4).		
	1. Must be signed and dated following all final revisions to the document	
	a. Petitioner may wait to submit until the review process is completed	
D. Summary Of Past Petition Related Approvals		
E. Quality Assurance And Quality Control		
	1. Describe processes used to verify that proper quality assurance and quality control plans were followed in preparing the petition demonstration- 40 CFR §148.21(a)(4)	
	a. Confirm all referenced tables, figures, appendices, etc., are included in the document	

III. ADMINISTRATIVE		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
F. Elevations		
	1. Clarify what depth reference elevations are used in the document	
	a. Confirm all depths listed include a reference datum	
	2. List the well elevations to allow depths to be converted to other reference depths	
G. Consistently Reference Specific Gravity Or Density Values Throughout The Petition.		
	1. Use a consistent number of decimal places a. Two decimal places are recommended, but no less than two can be used.	
	2. Always provide a corresponding reference temperature(s)	
	3. Volume weighted density/specific gravity ranges may be requested by facilities that do not inject a significant volume of immiscible fluid	
	4. The timeframe for volume weighted density/specific gravity averaging may consist of any of the following	
	a. Three – whole calendar month	
	b. Running 90 or 91 day (13 week)period	

IV. UPDATED ADJACENT SURFACE LAND OWNER LISTING 40 CFR §124.10(c)(4)	PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Include the names and mailing addresses of the surface owners of the tracts of land adjacent to the plant boundaries.	
B. Provide a map illustrating the location of the adjacent landowner tracts.	
C. Describe surrounding land usage (farming, industry, residential, etc.).	

V. PETITION APPLICATION REQUESTS		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Describe the specifics of the petition.		
	1. Identify the specific wastes and waste codes requested 40 CFR §148.22(a)(1)	
	2. Specify the well or wells for which the demonstration will be made 40CFR§148.22(a)(1)	
	3. List the specific gravity/density range, injection intervals, end of operations date, injection rates, etc.	
	4. For a reissuance or modification, specify the requested changes from the approved petition	
B. Clarify if application consists of the containment of waste within the defined injection zone - 40CFR§148.20(a)(1)(i), chemical fate demonstration-40CFR§148.20(a)(1)(ii), or a combination of both.		
	1. If a chemical fate demonstration is requested, additional documentation not covered in this outline will be required to satisfy 40CFR Part 148.	

VI. LOCATION MAPS		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Provide a USGS topographical map (1:24000 scales, if available) indicating the plant boundaries and well location(s).		
B. Provide a simple schematic with a scale or distances listed illustrating the plant boundary and surface and bottom hole well locations of all facility disposal wells.		
	1. Include facility wells completed in other injection intervals (hazardous and non-hazardous)	

VII. CHARACTERISTICS OF INJECTION FLUID 40CFR §148.22(a)		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Provide a brief summary of the operation or process that generates the injection fluids.		
B. Describe the characteristics of the injection waste stream.		
	1. Discuss if the physiochemical nature of the waste streams are such that reliable predictions can be made to satisfy the standards outlined in 40CFR §148.20(a)(1)(i) or 40CFR §148.20(a)(1)(ii)	
C. Include a recent waste analysis.		
	1. Fully describe the chemical and physical characteristics of the subject wastes 40CFR §148.22(a)(2)	
	2. Verify waste codes represent all applicable waste constituents and constituent concentrations do not exceed maximum concentrations used in the demonstration	
D. Describe if waste analysis testing performed is accurate and reproducible 40CFR §148.21(a)(1).		
E. Clarify if estimation techniques used were appropriate and if EPA-certified test protocols were used, where available and appropriate 40CFR §148.21(a)(2).		

VIII. DISPOSAL WELLS		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. General		
	1. Differentiate any plant well numbering system and Class I UIC permit numbers used in the document.	
	2. Provide well location description	
	3. Include latitude and longitude	
	a. Provide and reference a copy of the well's Class I hazardous waste UIC permit and summarize the permit limitations	
	4. Provide relevant elevations (Ground	

VIII. DISPOSAL WELLS		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
	Level(GL) and Kelly Bushing(KB))	
	5. Define the KB depths to the Confining Zone, Injection Zone, and Injection Interval in the well	
B. Disposal well design		
	1. Include a detailed well construction and completion history	
	a. Include sidetracks, abandoned boreholes, or remedial activity	
	2. Include a wellbore schematic for each well	
	a. Consistently reference depths to the referenced elevation	
	b. For legibility, add expanded detail for complex wellbore construction, if needed	
	3. Provide daily drilling log or details on well recompletions	
	a. Summarize historical well work	
	4. List the depths and describe the specifics of tubular, cement, packers, etc. used in the completion of the well	
	5. Provide relevant logs to demonstrate the cement integrity of the well	

IX. MECHANICAL INTEGRITY TESTING-MIT		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Include a copy of the most recent mechanical integrity demonstration (RAT and annulus pressure test) for each well included in the application 40CFR §148.20(a)(2)(iv).		
	1. Demonstrate mechanical integrity of a well's long string casing, injection tubing, annular seal, and bottom hole cement	

IX. MECHANICAL INTEGRITY TESTING-MIT		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
	2. Confirm that all injected fluids are entering the approved injection intervals and that no fluids are channeling up out of the injection zone near the wellbore.	
	a. Operators may be required to conduct a radioactive tracer survey (RAT) with multiple slug chases between the packer and injection interval to document casing integrity and no loss of fluid above the completed interval.	

X. OFFSET WELL(S)		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Provide a complete list of all facility disposal wells including other well classifications or wells completed in other intervals.		
B. Describe all pressure sinks and sources in the same injection zone located within a minimum 10 mile radial distance from the facility.		
	1. List all offset oil and gas production from the injection interval	
	a. Provide well completion information or general field information	
B. Describe all pressure sinks and sources in the same injection zone located within a minimum 10 mile radial distance from the facility.		
	2. List all offset injection wells completed in the same injection interval (Class I and Class II)	
	a. Provide well completion information and wellbore schematics	
	3. Provide a map illustrating the location of sinks and sources	
	4. Provide cumulative volumes for the sinks and sources completed in the injection	

X. OFFSET WELL(S)		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
	interval	
	a. Include supporting documentation for reported volumes	
	b. Address oil, gas, or water production from producing wells	
C. Support the general area reviewed for pressure sinks or sources based on volumes and reservoir transmissibility.		
	1. Include any modeling or analytical calculations, if applicable	
D. Identify the source or potential sources of the pressure sink in under pressured injection intervals.		

XI. INJECTION HISTORY		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Report and document historical injection into the injection interval to date.		
	1. Site specific	
	2. Offset wells	
	3. Oil and gas injection, enhanced recovery, or disposal wells	
B. Provide and reference a summary table for the volumes injected into each modeled disposal well, including offset wells.		
	1. List the volumes using the timeframes input into the model	
	2. Include a column in cubic feet per day for verification of SWIFT input, if applicable	
C. Based on historical injection, justify the maximum rates modeled during the operational period.		

XII. UNDERGROUND SOURCE OF DRINKING WATER (USDW) DETERMINATION		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Define the depth to the lowermost USDW.		
	1. Explain how this depth was determined	
	2. Provide logs, equations, and computations, if relevant	

XIII. Regional Geology		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Discuss the regional geology		
	1. Describe the stratigraphy, depositional environments, tectonic history, and structural geology	
	a. Include a geological stratigraphic column	
	b. Include supporting documentation i.e., maps, cross-sections, etc.	
B. Discuss the regional hydrogeology		
	1. Describe aquifers and aquicludes	
C. Seismicity		
	1. Include a listing of historical seismic activity in the regional area (at least a 100 square mile area around the injection well(s)	
	a. Data should include intensity levels (using an international scale) and distances from the injection facility	
	b. Provide a risk assessment of induced seismicity due to injection activities based on a known induced seismicity formula	

XIV. LOCAL GEOLOGY		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Provide a detailed description of the local geology.		
	1. Local geologic area should extend a minimum of 1 mile past the extent of the 10,000 year composite waste plume	
B. Include and reference a type log defining each of the following intervals.		
	1. Confining zone	
	2. Injection zone	
	a. Containment interval	
	b. Injection interval	
C. Include an updated commercial structure map on the most applicable reference datum available.		
	1. Compare with the local geologic interpretation and discuss any anomalies	
	2. Clarify if any geologic features illustrated on the commercial map are relevant to the no migration application	
	a. Address the vertical and horizontal extents of faults, if applicable	
D. Confining Zone		
	1. Define a confining zone located above the injection zone 40CFR §148.21(b)	
	2. Demonstrate the following for the Confining Zone 40CFR §148.21(b)(2)	
	a. Thickness	
	b. Porosity	
	c. Permeability	
	d. Areal extent and lateral continuity	
E. Injection Zone		
	1. Demonstrate each of the following for the various strata in the injection zone 40CFR§148.21(b)(1)	
	a. Thickness	
	b. Porosity	

XIV. LOCAL GEOLOGY		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
	c. Permeability	
	(i) Include available core data and core analysis	
	(a) Site specific, offset wells, area wells, or applicable literature references	
	d. Areal extent	
	e. Free of transecting, transmissive faults or fractures to prevent the vertical movement of fluids 40CFR §148.20(b) or (c)	
	2. Provide available seismic lines to delineate the local structure of the injection zone if there is a lack of well data at the required depth	
	3. Containment Interval	
	a. Identify the strata within the containment interval of the injection zone that will confine fluid movement above the injection interval 40CFR §148.20(b)	
	(i) Discuss litho logy and mineralogy	
	b. Show the containment interval is free of known of vertically transmissive faults or fractures 40CFR §148.20(b)	
	4. Injection Interval	
	a. Demonstrate each of the following for the injection interval of the injection zone 40CFR §148.21(b)(1)	
	(i) Areal extent and lateral continuity	
	(ii) Provide appropriate structure and isopach maps	
	b. Thickness	
	(i) Base on several criteria, i.e., logs, isopach, cross-sections	
	5. Porosity	
	a. Base on several criteria, i.e., logs, core	

XIV. LOCAL GEOLOGY		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
	data, core analyses, literature, interference tests, etc.	
	6. Permeability	
	a. Include available core data and core analysis	
	(i) Site specific, offset wells, area wells, or applicable literature references	
	(ii) Refer to model input parameters	
	b. Hydraulic gradient 40CFR §148.21(b)(3)	
	(i) Provide appropriate literature references or calculations	
	(a) Reference gradients from pressure tests, if applicable	
F. Geologic Maps		
	1. Include the following general features on structure, isopach, and base maps	
	a. Map scale should be 1" to 2000'	
	b. Outline the facility and AOR boundaries	
	c. Include appropriate legends, title blocks, and labeling	
	(i) Wells not deep enough to penetrate the mapped datum should be designated as such, e.g., NDE	
	(ii) Wells with no logs available should be designated as such, e.g., NA	
	d. Confirm the unique artificial penetration (AP) numbers are legible	
	(i) Expand portions of the map, if needed , for high well density areas	
	2. Structure maps should be based on applicable geologic datum's	
	3. Isopach maps should show areal extent and continuity of the specified intervals	
	4. Illustrate cross-section lines on all maps or	

XIV. LOCAL GEOLOGY		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
	include and reference a separate cross-section index map that illustrates the wells included on all cross-sections	
G. Cross-Sections		
	1. Include a minimum of two structural cross-sections perpendicular to each other that extend beyond the 10,000 year waste plume areas	
	a. Include additional mini-cross-sections over specific regions to demonstrate specific geologic features, i.e., the extent of a fault	
	(i) Include stratigraphic cross-sections based on a reasonable marker, if correlations are difficult	
	2. Include the following on each cross-section	
	a. Legend and title block with date last updated	
	b. Small scale map showing the cross-section line	
	c. Top and bottom of applicable intervals, i.e., injection interval, injection zone, confining zones, USDW, etc.	
	d. Document perforations or completion information, if relevant	
	3. At a minimum, include the well name, artificial penetration (AP) number, operator, well status, total depth, KB elevation for each log posted on the cross-section	
	4. Scale the cross-section so the depth scale is legible	
	5. Include and reference a copy of the actual logs included on the cross-section as an appendix	

XIV. LOCAL GEOLOGY		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
H. Reservoir Dip		
	1. Clarify if a variable structure or constant dip will be used for the no migration waste plume demonstrations	
	a. Constant dip	
	(i) Justify the average dip angle used in the demonstration	
	(a) Describe or illustrate on a map where and what depths were used	
	(b) List the equations and variables input to calculate the average dip angles	
	(ii) Variable dip	
	(a) Clarify what structure map was used for the model input	
I. Provide a sufficient number of well logs to document the structural depths and thicknesses on the structure and isopach maps		
	1. More data may be required for certain areas if correlations are difficult or unique geologic features exist	
J. Provide fracture gradient calculations and maximum surface pressure limitation.		

XV. GEOCHEMISTRY AND INJECTED WASTE COMPATIBILITY		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Describe the geochemical conditions of the well site 40CFR §148.21(b)(5).		
	1. Include the physical and chemical characteristics of the injection zone and the formation fluids in the injection zone	
B. Discuss the compatibility of the injected waste with the injection zone.		
C. Provide an analysis to demonstrate if the waste will adversely alter the confining capabilities of the injection and confining zones.		

XV. GEOCHEMISTRY AND INJECTED WASTE COMPATIBILITY	PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
D. Discuss compatibility with well construction.	

XVI. MODEL INPUT PARAMETERS		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Initial and current hydrostatic pressure in the injection zone 40CFR §148.21(b)(4).		
	1. Provide a summary table that lists all historical shut-in pressures for wells completed in the injection interval(s)	
	a. Compare with the initial static pressure assigned for the no migration demonstration	
	2. Discuss how the initial reservoir pressure was selected based on the available data	
	a. Include all reference data needed to verify selected pressure value	
B. Transmissibility		
	1. Provide and summarize available historical pressure transient testing, i.e., drill stem tests, falloffs, injectivity, interference, pulse, etc., to support the injection interval transmissibility values used in the no migration demonstrations	
	a. Provide electronic copy of pressure transient tests for site specific and offset wells, if available	
	b. Include summary report, tables, and figures of pressure transient reports	
	(i) Hard copy of recorded pressure and time data not necessary if plot of data is provided	
	c. High and low end transmissibility used in	

XVI. MODEL INPUT PARAMETERS		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
	the demonstrations should be reasonably conservative based on available data	
C. Effective Net Thickness		
	1. Discuss the selection of a conservative net thickness	
	a. Pressure buildup demonstration	
	b. Plume migration demonstrations	
	2. Include and reference copies of all criteria on which the net thickness values are based, i.e., logs, isopachs, cross-sections, historical temperature log summary and plots, seismic lines, literature, well tests, RATs, flow profile surveys, etc.	
	3. Demonstrate how the selected effective net thickness values are conservative based on all available data	
	a. Provide and discuss all historical temperature survey results	
	(i) Include a composite illustration of the temperature logs from the confining zone through the injection zone	
	(ii) Discuss and address any temperature anomalies	
	b. Provide copies of the RAT and flow profile surveys for the past 5 years	
	(i) Discuss how the fill depth and slug chase results were considered in the net thickness determination	
D. Effective Permeability		
	1. Referencing the transmissibility and effective net thickness discussions, identify a low and high range of permeability values	
	a. Discuss the effective permeability used in the pressure buildup demonstration	

XVI. MODEL INPUT PARAMETERS		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
	b. Discuss the effective permeability used in the plume migration demonstrations	
	2. Compare selected effective permeability values with available permeability data from pressure transient tests, core data, literature, etc.	
	3. Describe how the selected effective permeability values are conservative based on all available data	
E. Reference Temperatures		
	1. Designate a surface reference temperature for the requested specific gravity or density range of the waste stream	
	2. Specify a reservoir temperature of the injection interval and corresponding reference depth	
	a. Include support documentation to verify the reservoir temperature selection, i.e., a plot of the recorded temperatures versus depth from area well logs, temperature surveys, etc.	
F. Density or specific gravity values		
	1. Density or specific gravity values should have a minimum of two decimal places consistently used throughout the document, including the modeling	
	a. Two decimal places are recommended	
	b. Precision used in the model should be equivalent to the precision of the requested range	
	2. Specific gravity values should have temperature references for both the injectate and reference fluid, e.g., 60°F/60°F	
	3. Density values should have a single	

XVI. MODEL INPUT PARAMETERS		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
	temperature reference	
	4. Provide any calculations used to convert density or specific gravity values at surface conditions to reservoir conditions or vice versa	
	5. Provide conversion calculations for input into models, e.g., conversion of density range to lb/ft³ for input into SWIFT	
	6. Formation brine	
	a. Document how the density or specific gravity of the formation brine was selected and state the corresponding reference temp.	
	b. Include copies of all available formation fluid analyses	
	c. Explain how equivalent solutions, i.e., NaCl, etc., were determined, if applicable	
	7. Injectate	
	a. State requested density/specific gravity range of injectate &corresponding reference temps.	
	b. Include/discuss copies of injectate analyses	
	c. Explain how equiv. solns. determined, if applicable	
G. Viscosity Values		
	1. Specify/document the reservoir fluid/injectate viscosities used in the no migration demonstrations	
	a. Explain how equiv. solns. were determined, if applicable	
	b. Include copies of any monographs, tables, or references used	
H. Compressibility		

XVI. MODEL INPUT PARAMETERS		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
	1. Document rock/fluid compressibility used in demo	
	2. Provide appropriate references, interference tests, etc. used to obtain the rock/fluid compressibility	
I. Porosity		
	1. Clarify the porosity value used in the demonstration is conservative based on porosity discussion included in geology portion	
J. Concentration Reduction Factor (CRF)		
	1. Provide a table listing the CAS number, applicable waste codes, health based limit, maximum concentration, resulting CFR for ea. Waste constituent, if applicable	
	2. Use 1×10^{-12} CRF and only include a list the waste constituents w/less than 100% concentration	
K. Background Gradient		
	1. Document the regional background gradient in feet/yr. and direction of movement	
	a. Include any references, calculations etc.	
	2. Clarify background gradients used in no migration demo	
	a. Don't use background gradient when modeling plume movement opposing gradient	
	b. Use max. or reasonably conservative value to est. plume move. in direction of background gradient.	
L. Dispersivity		
	1. State longitude and transverse dispersivities used in demo	
	2. Provide calc. and appropriate references to	

XVI. MODEL INPUT PARAMETERS		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
	support the values selected	
M. Diffusion Coefficient		
	1. Document diffusion coefficients used to model waste plume move., if applicable	
	a. Include applicable doc., references or portion of references to support the assigned free water diffusivity coefficients	
	2. Provide a table listing the diffusion coefficient for each waste constituent or reasonably conservative value selected for the vertical diffusion demo	
N. Include equations, calc., and reference docs. To justify other model input parameters used in the no migration demo, i.e., well index, hydraulic conductivity, etc.		
	1. Include calc. for SWIFT parameters, e.g., RAQ, DMEFF, etc., if applicable	

XVII. MODEL SELECTION		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Keep models as simple as practical		
	1. Analytical calculations can typically be used for the heavy plume demo	
	2. Constant dip and constant thickness models are preferred	
B. Describe the numerical and analytical models used in the no migration demo		
	1. Clarify what model is used for which portion of the demo	
	2. Specify the version of modeling software used, if applicable	
C. Provide verification and validation for any predictive models used in the demo 40CFR §148.21(a)(3)		
	1. Include or reference specific	

XVII. MODEL SELECTION		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
	documentation	
D. Provide the applicable equations used by any analytical models		
E. Describe how the model is appropriate for the specific site, waste streams, and injection conditions of the facility operations		
F. Describe how the model was calibrated prior to use for predicting pressure buildup or plume movement		
G. Clarify the solution method used by the model and discuss appropriateness of the method selected, if applicable		

XVIII. PRESSURE BUILDUP MODELS		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. EPA R6 accepts both analytical soln. models and SWIFT for pressure buildup modeling		
	1. If an analytical soln. model is submitted for pressure buildup demo:	
	a. Include validation/verification discussion satisfying 40CFR §148.21(a)(3) and compare the model w/another widely accepted analytical model such as PanSystem or hand calc. such as those provided in SPE Monograph 5 Appendix C	
	b. If the petition pressure buildup demo involves fault boundaries, the validation/verification info should address this as well	
	2. If the SWIFT model is used, include one of the following:	
	a. Include a SWIFT sensitivity run w/larger grid to confirm the pressure buildup demo result is reasonable or doesn't change w/larger grid. This would address grid limit concerns	
	b. Include a supporting analytical calc. to	

XVIII. PRESSURE BUILDUP MODELS		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
	confirm SWIFT results	
Note: The sensitivity model run(s) (SWIFT and/or analytical calc.) would also address requirements for sensitivity analysis under 40CFR §148.21(a)(6)		

XIX. NO MIGRATION DEMONSTRATION		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Clarify all timeframes contained in the demo.		
B. Initialization period, if applicable		
	1. Run the model for a sufficient time to show model stability	
	2. Demonstrate no background gradient is generated by the model input for zero background gradient modeling	
	3. Verify the appropriate background gradient exists for the heavy plume model	
	4. Demonstrate background velocities present prior to injection in variable structure or variable thickness models	
	a. Illustrate or map the magnitude background velocities	
C. Historical Period		
	1. Include all historical injection from wells completed in the modeled injection interval	
	2. Include historical production, if applicable	
D. Modeled Operational Life		
E. Run the model for the requested operational life		
	1. Use the maximum requested injection rates	
	a. 10,000 year demo.	
	2. Buoyant plume	
	a. Do not include an opposing regional	

XIX. NO MIGRATION DEMONSTRATION		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
	background gradient to maximize plume movement	
	3. Heavy plume	
	a. Include background gradient, if in the down dip direction	
	b. Facilities that can demonstrate the lack of potential for future oil and gas development in vicinity of inj. well facility, /geol. environment, lack of structural trap, in area of inj. well facility, Region 6 requires min. 200 yr. heavy waste plume demo w/appropriate background gradient (EPA HDQTRS policy assuming oil/gas production will cease w/i 200yrs)	
	(i) Wells located w/i the heavy plume and outside the cone of influence(COI),lack a mechanism for waste to migrate vertically upward making the shorter demo sufficient to demo that waste will not migrate vertically upward in an abandoned well for 10,000years	
F. Modeled Boundaries		
	1. Clarify what type of outer boundary conditions were implemented on all sides of the model grids and document the appropriateness of the selected boundary	
	2. Describe any no flow boundaries input in the model and what the boundaries represent, i.e., symmetry, fault, pinch-out, etc.	
	a. Describe how no flow boundaries were input in the model	
	(i) Document the number and location of image wells was sufficient, if applicable	
G. Document the modeled injection rates for all wells included in demonstration, including production wells if appropriate		

XIX. NO MIGRATION DEMONSTRATION		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
	1. Historical period	
	a. Provide qtrly inj. reports for most recent five year history	
	b. Provide annual inj. volumes for six plus year well histories	
	c. More rigorous inj. data can be provided and used, if desired	
	2. Requested operational period	
	3. Area or offset well rates during post-operational period, if applicable	
H. Address any area geologic features		
	1. Clarify what geologic features are included in each demo (pressure buildup, plume, etc.)	
	2. Clarify how the geologic features are included (image wells no flow boundary, etc.)	
	3. Provide sufficient documentation for exclusion of any geologic feature, i.e., analytical calc. showing no impact on pressure buildup	
I. Document the assumptions used in low density waste plume demo		
	1. Low-end of the density range compared to formation fluid	
	2. Exclusion of a background gradient to maximize up dip plume movement	
J. Document the assumptions used in the high density waste plume demo		
	1. High-end of density range compared to formation fluid	
	2. Use of a background gradient to maximize the down dip movement	
K. Document the assumptions used in the vertical diffusion demo		
	1. Describe the depth, w/i the inj. interval, used as the starting point for the max. vertical diffusion movement	
	2. Specify the max. vertical movement used	

XIX. NO MIGRATION DEMONSTRATION		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
	for the no migration demo into intact strata and the appropriate mud-filled or brine filled wellbore	
	3. Describe the method selected to determine the max. vertical diffusion	
	a. List the vertical diffusion distances for each waste constituent and calc. used for determining the max. vertical diffusion distances	
	b. Justify use of a worst case constituent and how it was applied in the demo	
	c. Apply a 1000' vertical diffusion distance and do not document the free water diffusivity coefficient for the various constituents	
	(i) Facilities w/brine-filled APs may be required to make additional diffusion calc. if specific circumstances exist	
L. Results-Clarify the movement of waste from inj. operations will not result in the vertical movement of waste from the inj. zone or laterally w/i the inj. zone to a point of discharge or interface w/a USDW		
	1. Total vertical movement of waste from inj. operations and diffusion	
	2. Document the max. pressure buildup	
M. Document any convergence or material balance errors and demonstrate values are insignificant		
N. Document the model grid and cell sizes are appropriate for demonstration		
	1. Discuss how the grid orientation, cell size, etc. was selected	

XX. PLOTS		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Document the plotting program used to illustrate model results accurately depicts the model output and does not distort the plume boundary		
B. Provide an outline of the operational plume, up dip and down dip plumes overlain on a structure map of the inj. interval		
	1. Include an outline or overlay of the grid area	

XXI. SENSITIVITY ANALYSIS		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Perform a sensitivity analysis in order to determine the effect of uncertainties associated w/model parameters 40CFR §148.21(a)(6);Preamble to the July 26, 1988, Final Rule for 40CFR Part 148, page 28129		
	1. Identify areas where uncertainty is present in the geologic description or reservoir characterization	
	2. Determine a likely range of values and perform sensitivity analyses which would address the impact of the uncertainty, if applicable	
	a. Assign reasonably conservative parameters to maximize the pressure buildup and waste movement using appropriate estimation techniques and testing protocols 40CFR §148.21(a)(2)	

XXII. CONE OF INFLUENCE (COI)		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Define the minimum COI- 40CFR §148.20(a)(2)(i)		
	1. Include all COI eq., calc., and values assigned to the various eq. parameters	
	a. Demonstrate the assigned values are conservative, i.e., brine-filled wells, mud-filled wells, minimum mud weight	
	2. Overlay the COI contour from the max. pressure buildup demo. On a map to illustrate which wells are located w/i COI, if applicable	
	a. Pressure contour frequency should allow reviewer to easily est. the max. pressure buildup at each AP location, if pressure buildup info is not available elsewhere in the document	
B. Skeleton type wellbore schematics should be provided for each AP located w/i the COI. The wellbore schematics should include:		
	1. Unique AP number	
	2. Well name and number	
	3. Well location	
	4. Name of operator	
	5. Well status	
	6. Basic well drilling and construction info. critical to the well's evaluation, e.g., total depth, hole sizes, casing size and setting depth cementing info, plug depths, mud weights, etc.	
	7. Operators may also include additional info to expedite the review. This data may include:	
	a. Reference depths	
	b. Well elevation	
	c. Regulatory interval depths: USDW , confining zone, inj. zone, and inj. interval	

XXIII. AREA OF REVIEW (AOR)		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Describe the AOR used in the demonstration 40CFR §148.20(a)(2)(i)		
	1. At a minimum, use a 2 mile radius around the well(s)	
	2. Specify a larger AOR based on the COI , if necessary	
B. Locate and identify all APs located w/i the larger of the COI or AOR using acceptable protocol 40CFR §148.20(a)(2)(ii)		
	1. Use a unique numbering system so there are no duplicate AP numbers	
	2. Include sidetracked or abandoned wellbores w/i a current completion or plugged well	
C. Ascertain the condition of all APs located w/i the larger of the COI or AOR that penetrate the inj. zone or confining zone 40CFR §148.20(a)(2)(ii)		
	1. Use acceptable protocol	
	2. Identify all wells w/i the AOR and assign a unique AP numbering system	
	a. Document any water wells that penetrate the confining zone	
	3. Verify the well status of any active or temporarily abandoned wells	
D. Demonstrate that all wells are properly constructed or plugged to prevent the migration of waste from the inj. zone based on the max. pressure buildup demo 40CFR §148.20(a)(i)-(iii)		
E. Provide sufficient well records that are grouped and separated for each well (Tabulation of AP well data not required)		
	1. Level of documentation required for each well is dependent on whether the well penetrates the confining zone, inj. zone, or inj. interval and if the well is located w/i the COI or waste plume	
	2. Documentation may include scout tickets log headers, etc. to verify the location of plugs, casing, mud weights, etc.	
	3. Identify all wells that are not constructed	

XXIII. AREA OF REVIEW (AOR)		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
	or plugged to satisfy the no migration standard	
	a. Provide corrective action plan for any such wells 40CFR §148.20(a)(2)(iii)	
	4. Use tabs to separate blocks of well records to facilitate record review	

XXIV. WASTE PLUME BOUNDARIES		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Locate and identify all APs located w/i the 10,000 year waste plumes (Tabulation of AP well data is not required)		
	1. Overlay the composite plume on a base map	
	2. Use a unique AP numbering system so there are no duplicate AP numbers	
	3. Include sidetracked or abandoned wellbores w/i a current completion or plugged well	
B. Ascertain the condition of all APs located w/i the 10,000 year waste plumes that penetrate the injection zone		
	1. Use acceptable protocol	
	2. All wells outside the AOR, but w/i the composite plume boundaries should be identified and assigned a unique AP number	
	3. Verify the well status of any active or temporarily abandoned wells	
C. Demonstrate these wells are properly plugged or constructed so that no waste would migrate from the inj. zone due to buoyancy or molecular diffusion in an AP – 40CFR §148.20(a)(1)		
	1. Brine filled wellbores do not pass the no migration standard if located w/i a buoyant plume	

XXIV. WASTE PLUME BOUNDARIES		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
D. Provide sufficient well records that are grouped and separated for each well (AP summary tables are not required)		
	1. Level of documentation required for each well is dependent on whether the well penetrates the confining zone, inj. zone, or inj. interval and if the well is located w/i the COI or waste plume	
	2. Documentation may include scout tickets, log headers, etc. to verify the location of plugs, casing, mud weights, etc.	
	3. Identify all wells that are not constructed or plugged to satisfy the no migration standard	
	a. Provide corrective action plan for any such wells – 40CFR §148.20(a)(2)(iii)	
	4. Use tabs to separate blocks of well records to facilitate record review	

XXV. Implementation and Compliance Section		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Describe documentation in place at the facility that allows verification of compliance with no migration petition approval conditions		
B. Note: Documentation maintained for UIC permit compliance may not be sufficient for the no migration petition compliance		
	1. Provide a simple waste stream flow diagram	
	a. Illustrate sampling points and metering equipment	
	2. Waste stream density or specific gravity compliance	
	a. Describe how the facility will comply with petition requested range	

XXV. Implementation and Compliance Section		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
	(i) Records maintained at the facility should list the density/specific gravity range at the referenced temperature	
	b. Describe any temperature compensation or correction methods, if applicable	
	(i) Include an example of the temperature correction process if completed manually	
	3. Describe the instrument and measurement methodology	
	4. List the measuring and metering equipment calibration schedule	

USE OF REASONABLY CONSERVATIVE VALUES

The "reasonably conservative values" term is discussed in the Preamble to the July 26, 1988, Final Rule for 40CFR Part 148, page 28129. Region 6 allows the use of reasonably conservative or estimated values when site specific data is unavailable or limited- 40CFR §148.21(a)(5). The demonstration should include supporting information from literature or other sources to support these values. The reviewers will establish suitable conservative values, resulting in the protection of human health and the environment, during the petition evaluation. Sensitivity analysis or selection of some values may be more sharply defined because of the availability of site specific or field data.

MODIFICATION

The regulations contained in 40CFR §148.20(f) allow for modification to an approved exemption to include additional waste or wastes. The modification application must demonstrate the requested wastes behave hydraulically and chemically in a manner similar to previously included wastes and will not interfere with the containment capability of the injection zone.

REISSUANCE

The regulations contained in 40CFR §148.20(e) allow for reissuance of an approved exemption to modify any conditions placed on the exemption. The reissuance demonstration must also meet the no migration criteria.

PUBLIC NOTICE

EPA will issue a public notice – 40CFR §148.22(b), with a minimum 45 day public comment period required by 40CFR §124.10(b)(1) for all proposed decisions. Should EPA decide to hold a public hearing, a minimum 30 day public notice will be given prior to the hearing- 40CFR§124.10(b)(2).

FINAL DECISION

EPA will publish final decisions in the Federal Register as required by 40CFR §148.22(b)

PETITION CONDITIONS

In accordance with 40CFR §148.20(d)(2), Region 6 typically requires certain annual monitoring placed as a condition of petition approval.