Staff Responses to Public Comments on Draft Regulatory Guide DG-1234 (Proposed Revision 4 of Regulatory Guide 1.82)

GE-Hitachi Nuclear Energy Americas (ML102560161)	ARES Corp. (ML102580040)
Nuclear Energy Institute (ML102571402)	Nuclear Energy Institute(Alion Science & Technology) (ML102580041)
Toshiba Corporation (ML103010235)	

	Originator	DG-1234 Section	Specific Comment	NRC Staff Response
1	NEI		Delay issuing RG 1.82, rev 4, until after a Commission response is received on SECY-10-0113. This will enable Commission policy direction to be incorporated and reflected in the guidance.	Commission direction in SRM SECY-10-0113dated 23 December, 2010 (ADAMS Accession No ML103570354) is being incorporated into this revision.
2	NEI	Page 5, 1st paragraph	Discussion of and reference to NUREG/CR-6808 should be deleted since much of the information is no longer relevant as it has been superseded by more recent and appropriate NUREG/CR documents	The NRC staff disagrees. While NUREG/CR-6808 is several years old, it still has relevant data. In addition, the comment did not specify the NUREG/CR documents which are more "recent and appropriate."
3	NEI	Page 6, 4th paragraph	NUREG/CR-2792, "An Assessment of Residual Heat Removal and Containment Spray System Pump Performance under Air and Debris Ingesting Conditions," Reference 10 specifically states that the NPSHr correction factor used in Appendix A is "arbitrary". It also states that the relationship significantly overpredicts the effect of air on NPSH. Please explain how this arbitrary relationship applies to actual pump performance.	As discussed in NUREG/CR-2792 the % of air ingestion in the system before pump performance is affected is based on a combinations of tests and experience. 2% is a widely accepted value. Arbitrary" is used several times in this 20 year old NUREG to reflect the author's judgment that conservatism is necessary due to the scarcity of data. For example, Figure 4-3 only has three scattered experimental points obtained for one pump and none are within the 2 percent void fraction range where the correlation is applicable. A less conservative correlation could be used if justified on the basis of

				acceptable data. There is no change in this statement from prior revisions.
4	NEI	Page 6, 4th paragraph	The proposed RG is inconsistent in its acceptance criteria between GL 2004-02 and GL 2008-01. The GL 08-01 acceptance criterion of 5% air is inconsistent with the 2% of GL 2004-02.	The staff disagrees. The 2% criterion on allowable air ingestion is appropriate for evaluating strainer inlet geometry and strainer submergence for steady state operations. The Criteria in Appendix A Table A-2 is consistent with latest NRC Staff Criteria for Gas Management prepared for GL 08-01 (ML090900136, ML101590282 & ML103400347) and expands the guidance for a variety of operating conditions
5	NEI	Page 6, 1st paragraph	Recommended clarification of first and second sentence - Revise to read: "The calculation of NPSH margin should subtract the total debris laden strainer head loss from the available hydraulic head. The total debris laden strainer head loss, including the chemical reaction products, ... "	Comment accepted. The RG wording was revised for clarity, as proposed.
6	NEI	Page 6, 2nd paragraph	The term 'prototypical' is used in a number of instances but is not defined. The use of the term and paragraph its meaning 'changes' throughout the proposed RG. The term 'prototypical' should be defined and the use of the term clarified in the RG	The NRC staff disagrees with the comment. "Prototypical" implies that the test condition is fully representative of the plant conditions and that there are no remaining uncertainties that require the incorporation of excess margins (e.g., scaling the strainer approach velocity or debris quantity per unit strainer area). Note that, in some parts of the Regulatory Guide, where reference is made to prototypical testing, it is implied that conservative testing is also acceptable. With this understanding, the staff does not believe the meaning of the word "prototypical" changes throughout the RG. " Prototypical " means a test that is adequately conservative and representative in all the

				significant aspects of flow characteristics, debris loading, temperatures and test duration, and represents actual plant conditions as close as possible.
7	NEI	Pg 8 Figure 1	Figure 1 is based on initial sump screen designs prior to the issuance of GL 2004-02. In almost all cases, Licensees have replaced their existing, original sump screen with new designs. In essence, in Figure 1 the components identified as 'debris screen', trash rack (in some cases), and cover plate have been replaced in their entirety by the new strainer designs. Accordingly, Figure 1 as presented is no longer relevant and should be either deleted and/or revised to represent current strainer designs implemented by Licensees	The staff agrees with the comment. Fig. 1 will be deleted. The 5 new strainer designs vary significantly from each other and from this Fig. Also, all references to Fig 1in the text will be deleted.
8	NEI	Pg 10	General: There are multiple instances where it is stated that a solid cover plate should be installed on the top surface of the strainer to prevent entrained air from being drawn into the strainer. This seems like an overly simplistic statement that doesn't address the potential for air to be drawn in from the side of the strainer. It is not clear that how a solid surface on the top of the strainer would actually be effective for preventing air entrainment	The cover plate is for physical protection. The discussion on the cover plate on pg 10 is revised for clarity.
9	NEI	Pg 10	NUREG/CR-6772 -reference to subject document does not as stated provide debris sizing, type, and transport characteristics for all debris types. In addition, the subject NUREG/CR performed transport studies in non-prototypical conditions (i.e., clean, cold water without other debris types -particulate, fibrous, and chemical) that are not indicative of post-LOCA conditions where both non-chemical and chemical debris types would be mixed together. It is suggested that the subject reference be deleted since it provides non-prototypical/non-representative information	The NRC staff disagrees with the comment. This NUREG mainly describes separate effects debris transport testing conducted in a linear flume. It determined incipient and bulk transport thresholds of individual debris types. Limited efforts were made in the NUREG to evaluate interaction among the various debris types in a post LOCA environment. The staff considers the results sufficiently well documented to be useful in providing conservative debris transport threshold values for strainer performance analyses.
10	NEI	Page 14, 1.1.1.10	RG Section 1.1.1.10 refers to WCAP-16406-P, Reference 17. This document is not publically available and is not available for use without purchase or licensing agreement	There is no non-proprietary version of the WCAP. See ML081000025 from the PWROG which says “A non-proprietary version is not

			with the PWROG. The associated SE, Reference 18, does not provide sufficient detail to act as a stand-alone resource. Recommended Action: Reference section should be revised to include the non-proprietary version.	available and will not be transmitted. This is due to the extensive quantity of proprietary information contained in WCAP- 16406-P-A, Revision 1, and omitting such information within this document would compromise the intent and coherence of this WCAP".
11	NEI	Page 15, 1.1.2.5	This section should state that coatings should be DBA-qualified. Otherwise, adding coatings to metals would potentially add to the debris source term	Agree. The NRC staff will add a phrase as suggested.
12	NEI	Page 16, C.1.2	This section titled "Evaluation of Alternative Water Sources" should be applicable only if the licensing basis credits alternative water sources to mitigate design basis accidents. This is the context in which alternative water sources were discussed in RG 1.82 Revision 3 (Section C.11.2). Recommended change: Change title to "Evaluation of Alternative Water Sources Credited in Design Basis Analysis"	The NRC staff disagrees with interpretation of RG Rev 3. Use of Alternate Water Sources during DBAs depends on plant specific commitments As mentioned in Bulletin 03-01 and Generic Letter 88-20, Supplement 2, specifications in emergency procedures for aligning Alternate Water Sources to supply safety systems is an accident mitigation strategy recommended by the NRC staff. No change to RG needed.
13	NEI	Page 16, 1.1.5	Inspections should have words "as practicable" added. Inspection of some BWR's ECCS suction strainers requires divers or draining the suppression pool to perform an inspection. This inspection type is an excessive requirement not warranted by operating experience or commissary with the safety impact.	.The NRC staff disagrees with the suggestion. Inspections should be conducted in a manner consistent with the licensing basis. The staff does not believe the suggested clarification is needed.
14	NEI	Page 17, 1.3.1.1	For NPSH calculations performed at sump temperatures less than 212 F, allowance should be provided for using the containment pressure present prior to the postulated LOCA for the NPSH calculation, as opposed to using the very conservative approach that assumes containment pressure equals the containment pool fluid vapor pressure. Section 1.3.12.h recognizes that subcooling increases as the water cools; Section 1.3.1.1 should be consistent.	No technical changes are being made to this section (1.3.1.1) from prior Rev 3, until the entire issue of use of containment accident pressure (CAP) is resolved. The RG will be revised again, at that time, if needed. Note that the subcooling discussion in section 1.3.12.h will be moved so that the issue of CAP is discussed only in Section 1.3.1.1

15	NEI	Page 17, 1.3.1.1, 2nd	The first sentence states that: "For containment pools with temperature less than 212 degrees F, it is conservative to assume that the containment pressure equals the vapor pressure of the pool water." For clarity and consistency with the first paragraph in this section, another statement should be added that for containment pools with temperature less than 212F, it is acceptable to assume that containment pressure does not decrease below that present before the postulated LOCA.	This comment is similar to 14 & 16. Section 1.3.1.1 was re-formatted to clarify the statement.
16	NEI	Page 17, 1.3.1.1	"For containment pools with temperature less than 212 degrees F, it is conservative to assume that the containment pressure equals the vapor pressure of the pool water." This is overly conservative. Air is present in containment that contributes to the pressure. Licensees should be able to credit the air pressure present prior to the accident	Similar to comments 14 & 15. No technical changes are being made to this section from prior Rev 3, until the entire issue of use of CAP is resolved. The RG will be revised again, at that time, if needed.
17	NEI	Page 17, 1.3.1.5	Section 1.3.1.5 should be removed. If uncertainties in NPSHR will be required and an NPSH eff calculated, then ALL the uncertainties should be addressed. These uncertainties include the correction factor for pumping high-temperature fluid as discussed in ANSI/HI 1.3-2009. If NPSHR as supplied by the pump vendor is to be used without uncertainties, then Section 1.3.1.5 would be acceptable.	The NRC staff disagrees. No credit for fluid temperature should be used when determining NPSHr. There is no change in the NRC staff position from what it was in Rev 3.

18	NEI	Page 18, 1.3.2.a	Recommended revision: -Revise to read "A sufficient number of high energy pipe break locations resulting in recirculation should be considered ..."	The NRC staff accepts the comment and will revise the wording. 'resulting' is more descriptive than 'relies on'.
19	NEI	Page 21, 1.3.4.2	Recommend that NUREG/CR-2982, Buoyancy, Transport and Head Loss of Insulation be added to this section since it provides relevant guidance.	The NRC staff disagrees with the comment about adding NUREG/CR-2982, D.N. Brocard, "Buoyancy, Transport, and Head Loss of Fibrous Reactor Insulation" (SAND82-7205), Revision 1, USNRC, July 1983 as a reference in the RG. This report provides detailed information to assessing insulation debris transport representative of strainers used in the 1980s. Most of the test methods and data in this report are no longer relevant and consistent with present-day knowledge. With the new strainer designs, velocities are much lower and debris size is much smaller than what was used in this NUREG
20	NEI	Page 22, 1.3.4.6	Section states that if settlement of fine fibrous and particulate debris is credited during recirculation or pool fill up, that adequate theoretical and experimental basis should be provided to demonstrate that such settling is prototypical of plant conditions. Since 'adequate theoretical and experimental basis' are very subjective terms, Can the Staff provide specific examples and or reference documents? In addition, NUREG/CR-2982, Buoyancy, Transport, and Head Loss of Fibrous Reactor Insulation should be added to this section since it provides relevant guidance.	At present, the NRC staff has not reviewed any adequate theoretical and experimental approaches for quantifying the settlement of suspended fine debris. The NRC staff expects that licensees attempting to credit settlement of fine debris account for large uncertainties associated with settlement and re-suspension behavior of fine debris. Reference: NUREG/CR-2982, D.N. Brocard, "Buoyancy, Transport, and Head Loss of Fibrous Reactor Insulation" (SAND82-7205), Revision 1, USNRC, July 1983 is not applicable as mentioned in #19
21	NEI	Page 22, 1.3.4.7	Page 22, section 1.3.4.7 -both paragraphs are essentially stating the same thing. Section should be re-written	The NRC staff accepts the comment. This section has been re-written as suggested.

22	NEI	Page 26, 1.3.11.4	The DG states in this and other sections, that the head loss across BWR (as well as PWR) strainers should be determined by prototypical strainer testing, and not by empirical correlations. However, many BWRs determined their strainer head loss using an empirical correlation (e.g., NUREG/CR- 6224). The BWROG is currently evaluating lessons-learned from GSI-191 to determine what additional actions need to be taken by BWRs. It may be premature to make such a definitive statement about the need for prototypical strainer head loss testing for BWRs. The text in the third sentence of the first paragraph on page 11 seems more appropriate.	Based on head loss testing experience associated with the GSI-191 resolution effort, the NRC staff recognized that the assumptions used in the development of the NUREG/CR-6224 correlation are not consistent with predicting conservative head loss values. For example, testing and analysis has identified issues with the assumed debris sizes, bed densities, and compaction relationships associated with this correlation. If future testing validates this or other correlations, subsequent changes can be made to the RG to accommodate this new information.
23	NEI	Page 26, 1.3.11.1	It appears that the section is requiring a 'matrix' of debris combinations that should be tested by the Licensee. This appears to be different from the current practice where the postulated 'worse case pipe break' and the associated resultant debris types and quantities were utilized for strainer head loss testing. Please clarify the intent of this section	The NRC staff disagrees. It is consistent with the current practice. The guidance has always been to consider debris types from different breaks and test for the worst case. A part of resolution of GSI-191, many licensees determined enveloping test conditions to reduce the number of tests needed. No change to the RG is needed.
24	NEI	Page 26-27, 1.3.12b	The draft guidance states in part ... conditions within the test tank should be prototypical or conservative ... However, a plant condition or design parameter may be prototypical and realistic of the post-LOCA condition, but it may not be conservative. Likewise, something could be conservative, but not prototypical. The Staff has used the 'prototypical or conservative' statement in other parts of this proposed RG as well as extensively in the "March Guidance Document" (i.e., proposed RG reference 8). The Staffs use of the two (2) terms has created much confusion	This comment is similar to #6 No change to the RG is needed. “Prototypical” implies that the test condition is fully representative of the plant condition and that there are no remaining uncertainties that require the incorporation of excess margins (e.g., scaling the strainer approach velocity or debris quantity per unit strainer area). “Conservative” implies that the test condition

			and discussion due to the subjective nature of the terms. It is highly suggested that the Staff eliminate the 'dual usage' of the terms for the same issue, specifically define the terms when they are used, and provide the basis for what is prototypical and what is conservative. This would eliminate considerable confusion and discussion in the future	incorporates margins, often to account for uncertainties and unknowns associated with behavior in the plant condition. Ultimately, the goal of the testing in a prototypical or conservative manner is to show that what has been done is not non-conservative.
25	NEI	Page 27, 1.3.12e	The conservative approach of a linear extrapolation of test data is provided; a natural log curve fit extrapolation should also be offered as an acceptable alternative	The NRC staff will revise the last sentence of section 1.12e on page 27, to wording similar to "The results may be extrapolated to fit the data over an appropriate period of time"
26	NEI	Page 27, 1.3.12e	The draft guidance indicates that the head loss testing may require extrapolation for a time period matching the mission time of the ECCS (i.e., typically 30 days post-LOCA). Since the head loss testing is performed with the entire design basis non-chemical and chemical debris that would be generated post-LOCA, it appears that extrapolation beyond the end of head loss testing as the Staff has required is actually beyond the 'time period matching the mission time of the ECCS'. Therefore any extrapolation of the test head loss would actually be for a period beyond the ECCS mission time of 30 days. Please provide clarification.	Most licensees did not run the test for 30 day duration for GSI-191. However, the testing should address any time-based effects such as time-dependent erosion of insulation, or corrosion of metals, as well as long-term compression effects on the debris bed. Extrapolation is a means to account for long-term time-dependent effects on the debris bed head loss. Staff is not requiring a test to last beyond the mission time of the ECCS, or for extrapolation to be extended beyond this time period.
27	NEI	Page 29, 1.3.12f	The guidance is suggesting new and different criteria with regard to scaling as it relates to debris. Since the post-LOCA conditions are virtually unknown, following the Staffs suggestions/guidance would be next to impossible. Clarification is required. Staff also states that due to the complexities of an integrated transport, settlement, and head loss test, that conservatisms should be applied to the tests. However, the Staff does not provide any guidance and/or examples. Clarification is required. Furthermore, the Staff once again uses the term 'prototypical or conservative'. The inconsistency associated with the use of this term has been previously discussed and requires clarification	The NRC staff disagrees with the comment. No change needed in content. Section 1.3.12 f is consistent with Ref 8, which provides further details for conducting strainer head loss testing. Ref 8 has been used as head loss testing guidance for the past 3 years and is the NRC staffs detailed guidance in this area. RG 1.82 is not intended to provide detailed guidance in this area, just provide information on where the detailed guidance is located.

28	NEI	Page 29-30,1.3.12j	The guidance recommends repeatability of head loss testing. No guidance is provided with regard to the acceptability of results that differ by some unknown margin. Clarification is required.	Acceptable repeatability depends on several factors. Will add clarification "…sufficiently repeatable, in light of known margins, uncertainties in debris quantities, body of knowledge from tests on similar strainers, etc."
29	NEI	Page 30, 2.1.1, 1st paragraph	The subject NUREG/CRs performed transport studies in non-prototypical conditions that are not indicative of post-LOCA conditions where both non-chemical and chemical debris types would be together. It is suggested that the subject references be deleted since they are neither representative or prototypical regarding debris transport and expected post-LOCA containment conditions	NUREG/CR-6772 is most useful to evaluate debris transport by sliding along the floor, as mentioned in the RG. NUREG/CR-6916 has been accepted by staff and is used by many licensees for coating transport Agree that these are mostly single debris type tests. However, the staff does not consider the results to be non-representative of PWR post-LOCA conditions. Modified the section.
30	NEI	Page 31, Fig. 4	Containment Pool Transport column -column fails to recognize that debris within the post-LOCA pool will have been thoroughly mixed, will not be immediately transported to the strainer, and the debris will have approximately 15 - 45 minutes to settle before the ECCS /CSS recirculation is initiated. How does this phenomenon integrate with the 'prototypical or conservative' head loss test guidance that the Staff has provided in sections 1.3.4.6, 1.3.12b, 1.3.12f, and 2.1.1 ? clarification	The NRC staff disagrees with comment. Fig 4(now Fig 3 after the original Fig 1 was deleted) is a simplified model that does recognize that debris transport and accumulation happens largely after injection phase. No inconsistencies are noted with the text of the RG. (there are two other typos in the Fig that will be fixed)
31	NEI	Page 32, C.3.2.2	In the last sentence, C.1.3.4.7 should be C.1.3.4.6.	The NRC staff agrees with the comment and will correct the typo.
32	NEI	Page A-1	Typo Appendix A, Figure A-1 "Ingestion" not "Injection"	The NRC staff agrees with the comment. The typo in the Fig will be corrected.
33	NEI	Page A-3,	Page A-3, Section A-2, last sentence of the second	Agree, will add the (U_) term in the text to

		Section A-2	paragraph -Placement of "U" in the sentence makes it appear that it refers to the effective area, instead of the pipe velocity; revise as follows: "The ratio of the water depth above the pipe centerline and the inlet pipe velocity (U_) based on the effective pipe flow area U can be expressed...	improve readability
34	NEI	Page A-3, Section A-2, 2nd	Figure reference for the Froude Number equation should be Figure A-2, not A-1a.	NRC staff agrees with comment. The figure number has been corrected.
35	NEI	Page A-4, Section A-3	With regard to evaluating the effect of air ingestion -the RG states that the only pump acceptance criteria is NPSH margin. It also states a 2% air ingestion limit. Please provide a technical basis or references that support application of this criterion to all pumps regardless of their design and operating conditions. GL 2008-01 criteria is now included stating that 5% air is OK from a pump performance perspective -using the same NPSHr adjustment leads to a 3.5 X NPSHr requirement. GL 04-02 and 08-01 are inconsistent.	Section A-3 has been rewritten to reflect the latest information related to GL 08-01and to better describe the information. With respect to the "5% air is OK" statement, that criterion is for transient operation and the RG states "the effect of gas on NPSH does not have to be considered if the Table A-1 transient conditions are met…." The NRC Staff does not believe there is an inconsistency. With respect to "a technical basis or references," Table A-1 and the Froude number information represent the latest understanding as mutually reached by industry and the NRC staff and discussed during the June 2010, and later meetings with NEI.
36	NEI	Page A-4, Footnote 5	Coordinate the Froude numbers cited for transport of gas with the GL2008-01 criteria.	The Froude number information is provided so that licensees have information to assist in evaluation of gas movement when addressing the issues identified in GL 2008-01
37	NEI	Page A-4, last sentence	The definition of Alpha should be revised from "air ingestion rate" to "void fraction". (The term "rate" implies a quantity/time relationship)	A change will be made to clarify that the quantity α_p is the volumetric percentage of air in the fluid at the pump inlet flange rather than the air ingestion rate.
38	NEI	Page A-4, A-2, 2nd paragraph	Need to add a clarification that Table A-1 (should be A-2) vortex data is only applicable to PWR sump screens without a complete water seal (e.g., screens are not fully	Changed from Table A-1 to Table A-2. Also, clarify by adding words: … Table A-1 which is only applicable to PWR sump screens

			submerged), to be consistent with the limitation stated in second-to-last sentence in the first paragraph on page 9.	without a complete water seal (e.g., screens are not fully submerged) and the appropriate sump geometry….. However, it should be noted that most strainers have the potential to generate and accumulate air in the long term, which could lead to the formation of a free surface inside the strainer volume. If long term generation and accumulation of air cannot be ruled out, licensees should continue to consider the design guidance in Table A-1, even if fully submerged.
39	NEI	Page A-4, Table A-2	Coordinate the allowable void fractions cited for acceptable pump performance with the GL2008-01 criteria.	This comment is similar to NEI # 35 and 36. The RG sections regarding allowable void fractions have been coordinated with the NRR staff responsible for GL 08-01.
40	NEI	Page A-5, A-5.1, 1st paragraph	Delete item 2, "flow starvation"; a fully submerged strainer cannot become flow-starved. (bullets on the next page, above Fig 3a, correctly omit this)	Although it is not clear that flow starvation failures are not possible for fully submerged strainers, if a flow starvation failure occurred in this configuration, the NPSH margin would also have been exceeded. Therefore, the staff agrees that separate specification of the flow starvation failure mode is not necessary for a fully submerged configuration.
41	NEI	Page A-5, Table A2	Based on review of latest GL 08-01 NRC guidance (dated 6-7-10), the PWR single stage pump 20 second transient void fractions should be 5%.	NRC staff agrees with the comment. Revised Table A-2 accordingly.
42	NEI	Page A-6, A-5.2, 1st paragraph	Delete item 2, "structural failure"; a partially submerged strainer should not be susceptible to structural failure. (The bullets on the next page correctly omit this)	NRC staff disagrees with the comment. An improperly designed strainer could collapse due to differential pressure even if it is partially submerged. An analogy is trash screens at Circ Water pumps
43	NEI	Page A-7, Figure A-3b	Figure is not clearly depicting a partially submerged strainer as indicated in the text	NRC staff agrees with the comment. Fig A3b is not correct. It will be re-drawn.

1	GEH	Page 12, first full paragraph and page 26, item 1.3.12	These paragraphs include a statement that "strainer testing methodology should be similar to that used for the testing performed for the resolution of GSI-1 91 and GL 2004-02." Extensive testing of BWR strainers was performed in the late 1990's and the results of these tests were used as the design basis for BWR strainers. For example, GEH conducted a series of tests with a large-scale optimized stacked disk test article using various debris mixtures and flow rates. The test methods used by GEH to perform the optimized stacked disk strainer tests have many similarities to the methods used in response to GSI-1 91, except chemical effects tests were not included in the debris mixtures and the testing for thin bed formation was less extensive. The GEH test methods and test results are documented in a proprietary Licensing Topical Report ("LTR") that was reviewed and approved by the NRC. GEH believes the test results contained in the approved LTR remain an acceptable basis for strainer designs without chemical effects and which do not have thin bed conditions. The BWROG is pursuing the characterization of the added head loss associated with BWR chemical effects. Once the BWROG efforts on chemical effects are complete, GEH will determine how to incorporate the chemical effects head loss into the total strainer head loss. Also, GEH will work with BWR licensees to identify any BWR plants with debris mixtures that may require additional tests concerning the potential to develop thin bed conditions. On this basis, GEH requests that this paragraph be re-written to clarify that previously approved GEH optimized stack disk strainer tests remain valid provided any adjustments to the strainer head loss associated with chemical effects and thin beds are accounted for properly.	There is no requirement, with this RG revision, to rollback and re-evaluate the previously approved stack disk strainer designs. As stated in the comment, there is a separate effect underway by the BWROG to look at lessons learned from GSI-191 for chemical effects, etc. There is no 'backfit' imposed or associated with this revision of the RG. However, as stated in comment NEI #22, new information from testing performed subsequent to the GEH LTR indicates that plant specific testing with plant specific debris loads may be necessary to conservatively predict strainer head losses. Generic testing and the use of the NUREG/CR-6224 correlation was accepted for BWRs in the 1990s, but is not recommended for future applications, as noted in the SE for topical report NEI 04-07. It is also noted that Chemical Effects and thin bed effects are not the only concerns with the use of the correlation. The staff is also concerned with method of debris preparation and test protocols used to determine empirical and semi-empirical head loss correlations.

2	GEH	Page 13, Item 1.1.1.8	This paragraph, as well as several others in the draft RG, uses the term "debris blockage" as a cause of increased head loss. The term "debris accumulation" may be better suited than "debris blockage" for this cause-and-effect relationship.	NRC staff agrees with the comment. Debris accumulation is a more descriptive term and will be used.
3	GEH	Page 19, item 1.3.2.2	It is suggested that the word "sump" be replaced with "strainer."	NRC staff agrees with the comment. Strainer is more appropriate than sump
4	GEH	Page 20, item 1.3.3.1, b	If a wall or other object prevents passage of the jet, the protected portion of the zone of influence ("ZOI") does not need to be considered in determining debris generation.	In the SE for NEI-04-07, the NRC staff position is that licensees should center the spherical ZOI at the location of the break. Where the sphere extends beyond robust barriers, such as walls, or encompasses large components, such as tanks and steam generators, the extended volume can be truncated. This truncation should be conservatively determined with a goal of +0/−25 percent accuracy, and only large obstructions should be considered. The shadow surfaces of components should be included in this analysis and not truncated, as debris generation tests clearly demonstrate damage to shadowed surfaces of components. In the SE for the URG, staff calculations provided insights that the presence of obstacles would tend to disperse the break jet. Comment accepted. Add sentence to RG similar to *'where robust barriers intersect the postulated jet zone, the extended volume may be truncated within the limitations of the Safety Evaluation for NEI-04-07 (Ref 21)'*
5	GEH	Page 21, item 1.3.4.2	It is suggested that the word "sump" in the first sentence be replaced with "containment."	NRC staff agrees with the comment.
6	GEH	Page 27,	It is suggested that the word "box" be replaced with	NRC staff accepts this comment. The word

		item 1.3.12, b	"schematic."	'schematic' will be used.
7	GEH	Page 32, item 3.2. 1	The BWROG Utility Resolution Guidance ("URG") contains a generic BWR sludge size distribution. There is no need for each BWR to generate a plant-unique sludge size distribution, as the URG developed generic size distribution should be acceptable.	NRC staff agrees with the comment, that a generic sludge distribution was accepted by the NRC staff in the URG for operating BWRs based on the analysis of actual plant samples. Total volume and distribution of sludge was accepted in the SE to the URG which was based on a sampling program as discussed in Appendix J to the SE. Will add a clarification to the RG.

1	ARES Corp.	1.3.12.b 1.3.12.c 1.3.12.f 1.3.11.c	An inconsistency exists in the prototype head loss testing section, Section 1.3.12. ITEM 1.3.12.b, ITEM 1.3.12.c, ITEM 1.3.11 .b). *The problem and inconsistency is a statement in Item 1.3.12.f, which states "Agitation of the test fluid with stirrers may be necessary to achieve complete transport."* This statement conflicts for three reasons. First, artificial agitation likely disrupts the proto-typicality of the test tank defined in ITEM 1.3.12.b. Second, if the agitation is in proximity of the strainer, the agitation can affect debris accumulation in a non-prototypical manner. Third, agitation can cause larger debris to accumulate that would not realistically accumulate in the prototypical sump pool.	NRC staff agrees with the point of interest, agitation of test flume needs to be done in a controlled manner, when needed, so as to not interfere with test results. The staff guidance, as described in the staff's head loss and vortexing review guidance (REF 8), is consistent with this intent, whether a test is agitated or not. The staff would not consider it acceptable for agitation to disrupt debris bed formation. This concern has been reviewed by the staff during observations of vendor head loss testing, and the staff has concluded from these observations that vendors generally have adequately addressed it. For thin bed testing, the guidance is that debris fines are introduced first. If sufficient fines are included in the debris loading, the debris bed will be formed from only fines, and thus, the agitation of the test tank will not result in larger debris accumulating on the strainer.
2	ARES Corp	1.3.12.f	Item 1.3.12.f needs fixing or clarification: "Scaling of the debris areal density on the test tank floor should be considered relative to the plant condition." With all my experience, I do not understand this sentence.	NRC staff agrees with comment. Section 1.3.12 f has been re-written for clarification. Scaling of debris per unit area of floor in the flume versus debris per unit floor area of the plant should be considered with respect to effects on debris transport due to potential piling up of debris in areas of flow restrictions. The quantity of debris per unit width of the flume relative to the flow passages in the plant is also an important scaling parameter

3	ARES Corp	General	At the beginning of testing, we did not know how to write valid test guidance. Each vendor took their own path leading to diverse approaches, some of which are reflected in the overall complexity of DG-1234. In my opinion, it is now possible to prescribe a singular worst case qualification head loss test for use by all vendors that is prototypical of most of the large PWR replacement strainers. That singular test would be the classic thin-bed test properly conducted. One test could just about cover the head loss testing issue, with the possible exception of late mission chemical effects. Based on experience, the licensee likely would not pass this test if large quantities of particulate insulation debris (e.g., calcium silicate) or chemical effects precipitant is introduced.	The staff disagrees that a single thin bed test will be limiting, after having seen a number of cases where the full load test resulted in a higher HL. Staff believes that we have adequate guidance for thin bed testing (debris addition order ensures all fine debris added first) and stirring (potential to affect the debris bed) to ensure that commenter's concerns are reasonably addressed. Detailed guidance for performing head loss tests is not provided in the RG. Rather, the RG cites the HL&V review guidance as a reference. The RG is not intended to provide detailed testing guidance. It provides an approach that the staff considers acceptable. The performance of a full load test in addition to a properly conducted thin bed test provides adequate assurance that the strainer response has been bounded by the tests

4	ARES Corp	General	While this comment (i.e.; #3) was aimed at strainer head loss, a similar comment may help address the downstream head loss, as well. (*regarding the need to test with very fine slowly accumulating fibrous debris and the need to minimize calcium silicate types of particulates and the early chemical effects precipitants in containment should apply to downstream head losses, as well as strainer head losses*.)	NRC staff agrees with the comment. . Downstream headloss is dependent on debris that passes thru the strainer into the ECCS. The slower the fiber bed builds up on the strainer, the more that will pass thru. NRC Staff believes the test protocols used by licensees adequately address this phenomenon.

1	Alion Science & Technology (AST)		There are significant differences in the draft of Revision 4 from the three previous revisions to RG 1.82, e.g. the break location selection criteria increased from 5 to 8. Will the current analysis of record (both for BWRs and PWRs) need to be revised to comport with Revision 4? If not, what is the NRC's position for when the analysis of record needs to comport with Revision 4 of RG 1.82?	The major change to this section is to specify restrictions on use of break exclusion zones, and use of NRC BTP 3-4. These restrictions, while new to the RG, are not new staff positions. They are consistent with the SEs for the URG and NEI-04-07 There is no 'backfit' imposed or implied with this revision of the RG.
2	AST		Suggest doing a global search for the words "very challenging" and delete, or simply say "are unacceptable."	Section 1.3.12 has been revised based on this comment to change "very challenging to justify" (Also in 1.3.2a, 1.3.3.1d, and A-1 3rd paragraph) Change sentence to say 'not recommended' or justifiable
3	AST		Suggest removing the references to the WCAPs and simply state should be evaluated with approved methods or equivalent or the Staff Review Guidance.	The NRC staff disagrees with the comment. Since there are SEs approved for the WCAPs, in general, the staff believes it is appropriate to cite the WCAPs
4	AST	Pg 9	Page 9 discussions on flashing: Attachment V-1 of the SER to NEI-04-07 discusses evaluation of two phase condition caused by a pressure drop. The following explanation is provided in the Attachment: "Two-phase condition can result from two causes. As pressure decreases downstream of the screen, noncondensible gas dissolved in the water can come out of solution and/or hot water can flash into steam. Either or a combination of these two phenomena can result in two-phase flow with increased pressure drop." Deareation is based on Henry's law whereas flashing into steam is a thermodynamic phenomenon. The draft revision 4 applies the term "flashing" to both phenomena. "Flashing" usually refers to as the generation of steam. Consistent terminology should be used throughout the proposed regulatory guide revision to describe the two	The NRC staff agrees with the comment. and will rephrase the RG, where appropriate, for consistency.

			phenomena associated with gas evolution downstream of the strainer.	
5	AST		The "NRC Draft Guidance for the Use of Containment Accident Pressure in Determining the NPSH Margin of ECCS and Containment Heat Removal Pumps" provides a good discussion of NPSH, its uses and its limitations. Staff should consider incorporating the discussion of Section 2, 3 and 4 into the RG.	This comment is related to NEI # 14 The NRC staff disagrees with the comment. No changes are being made to this section from prior Rev 3, until the entire issue of use of CAP is resolved. The RG will be revised again, at that time.
6	AST		The proposed RG is inconsistent in its acceptance criteria between GL 2004-02 and GL 2008-01. The GL 08-01 acceptance criterion of 5% air is inconsistent with the 2% of GL 2004-02.	Note: same as NEI's comment #4. The NRC staff disagrees with the comment. The enclosure to GL 08-01 is consistent with the DG. In any event, the 2% or 1% criteria provided in both GL 2008-01 and the draft RG (DG-1234) refers to steady state operation, shown as > 20 sec or > 5 sec, depending upon operating conditions. All the 2% references provided before GL 2008-01 did not differentiate between transient and steady state conditions and were based on steady state tests. This is consistent with latest Staff Criteria for Gas Management prepared for GL 08-01 (see ML090900136 and ML103400347). It also noted that this Staff Criteria is for satisfying operability, and should not be used for initial design.
7	AST	1.3.1.3	Cavitation is a long term degradation mechanism and therefore its use as a short term assessment tool is not appropriate.	The NRC staff disagrees with the comment; Cavitation over the post-LOCA mission time could affect pump performance. Cavitation can result in fluctuations in flow rates and discharge pressures. Ensuring adequate NPSHa is one method of demonstrating no cavitation.
8	AST	1.3.1	NPSH is not an absolute when assessing the ability of a pump to perform its function of providing flow at a pressure.	The NRC staff disagrees with the comment. NPSH is one primary acceptance criterion to assess that the pump is able to perform its

			Recommend that the ECCS and CSS acceptance criteria be based on reasonable assurance that the pump is able to perform its design basis function for its intended mission time.	function. NPSH is a surrogate used to assess pump performance because it is relatively easy to determine.

9	AST	1.1.5?	The RG should note that current compliance with 10CFR50.55a and ASME OM Code for Inservice Testing is adequate to show pump operability.	The NRC staff disagrees with the comment. Compliance with 10CFR50.55a and ASME OM Code would demonstrate operability of the pumps when suction is from the RWST, but would not demonstrate operability of the suction strainers when the pump suction is aligned to the containment pool in a PWR because there is no flow thru the strainer. Visual inspection is needed to augment.
10	AST	1.3.b	1.3.b. The discussion implies that reduction in water level due to upstream debris blockage impacts only NPSH. Reduction in water level could also cause the strainer not to become fully submerged hence air ingestion could occur and once the strainer is uncovered the available NPSH then becomes the submergence height and is decoupled from pump suction NPSH criterion. The discussion should include evaluation of strainer submergence and flag the change in NPSH criterion once the strainer becomes uncovered.	The NRC staff agrees with the comment. The section will be reworded to make this clear. NPSH is also a function of frictional pressure drop and any entrained gas as well?
11	AST	1.3.1.4	1.3.1.4 The determination of high water temperature appears to be only associated with NPSH. A clarification should be added that the high water temperature calculation also applies to deareation and flashing.	The NRC staff agrees with the comment, and will revise the RG accordingly
12	AST	1.3.1.6	1.3.1.6 Upstream blockage by debris should also be added in the list of issues that need to be addressed in determining the minimum water level at the strainer.	The NRC staff agrees with the comment. It is already in 1.3 b, but it can be add to 1.3.6 in the 4th line to be more explicit.
13	AST	1.3.3 1.3.10 b	1.3.3 The concept of a partially damaged insulation outside the ZOI (e.g. insulation blown off piping or the portion of a blanket outside the ZOI) contributing to the chemical source term was introduced in the draft revisions to the SER to NEI-04-07. This section on debris generation is mute on this concept. Please indicate if partially damaged insulation outside the ZOI needs to be considered generically.	The staff does not believe a new concept has been introduced by the draft revision to the SE on NEI 04-07. In essence, the proposed guidance for Transco RMI with aluminum foils can be thought of as a ZOI with two subregions, which derives from a general concept outlined in Appendix II to the SE:

				From 0 to 4D, a 75% / 25% distribution between small pieces and large pieces is assumed, and from 4 to 17D, 100% partially damaged cassettes is assumed. This draft revision to the SE on NEI 04-07 was based on a reevaluation of existing test data in light of chemical effects issues identified after the issuance of the staff's SE on NEI 04-07. The staff's review did not identify other insulation types for which the existing ZOIs and debris size distributions specified in the SE could lead to an under prediction of debris or dissolved chemical species. Therefore, no change is necessary to the regulatory guide in response to this comment.
14a	AST	1.3.3.1	To date all debris generation experiments have been conducted with rupture disk initiated jets and damage pressures calculated at observed distances from the nozzle calculated with various models, e.g. NPARC CFD, ANSI Jet, etc. In none of these experiments or calculations have pressure wave impulse been considered. Please provide guidance on how to factor in pressure wave impulses in debris generation analysis based on the publicly available debris generation tests as reported in NUREG/CR-6808.	The current state of knowledge regarding the specific mechanisms for the damage or destruction of component insulation is not sufficiently complete to discern how near-field pressure wave dynamics and far-field jet erosion combine to dislodge insulation from its initial location and break it apart into debris fragments of various sizes. This is in part because experiments simulating the damage or destruction of piping insulation by impingement of a high-pressure steam/water jet are able to "measure" only the end-state of the insulation material, i.e., the amount of material dislodged from a target location, and the size distribution of fragmented debris. It is not reasonably possible to determine accurately specifically how the fragments were generated. Jet tests using rupture disks do inherently include the results of pressure wave damage, though the pressure wave is not accounted for in any particular model. Additionally, the

				staff's current understanding of debris-generation phenomena is that the initial blast accompanying rupture of a high-pressure steam or water-filled pipe does not have as significant an effect on debris sources as the subsequent jet blowdown which extends far beyond the break and is the likely dominant factor in debris generation. As such, in light of the conservatisms associated with existing approved ZOI models, separate modeling and/or analysis of a damaging pressure wave is not currently required in debris generation evaluations. It should further be noted that a number of debris generation tests used measurements, rather than calculations, to determine the threshold damage pressures for target materials.
14b		1.3.3.1	Most debris generation calculations have been performed using a spherical ZOI whose radius is based on the volume contained within an isobar whose pressure is the destruction pressure for a particular material. The destruction pressures are derived from experiments of different insulating materials. The spherical ZOI accounts for uncertainties associated with piping separation and piping whip issues, jet direction, impingement forces, material variation, etc. To date, application of the spherical ZOI has been independent of any similitude study between the plant insulation system and the tested material. Please provide guidance on how to perform a similitude analysis for each insulation system and how should the ZOI be adjusted if the plant insulation system is not "identical" to the tested system.	It is a standard expectation of the NRC staff that licensees apply test results only insofar as they are representative of plant configurations. For the purpose of ZOI determination, similitude analysis would need to demonstrate that an untested insulation in question is sufficiently similar in physical properties to the material tested that there is assurance that failure would not occur at exposure to lower impingement pressures. Although the details are beyond the scope of this regulatory guide, similarity analyses should evaluate factors such as the materials and configuration of bands, jacketing, latches, coverings, insulation base material, etc.
14c		1.3.3.1e	1.3.3.1.e suggests that a spherical ZOI analysis also requires an additional jet ZOI analysis. Please provide a	The staff believes that existing spherical ZOIs will lead to conservative predictions of

			reference of a spherical ZOI analysis that includes additional jet ZOI analysis. If an example is not available, please provide guidance on how to perform a jet ZOI analysis, e.g. what jet model should be used, how to consider pipe separation, pipe whipping, direction of the jet, etc.	generated debris for debris that is relatively homogenously distributed around a given break location. However, for particularly problematic materials, as noted in the RG, this simplified model can lead to the incorrect conclusion that even relatively small quantities of problematic materials cannot be destroyed. The ANSI 58.2 jet model (i.e., without spherical resizing) would currently be an acceptable jet model to evaluate problematic materials outside the spherical zone. Complete separation of the ends of the pipe should be considered, unless pipe whip restraints are present to reduce the motion. However, if whip restraints are present at a given break location, then additional locations should be considered (if applicable) where whip restraints are not present. The most limiting direction of the jet with respect to destroying problematic materials should be considered in the evaluation. The attenuating influence of non-robust barriers and any obstacles smaller than the jet diameter should be neglected in the evaluation
15	AST	1.3.3.3	1.3.3.3. Concrete erosion has not been considered in most debris generation analysis. There are currently no publicly available concrete damage pressures for which to derive a ZOI. Please provide an example of a debris generation analysis that quantifies and characterizes the concrete debris source term and characteristics. If such an analysis is not available, please provide guidance on how to quantify and characterize a concrete debris source term.	Debris from concrete erosion was not specifically accounted for in most licensees' GSI-191 evaluations. However, based on conservatisms in the NEI 04-07 guidance and safety evaluation, the staff believes conservatisms in the determination of particulate debris, latent debris and coating debris are sufficient to address the omission of concrete erosion. This is similar to the staff position in the SE for the AP 1000 reactor where the applicant referenced a proprietary test report that documented minimal concrete

				erosion from a simulated LOCA jet at reactor coolant cold-leg temperature and pressure. The applicant used the test report as part of a margin assessment to support its position that concrete debris generation is unlikely and that a reasonable estimate of the amount of concrete debris that could be generated by a LOCA jet is within the design basis.
16	AST	1.3.4.3	Agglomeration of material has been observed in several experiments, e.g. debris head loss experiments where particulate agglomerates on fibers. Please indicate if agglomeration can be considered thereby reducing the quantity of material reaching the strainer.	The staff believes that credit for agglomeration is not presently feasible and should not be credited in a head loss test protocol. This is for a number of reasons, including primarily: (1) defining prototypical debris agglomeration for the plant condition is not currently possible based on significant uncertainties associated with the behavior of debris during the blowdown, washdown, and pool fill phases, (2) existing head loss test facilities are insufficient for performing tests that could adequately scale the requisite debris concentration parameters, and (3) existing head loss testing programs attempt to perform a small number of tests to identify the limiting head loss for a given strainer, which implies that agglomeration should be minimized in these tests.
17	AST	1.3.9	This Strainer Structural Analysis section is silent on the impact of fluid temperature. Please provide guidance on how fluid temperature needs to be considered.	Fluid temperature effects on the structural integrity of the strainer are captured in the loading combinations required to demonstrate the structural integrity of the structure, as indicated in Section 1.3.9.4 of DG1234 (i.e., the inclusion of thermal loads as part of bounding loading combinations to which the strainer must be subjected). As such, any feature of the structure which could create a stress due to restrained thermal growth (resulting from a change in temperature) must be captured during the structural analysis. Conservative material

				properties based on the fluid temperature should be chosen consistent with the fluid temperature expected during the design basis accident
18	AST	Appen. A A-1	Appendix A provides guidance that the strainer should be sufficiently submerged to prevent downstream gas formation. Attachment V-1 of the SER to NEI-04-07 suggests that "In order to prevent water flashing, the pressure downstream of the sump screen must always remain above the saturation pressure at the sump water temperature." The guidance of Appendix A should comport with the previous NRC criteria on downstream gas formation.	RG quotation is discussing deaeration. SE quotation is discussing flashing. There is not a contradiction in guidance. These are different phenomena No change needed to RG
19	AST	Section B	Section B, Background; Appendix A and Section A.3 - With regard to evaluating the effect of air ingestion - the RG states that the only pump acceptance criterion is NPSH margin. It also states 2% max is the acceptance criteria. Please provide a technical basis as to how this absolute criterion applies to all pumps regardless of its design and operating conditions. GL 08-01 criteria is now included stating that 5% air is OK from a pump performance perspective - using the same NPSHr adjustment leads to a 3.5XNPSHr requirement - GL 04-02 and 08-01 are inconsistent.	This comment is similar to NEI comment #4 The 2% criterion on allowable air ingestion is appropriate for evaluating strainer inlet geometry and strainer submergence for steady state operations. The Criteria in Appendix A Table A-2 is consistent with latest NRC Staff Criteria for Gas Management prepared for GL 08-01 (ML090900136, ML101590282 & ML103400347) and expands the guidance for a variety of operating conditions
20	AST		NUREG/CR-2792, Reference 10 - specifically states that the NPSHr correction factor used in Appendix A is "arbitrary". It also states that the relationship significantly over-predicts the effect of air on NPSH. Please explain how this arbitrary relationship applies to actual pump performance.	This comment is the same as NEI comment # 3. As discussed in NUREG/CR-2792 the % of air ingestion in the system before pump performance is affected is based on a combinations of tests and experience. 2% is a widely accepted value
21	AST	Pg 5, etc.	Background, 1.2.12, A.5 and Table A-2; The RG statement that "No cavitation is allowed" is inconsistent with pump physics. NPSHr is based upon a pump cavitating. In reality, the ingestion of small amounts of air (not allowed	This comment is similar to AST comment #7 Appendix A of the RG clarifies that the staff's use of the term cavitation in this RG is in the sense of the NPSH margin of a given pump

			by the RG without NPSH penalty) actually reduces cavitation and is beneficial to pump health and long term reliability.	being less than zero. Excessive cavitation can cause pump damage and fluctuations in flow. The regulatory concern is potential damage to the pump and failure to deliver the amount of water required by the safety analyses. If a cavitating pump can satisfy the required safety functions over the entire mission time, then it would be considered acceptable. This is consistent with 1.3.1.3 and A-5. The staff has previously addressed the comment on air ingestion in response to NEI #3. No change to RG needed.
22	AST		RG Section 1.1.1.10 refers to WCAP-16406-P, Reference 17. This document is not publically available and is not available for use without purchase or licensing agreement with the PWROG. The associated SE, Reference 18, does not provide details to enable a non-purchaser of the proprietary document to be able to assess pump performance. No non-proprietary version of the WCAP is publically available.	There is not a non-proprietary version available of WCAP 16406-P
23	AST	1.1.1.10	It is noted that use of WCAP-16406-P alone does not provide a complete answer to the acceptability of ECCS or CSS performance under post-LOCA conditions. RG Section 1.1.1.10 should be clarified.	The NRC staff agrees with the comment and will clarify this section by including a discussion of WCAPs 16530-NP and 16793-NP.
24	AST		Typo - ADAMS # for WCAP-16406 is not ML081000027.	The NRC disagrees. ML081000027 is the correct reference ML # for WCAP 16406-P-A. Since this is a proprietary report, it does not show up in a search by an unauthorized user.
25	AST		Typo - Appendix A, Figure **A-1** "Ingestion" not "Injection".	The typo was corrected as suggested
26	AST	Pg A-1	Appendix A - the Statement that "The Primary Acceptance criterion for is that adequate net positive suction head...under all postulated LOCA conditions." Does not physically relate to the ability of the pump to provide its design criteria of providing adequate flow at pressure.	The ability of the pump to satisfy its nuclear safety function of providing adequate flow is implied, but not explicitly stated. It will be revised.
27	AST	1.3.11.4	Section 1.3.11.4 (page 26) states that strainer designs should be validated through testing, and analytical or	This comment is similar to NEI #22 The NRC staff believes that strainer designs

			empirical head loss correlations should not be used to calculate debris bed head losses. This guideline appears to be too restrictive since the NRC has stated that it is acceptable to use correlations (such as the one in NUREG/CR-6224) for operability evaluations or parametric analyses provided that the correlation is used within the specified limitations. Suggest rephrasing to state that correlations should not solely be used to predict head losses and should be used within the range of ~applicable test data.	should be based on testing. Existing correlations have not been demonstrated capable of accurately predicting strainer head loss for PWRs. Although the staff has accepted in the past (i.e. BWRs) the use of correlations within certain constraints for some licensees with significant margins, this is not a recommended approach. Regulatory guides represent the staff's technical positions, and are not regulatory requirements.
28	AST		In Figure 3 (page 28), the Debris Generation box should include "debris quantities" and "material properties" or something similar.	These attributes are in the Debris Load box. The Fig. does not need to be changed
29	AST	1.3.12.g	Section 1.3.12.g (page 29) states that flow downstream of the strainer may be sampled to determine the amount of debris passing through the strainer. This section should be clarified to specify that an appropriate sampling frequency should be used to adequately characterize the total debris bypass.	The NRC staff accepts the comment. This section has been revised to include more information about sampling methods.
30	AST		Section A-2 (page A-3) states that vortex formation is a strong function of the Froude number and the submergence level. Submergence level is actually one of the terms in the Froude number, so this statement is somewhat redundant. Another important factor that is not included in the Froude number is the geometry of the flow approach path. For example, a plant with a sump drawing suction in a wide open pool is less likely to form a vortex than a plant where flow has to turn a sharp corner just before reaching the sump.	The NRC staff agrees and will add a discussion of approach geometry
31	AST	Pg 33-34	The reference from which figures 5 and 6 were taken should be provided in the same format as the reference noted in figure 4.	These figures did not change since revision 2 in 1996. Fig 5 is from NUREG/CR-6224, Fig 1-1, 1995 Fig 6 is from NUREG/CR-6224, Fig B-1, 1995 and NEA/CSNI/R(95)11 Fig 1-6 (Note these are now Fig 4 & 5)

1	Toshiba	1.3.1.1	The proposed changes to RG 1.82, Rev. 3 as stated in Draft Regulatory Guide DG-1234 include combining regulatory positions for PWRs and BWRs into common positions compared to the organization of RG 1.82 Rev. 3. As a result of the combined regulatory position for determination of available NPSH for ECC and containment heat removal pumps, Section 1.3.1.1 in DG-1234, appears to change the regulatory position for BWRs given in RG 1.82, Rev. 3. The first paragraph of DG-1234 Section 1.3.1.1 is consistent with Section 2.1.1.1 of RG 1.82, Rev. 3 guidance that there should be "no increase in containment pressure from that present prior to the postulated LOCA." That is the end of the guidance on assumptions of containment pressure for BWRs in RG 1.82, Rev. 3. Section 1.3.1.1 in DG-1234, however, adds an additional paragraph and statement that "it is conservative to assume that the containment pressure equals the vapor pressure of the pool water." This is likely more conservative than the typical BWR assumption of the containment being at atmospheric pressure. Therefore, DG-1234 Section 1.3.1.1 appears to change the regulatory position from that stated in RG 1.82, Rev. 3 Section 2.1.1.1 for BWRs, and to require an overly conservative assumption in the calculation of ECC and containment heat removal system pumps' available NPSH.	There was no intent to change the regulatory position for use of containment accident pressure. The use of atmospheric pressure is acceptable.

2	Toshiba	1.1.1.1	Proposed Section 1.1.1.1 in Draft Regulatory Guide DG-1234 states that "A minimum of two independent ECCS suction strainers should be provided, each with sufficient capacity to accommodate the full plant debris loading while providing sufficient flow to one train of ECCS and containment heat removal pumps. To the extent practical, the redundant suction strainers should be physically separated from each other by structural barriers to preclude damage resulting from a LOCA, such as whipping pipes or high-velocity jet impingement." These statements appear to be revisions of PWR regulatory positions 1.1.1.1 and 1.1.1.2 in RG 1.82, Rev. 3. The terminology used in Section 1.1.1.1 in DG-1234 does not match well with the typical configurations in BWRs. For example, ECC suctions from the suppression pool are often fitted with two strainers (e.g., on the ends of a common tee), so the independence and separation is between the different ECC suctions, not between pairs of strainers. Additionally, the redundancy for debris loading is achieved by sizing the strainers such that all debris is shared between the operating trains of the ECC systems, assuming at least one train is out of operation for a given system. For the ABWR, there are three independent trains of low pressure ECC (via the Residual Heat Removal system), but two of the three trains are assumed to be operating, so the postulated debris is shared among two (of three) low pressure ECC suctions and one (of three) high pressure ECC suctions for long-term recirculation cooling following a LOCA. This type of configuration, which is clearly acceptable for the ABWR, does not seem to be included as an acceptable configuration the way that DG-1234 Section 1.1.1.1 is written	Section 1.1.1.1 and 1.1.1.2 from rev 3 was combined into the new Section 1.1.1.1 with the PWR specific language moved to new section 2.1. There is no change in the intent of the regulatory positions. As noted in Section B- Discussion, on page 7, Advanced PWR or BWR designs may employ design features that are different from the operating reactors that formed the basis for this regulatory guide and adjustments may be necessary. For example, a plant with passive features will have to make adjustments regarding pump NPSH, and PWRs with in-containment refueling water storage tanks may need to use features of both the PWR and BWR guidance. Therefore, for advanced reactor designs, this document provides guidance for both PWRs and BWRs, with the recognition that some sections may need to be adjusted based on the particular plant features.