

APPENDIX G
MITIGATING STRATEGIES ASSESSMENT FOR NEW FLOOD HAZARD INFORMATION ASSESSMENT

G.1 INTRODUCTION

~~The purpose of this appendix is to provide guidance for developing mitigating strategies and performing an integrated Mitigating Strategy Assessment (MSA) assessment based on the mitigating strategies flood hazard information (MSFHI). The integrated assessment process is illustrated in Figure 1.~~

OR

The purpose of this appendix guidance is to provide guidance for a Mitigating Strategies Assessment (MSA) of assess the impact of the new flood hazard information developed in response to the Fukushima Near Term Task Force 50.54(f) letter ~~MSFHI on the mitigating strategies~~ and, if necessary, modify existing or develop new mitigating strategies. In this appendix the new hazard information will be referred to as the Mitigating Strategies Flood Hazard Information (MSFHI). The assessment process is illustrated in Figure 1. ~~in light of the reevaluated flooding hazards. The guidance does not preclude the need to perform an integrated assessment not preclude the need to perform an IA as requested by the Fukushima 50.54 letter.~~

The FLEX strategies developed in response to Order EA-12-049 assumed an ELAP with a LUHS from an unspecified event. Sections 2 and 3 of the main body of this document establish the boundary conditions and initial assumptions used for developing these strategies. In addition, Section 3 the main body of this document provides key considerations in the development of the strategies. Sections 4 through 9 establish the reasonable protection requirements for on-site FLEX equipment.

The MSA will make use of the NEI 12-06 guidance to either demonstrate that the FLEX strategies can be implemented as currently developed or can be modified to remain implementable given the MSFHI, or a different mitigating strategy can be implemented to address the specific attributes of the MSFHI.

~~This Appendix is intended to make use of the NEI 12-06 guidance for either demonstrating that the FLEX strategies can be implemented as is considering the new FHI or can be modified to remain implementable considering the new FHI, or for developing different mitigating strategies targeted toward specific FHI. Do we need to use MSFHI vs FHI?.~~

A brief description of the steps in this process (and associated sections in this Appendix) is as follows:

The integrated assessment defined in this Appendix is intended to make use of this guidance for either demonstrating that the FLEX strategies already developed can still be implemented as is or can be modified to remain viable, or developing different mitigating strategies specific to the flood hazard information.

Comment [SSP1]: Suggest "Assessment of Mitigating Strategies for New Flood Hazard Information" or something somewhat more descriptive
 FFTF - OK, we will use "Mitigating Strategies Assessment for New Flood Hazard Information"

Comment [NRC2]: Staff: The staff terminology will use integrated assessment or IA for the evaluation of possible actions beyond mitigating strategies and so it would be better to use different terminology in this appendix for the review of MS against the reevaluated flooding hazard (e.g., MS Flood Hazard Assessment). It is understood that all references to "integrated assessment" will be removed from this document to avoid confusion with the use of the term "integrated assessment" in conjunction with NTF R2.1 activities.
 FFTF - OK, we will use "Mitigating Strategies Assessment for New Flood Hazard Information". Also removed the term "integrated assessment" from this document.

Comment [NRC3]: The purpose of this document should be further clarified. Some suggested comments:

- The purpose of this guidance is to assess mitigating strategies in light of the reevaluated flooding hazards. The guidance does not preclude the need to perform an integrated assessment or supersede associated NRC guidance described in JLD-ISG-2012-05 (including any subsequent revisions).

The purpose of this appendix is to provide guidance for developing mitigating strategies and/or other capabilities for plant protection considering revised flood hazard information (FHI) devel... [1]

Comment [NRC4]: General acronym comment: Acronyms should be defined / re-defined for this appendix (should not rely on definitions from the rest of NEI 12-06 or other referenced documents). Make sure that the definitions and the use / applicability of these terms within this appendix is clear.
 FFTF - The format we have chosen is to not make this appendix is not a 'stand alone' document. It will rely on acronyms and ... [2]

Comment [NRC5]: "currently developed?"

Changed

Change not yet reflected here.

FFTF - fixed

Comment [NRC6]: Please note general NRC comment regarding applicability of FLEX guidance (particularly Appendix E) to AMS and THMS.

FFTF - We will review APP E for possible clarification, App E sufficient for AMS and THMS

A brief description of the steps in this process (and associated sections in this Appendix) is as follows:

- Section 2.0- this section is used to characterize the MSFHI.
- Section 3.0- the flood hazard used to develop the FLEX strategies is compared to the MSFHI to determine if the MSFHI is bounded.
- Section 4.1- if the MSFHI is NOT bounded in all aspects per as described in Section 3.0 (i.e., flood height, associated effects, and flood event duration), then the existing FLEX strategies are evaluated against the characteristics of the MSFHI to ensure the assumptions used in the FLEX strategies are not impacted.
- Section 4.2- if the evaluation performed per Section 4.1 determines that existing FLEX strategies cannot be implemented without change, Section G.4.2 provides guidance for determining are otherwise impacted, then an evaluation is performed to determine if the FLEX strategies can be modified to address any the vulnerability identified impacts.
- Section 4.3- as an alternative to modifying the FLEX strategies if the Section 4.2 evaluation determines the FLEX strategies cannot be successfully modified, then an alternate mitigating strategy (AMS) would can be evaluated considered. Unlike the FLEX strategies which assume a stylized specific event consequences (i.e., ELAP and LUHS) given result from an undefined external event, the AMS would be based specifically upon the flood as the initiating defined external event and would determine the plant impacts from the flood for determining the necessary strategies for mitigating the event. As such, the AMS would not assume an ELAP and LUHS unless the flood event caused such consequences. The AMS would, similar to the FLEX strategies, use a combination of plant equipment and FLEX equipment to maintain the key safety functions of core cooling, spent fuel pool cooling, and containment function.
- Section 4.4- if an AMS cannot reasonably be developed to mitigate the flood, then a Targeted Hazard Mitigating Strategy (THMS) would be developed that would consider alternative risk reduction measures. The difference between an AMS and THMS is that for the THMS there will be a need to open containment as an element of the strategy to perform the core cooling function and, as such, only the key safety functions of core and spent fuel pool cooling would be maintained. will not be maintained for the THMS. The THMS also assumes the flood as the initiating event.

Comment [NRC7]: See comment above on section numbering / terminology.

FFTF – OK, We will use G-1, G-2 numbering. We will make these changes during the editorial cleanup.

Comment [SSP8]: Still need to change section numbering here to G.2, G.3, etc. FFTF – OK < we agree. We will fix this during the editorial cleanup.

Comment [NRC9]: Clarify what is meant by "all aspects." Suggest adding a parenthetical (i.e., flood height, associated effects, and flood event duration). Recommended including definitions for these key terms. Will remove all aspects to "....."

Will delete "in all aspects" defined in App G Section 3 will use "associated affects" as consistent terminology include definition in App A

FFTF – OK, will use the suggested parenthetical note and will add a definition of "associated affects" to NEI 12-06

Comment [NRC10]: Should these items be identified as "vulnerabilities"? Seems like a bad sound bite. Maybe call them something else?

FFTF – OK, Changed to "impacts" in lieu of vulnerability

Comment [NRC11]: ... need not be maintained ... assumes the flood as the initiating event but also considers risk reduction measures that might include plant shutdowns and opening containment.

FFTF – see change in terminology

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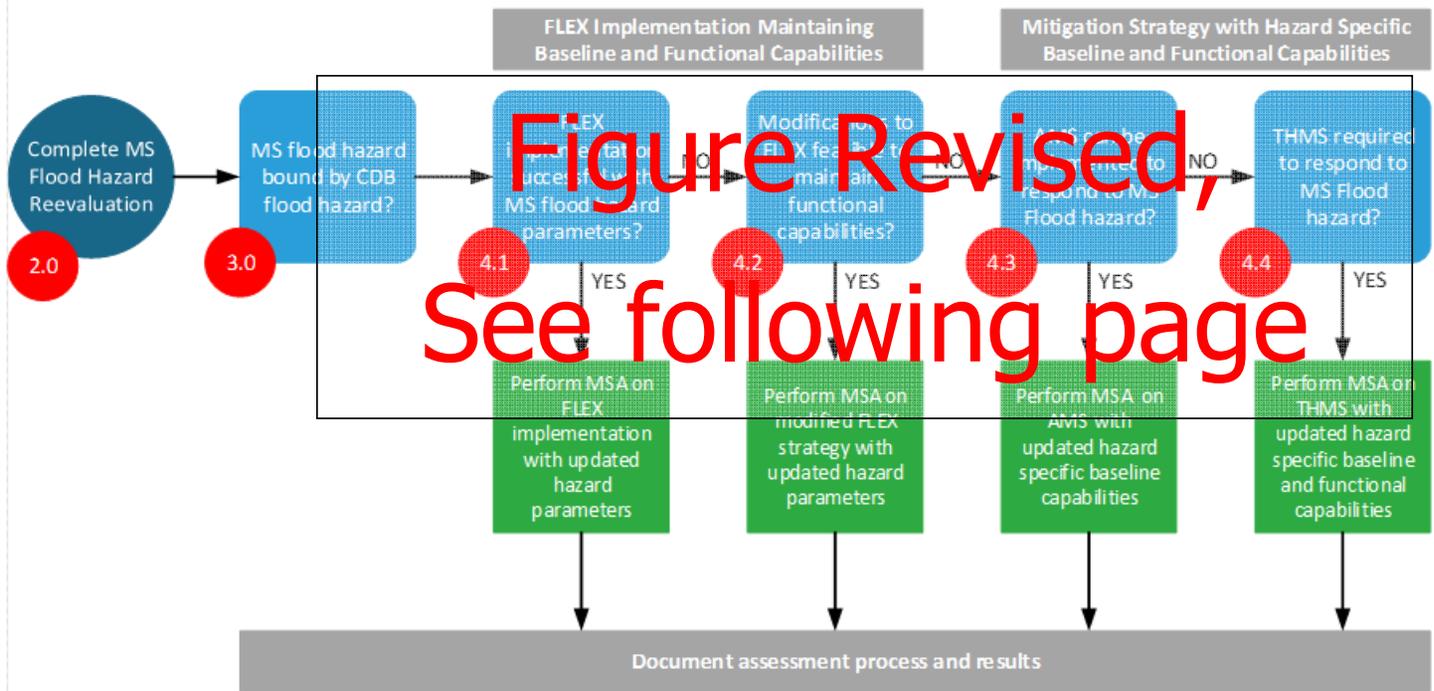


Figure Revised,
See following page

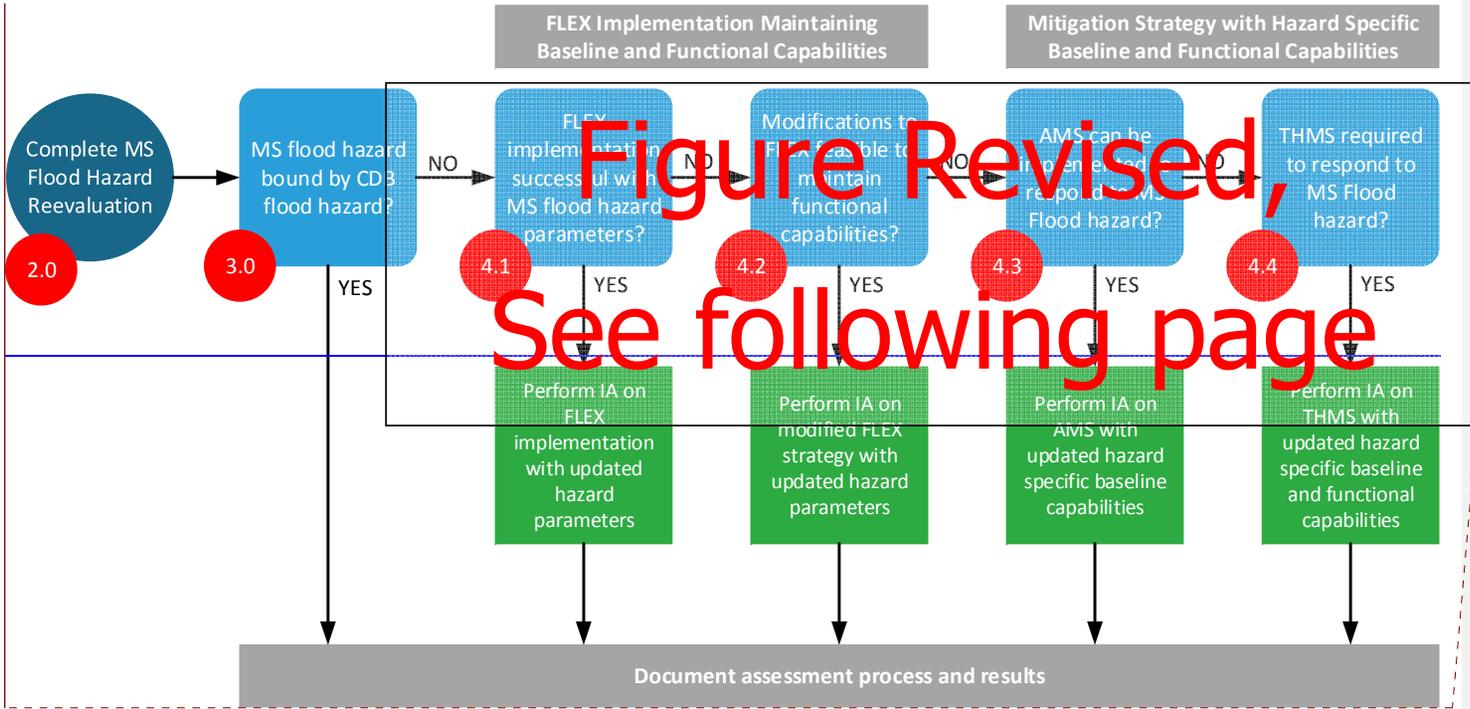


Figure Revised,
See following page

Figure 1 – Mitigation for New Flood Hazard Information and Mitigating Strategies Assessment Flow Chart

Comment [SSP12]: Use G.x section numbers in the figures.

What about a "Yes" result for the bounded question? Is that not a possible outcome? Show that this would be the MSA or include in this first block.
FFTF – agree, we will add a green block under 3.0 to illustrate the need to document this conclusion.

Comment [NRC13]: The whole lower section of this graph should discuss implementation plans. WRT IAs it should just say "candidate for IA."

FFTF - No intent to change – chart is for simplicity not guidance. IA should be removed from the chart. See next page for final chart.

Comment [NRC14]: Should this figure include multiple arrows... to reflect evaluation of multiple flooding aspects / hazards?

FFTF - No intent to change – chart is for simplicity not guidance. See next page for final chart.

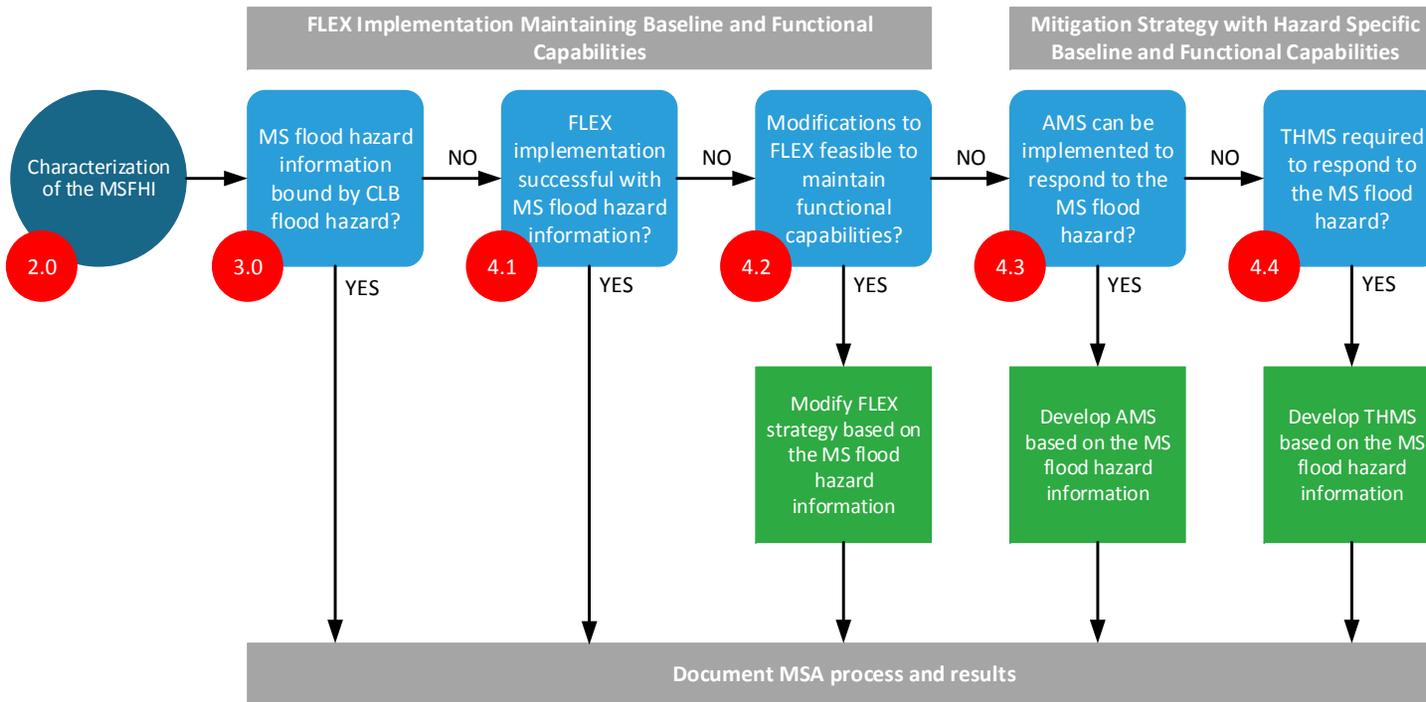


Figure 1- Mitigating Strategies Assessment Flow Chart

Comment [NRC15]: The whole lower section of this graph should discuss implementation plans. WRT IAs it should just say "candidate for IA."
 FFTF - No intent to change – chart is for simplicity not guidance. IA should be removed from the chart. See next page for final chart.

G.2 CHARACTERIZATION OF THE MSFHI

IDENTIFICATION OF CONTROLLING FLOOD PARAMETERS

The following controlling flood parameters should be identified from the MSFHI from the MSFHI are determined. The site should consider the following flood scenario parameters:

- flood level(s)
- flood event duration (s)
- relevant associated effects (e.g., wind driven waves and run-up effects, hydrodynamic loading including debris, sedimentation and erosion, etc.)
- warning time and flood event transient water surface elevations. Identify intermediate water surface elevations that trigger actions by plant personnel necessary to implement mitigation strategies
- plant mode(s) of operation prior to the event and during the flood event duration
- other relevant plant-specific factors

In some cases, only one controlling or bounding flood hazard may exist for a site. In this case, sites should define the flood scenario parameters based on this controlling flood hazard. However, sites that have a diversity of flood hazards should ensure all controlling hazard features are considered. In addition, sites may use different flood protection systems to protect against or mitigate different flood hazards. In such instances, the integrated mitigating strategy assessment should define multiple sets of flood scenario parameters.

If appropriate, the site may combine these flood parameters to generate a single bounding set of flood scenario parameters for use in the assessment. This bounding scenario (e.g., the maximum water surface elevation from one hazard combined with inundation duration, minimum warning time, and maximum impact of associated effects from other hazards) can then be used in the assessment instead of considering multiple sets of flood scenario parameters.

Comment [NRC16]: Editorial: Does this mean to say "...are defined based on the R2.1 reevaluated hazard?"

- or, refer to whatever guidance is being used for the determination?
- or could add ... based on interactions with the NRC staff. Plan is for NRC to document agreement on MSFHI in a letter to licensees.

NO – will discuss

+As determined by R2.1 FHR – add another sentence for future applicability

FFTF – Revised the introduction to add additional explanation.

Comment [NRC17]: This, and other terms from the IA ISG, that are also used in App G should be clearly defined.

Definitions will be in App A

FFTF – we will add the necessary definitions from existing flooding guidance documents to App A of NEI 12-06

Comment [nrx18]: NRC 17 plural or singular
FFTF – Depends on the site, one for each relevant flooding event

Comment [NRC19]: I assume this includes proceduralized triggers beyond on-site water levels – see LIP white paper.

Out of ISG will discuss
+noted

FFTF - That was the intent.

Comment [NRC20]: Not clear what's meant here. If we're just talking water level, mode is irrelevant. I think what you're getting at is a plant shutdown in response to a trigger. This becomes part of the strategies. You can probably delete bullet here.

Wording came from ISG, need to discuss
FFTF - MODE of operation has an effect on necessary actions. Document OK as is.

Comment [NRC21]: It may not be appropriate in all cases to create a single bounding scenario. It is recommended that a qualifier such as "if appropriate" be added to this paragraph as shown.

Discuss and include "If appropriate"
FFTF - Noted – OK as is

Comment [NRC22]: Is this really true for all possible scenarios at existing plants? Do we have any complications that would undermine this (e.g., loss of access to the UHS due to a maximal flooding event that wouldn't be present for a lower flooding event).

FFTF - Disagree – this came from the ISG. OK as is.

G.3 BASIS FOR MITIGATING STRATEGY ASSESSMENT TRIGGER

This section provides guidance on comparing the MSFHI to the flood hazard used for developing the FLEX mitigating strategies. In most cases FLEX was designed to this was the Current Design Basis (CDB) flood hazard. The CDB flood hazard will be used herein to represent the flood hazard used for the FLEX mitigating strategies. When the MSFHI or the associated effects are not bound by the CDB flood hazard, then an integrated assessment of the impacts on mitigating strategies is required.

If the MSFHI is bounded by the CDB, then this information is documented in accordance with Section 6 of this appendix and no further action is required. This is a hazard to hazard comparison and does not take the plant's flood protection or design basis into consideration.

All aspects of the flood hazard must be given consideration when determining if it is bounded by the CDB. These parameters include water level, associated effects, and the identification of new flood mechanisms that were not addressed in the CDB flood analysis. These parameters include water level, associated effects, and the identification of new flood mechanisms that were not addressed in the CDB flood analysis. The following considerations should be addressed guidance applies to the determination

- Only those flood mechanisms whose effects exceed the CDB need to be included in the integrated mitigating strategy assessment (e.g., if a site's CDB includes river flooding and storm surge, and the MSFHI shows that the design basis flood bounds the river flood results, but not the storm surge results, only the storm surge needs to be evaluated in the integrated mitigating strategy assessment).
- If the MSFHI exceeds the design basis flood level, an assessment (i.e., addressing applicable hazards) of the effects of the applicable flood mechanism is required.
- If the MSFHI introduces a new flood mechanism (e.g., local intense precipitation) or a new associated effect (e.g., debris) that was not included in the CDB, then the integrated mitigating strategy assessment must be performed on the new mechanism.
- If one or more associated effects was not considered in the CDB, those effect(s) would be treated as being not bounded and an integrated mitigating strategy assessment (all applicable flooding mechanisms) is required, except
 - If only a single associated effect of a flooding mechanism is not bounded by the CDB, the integrated assessment needs to initially consider only the changes introduced by the new or more severe associated effect. It is only necessary to consider all the aspects of the flood hazard when there is reason to believe that the single unbounded associated effect influences other aspects of the evaluation, or when more than one associated effect differs from the CDB.

Comment [SSP23]: Is the intention to use the text provided on page 21 here, rather than this text?
FFTF - Yes, we intend to replace this section in its entirety with the text in the replacement to this section (see immediately below).

Comment [NRC24]: Design or licensing? Or is this a meaningful distinction for this exercise?

Current Design Basis

FFTF - we intend to replace this section in its entirety with the text in the replacement to this section (see immediately below).

Comment [NRC25]: Clarification is needed regarding the MSFHI. For example, does MSFHI include all relevant flood scenario parameters (e.g., the flood height, associated effects, and flood event duration)? If so, then it is not clear why MSFHI and associated effects are identified as separate components in this sentence. It is recommended that clear definition of MSFHI be provided in this Appendix.

MSFHI defined in Section G2 to discuss

FFTF - we intend to replace this section in its entirety with the text in the replacement to this section (see immediately below).

Comment [NRC26]: This statement is not clear. The hazard to hazard comparison utilizes the plant's DB hazard.

Removing last sentence "hazard to hazard"

FFTF - we intend to replace this section in its entirety with the text in the replacement to this section (see immediately below).

Comment [NRC27]: It may also be appropriate to consider flood event duration parameters (e.g., warning time) in understanding whether the DB bounds the MSFHI. For example, if warning time is shorter under the MSFHI than assumed in develop... [3]

Comment [NRC28]: Why is this different than the listing in section 2.0? Is it intentional, or would it be better to merely refer back to that section? ... [4]

Comment [NRC29]: It's unclear what determination is being discussed here. The paragraph starts out discussing a determination of whether the CDB bounds the MSFHI, but the bullets below seem to speak about a determination of whether an IA is necessary for some aspects of a flood hazard. Based o... [5]

Comment [NRC30]: There is a certain amount of sense to this as a criteria for conducting the IAs, but it seems out of place here in the portion of the appendix that covers determining if the CDB is bounding for the MSFHI. Is there a better place for this? ... [6]

G.3 DETERMINING IF THE CLB FLOOD BOUNDS THE MSFHI

In most cases, FLEX was originally designed to function in the presence of the site's design basis flood,

This section provides guidance on:

- Comparing the MSFHI to the flood hazard used for developing the FLEX mitigating strategies,
- Describing what flood mechanisms or associated effects of the MSFHI need to be evaluated.

For the purposes of this explanation, the term FLEX DB will refer to the flood hazard for which FLEX was designed and the term MSFHI will refer to new flood hazard information.

All elements of the flood hazard must be given consideration when determining if the MSFHI is bounded by the FLEX DB and when determining the scope of the evaluation that is required.

These elements include applicable flood mechanisms (including the identification of new flood mechanisms that were not addressed in the FLEX DB flood analysis) and for each mechanism: water level, flooding event duration, warning time, and associated effects. The following considerations apply:

- The FLEX DB to MSFHI comparison is to be done on a flood mechanism to flood mechanism basis, comparing the flood water heights, associated effects, warning times, and flooding event duration.
- If the MSFHI overall flood level exceeds the design basis flood level for a given flood mechanism, the FLEX DB flood does not bound and an assessment of the effects of the applicable flood mechanism is required.
 - Only those MSFHI flood mechanisms whose effects exceed the FLEX DB need to be included in the assessment (e.g., if a site's FLEX DB includes river flooding and storm surge, and the MSFHI shows that the FLEX DB flood bounds the river flood results, but not the storm surge results, only the storm surge needs to be evaluated in MSA.)
- If the MSFHI introduces a new flood mechanism, (e.g., local intense precipitation) or a new associated effect (e.g., debris) that was not included in the FLEX DB, then FLEX DB does not bound the MSFHI for this condition and the assessment must be performed on the new mechanism or associated effect.
- If one or more associated effects evaluated in the MSFHI is greater than the effect in the FLEX DB or was not considered in the FLEX DB, those effect(s) would be treated as being not bounded and an assessment of all associated flooding mechanisms is required, except
 - If only a single associated effect of a flooding mechanism is not bounded by the FLEX DB, the assessment needs to initially consider only the changes introduced by the new or more severe associated effect. It is only necessary to consider all

Comment [NRC31]: Why is this different than the listing in section 2.0? Is it intentional, or would it be better to merely refer back to that section?

FFTF - Section G.2 describes the information that should be collected, this section describes how to compare that information with the design basis and how extensive an analysis is required.

Comment [SSP32]: Original comment on the meaning and intent of the use of the word "determination" remains valid. The subject of this particular paragraph is "determining if the MSFHI is bounded by the CDB." The list that follows is purported to be guidance that applies to the "determination" but includes guidance on what to do with the output of the "determination" rather than how to make the "determination." For example, the second bullet says that an assessment of the effects of an applicable flood mechanism is required if its overall level exceeds the CDB; this is not guidance on determining whether the CDB bounds the MSFHI. The same holds true for the remainder of the list, with only the first bullet providing guidance that applies to the determination of whether the CDB is bounding. What the list really does is provide guidance on what the content of the assessment should be once a licensee determines that the CDB is not bounding.

Suggest moving those bullets to G.4...? Or separate G.3 into G.3.1 for determining whether MSFHI is bounded and G.3.2 for determining the scope of the assessment in G.4....?

Comment [NRC33]: Recommend deleting this second bullet.

FFTF - rewrote the description to clarify

Comment [NRC34]: There is a certain amount of sense to this as a criteria for conducting the IAs, but it seems out of place here in the portion of the appendix that covers determining if the CDB is bounding for the MSFHI. Is there a better place for this?

FFTF - Section revised to clarify.

the aspects of the flood hazard when there is reason to believe that the single unbounded associated effect influences other aspects of the evaluation, or when more than one associated effect differs from the FLEX DB.

If it is determined that the FLEX DB bounds the MSFHI for a given flood mechanism, then this information is documented in accordance with Section 6 of this appendix and no further action is required for that flood mechanism.

If it is determined that the FLEX DB does not bound the MSFHI, the guidance in sections 4.1 through 4.4 below (as applicable) should be followed for all unbounded flood mechanisms and associated effects as described in the bullets above.

Comment [EEB35]: Why are these bullets included in this section rather than in G.4? They affect the content of the assessment, not the basis for conducting it.

FFTF – This section replaces section G 3 in its entirety and is intended to serve as an introduction/explanation for the evaluation guidance. This section was revised to clarify its guidance and purpose.

G.4 EVALUATION OF THE ~~EFFECTIVENESS~~ ~~FEASIBILITY~~ OF MITIGATING STRATEGIES WITH RESPECT TO THE MSFHI

Once it has been determined that one or more ~~aspects~~ of the MSFHI (i.e., water level, associated effects, warning time, flood event duration, etc.) are not bounded by the ~~CDB-FLEX DB of the plant, an IAa (MSA)~~ an assessment of the impacts ~~on mitigating strategies~~ is required. The focus of the ~~IA-MSA~~ assessment will be to determine the ~~overall effectiveness~~ ~~feasibility of a~~ appropriate mitigating strategy ~~in consideration of~~ for the new flood hazard information. This determination includes considering use of or modification of the existing FLEX strategies or development of new mitigating strategies using the flood event as the initiating event. The following sections provide guidance for ~~Steps~~ strategies 4.1 through 4.4 as shown in Figure 1 (as necessary).

~~It is anticipated that as the process in Figure 1 moves from left to right, increased justification of the effectiveness of the strategy will be required basis for moving to the next step of the process is necessary. When impacts vulnerabilities are found in a particular step, and it is determined that one or more vulnerability impact cannot be resolved in the context of the parameters for that particular strategy (i.e., the guidance of the main body of this document cannot be met), only then will the MSA evaluation continue to the next level? step.~~

The scope of this ~~IA-MSA~~ should be on the SSCs, operator actions and procedures required to successfully implement the selected mitigating strategies so that a site may cope indefinitely throughout the duration of the applicable hazard. Sections 4.1 and 4.2 focus on evaluating implementation of the currently designed FLEX strategies with respect to the MSFHI. If any modifications are proposed to the existing FLEX strategy, those should be taken into account in Section 4.2.

~~If it is not practicable feasible to modify a FLEX strategy to cope with the mitigating strategies flood hazard information, then an Alternate Mitigating Strategy (AMS) is developed. Section 4.3 should be used to develop and evaluate the effectiveness of the sn Alternate Mitigating Sstrategy in maintaining that maintains core and spent fuel pool cooling and containment function using a combination of FLEX equipment and/or plant equipment.~~

~~If development of an AMS is not practicable chosen feasible then A-a Targeted Hazard Mitigating Strategy (THMS) may be developed to maintain core and spent fuel pool cooling. Maintaining the containment function is not required as part of a THMS. Section 4.4 guidance should be used for this evaluation. Similar to the~~

For both AMS and THMS, MSFHI specific scenarios and baseline capabilities should be developed for use in the evaluation and documented in accordance with Section 6.

If any of the above strategies for addressing new flood hazard information (modified FLEX, AMS, or THMS) involve changes to the current FLEX strategy, the required baseline capabilities of FLEX to cope with an ELAP and LUHS must continue to be maintained for all other screened-in hazards.

G.4.1 ASSESSMENT OF THE CURRENT FLEX STRATEGY ~~REVIEW~~

This section applies to the condition where the current FLEX strategies ensure the key safety functions are maintained or restored without any modification required. The

Comment [SSP36]: Should this be "Feasibility" instead?
FFTF - OK

Comment [NRC37]: What is an "aspect" of the MSFHI? Is it a "mechanism" or "associated effect"? We've also used the word "parameter." FFTF - Will add a definition of "all aspects" as a parenthetical note (refer NRC 8)

Comment [NRC38]: What is meant by "overall effectiveness"? Is it related to "feasibility" or "feasibility and reliability"? This guidance appears to be a check of the feasibility of mitigating strategies rather than an assessment of overall effectiveness (e.g., via assessment of quantitative reliability). Should focus on feasibility only. Similar comments apply elsewhere in the document, but will not be repeated. OK changed to feasibility need to change in document

FFTF - OK will change to feasibility elsewhere in document

Comment [NRC39]: This notion is not apparent when moving from AMS to THMS because the guidance provided in Sections 4.3 and 4.4 is nearly identical. **Noted not changing**
Get rid of the word "increased"

FFTF - OK as revised

Comment [NRC40]: Next step only for those aspects?
FFTF - No Applies to whole evaluation

Comment [NRC41]: "Should"? This is guidance, not requirements.
FFTF - Accepted

Comment [SSP42]: Agreed to change to "practical." Define criteria for "practical."
FFTF - OK

Comment [SSP43]: How will a licensee justify? (see response to the following original comment)

Suggest NEI propose decision criteria to assist in review.
FFTF - see proposed text.

Comment [NRC44]: It is unclear what criteria will be used to determine whether it is appropriate to remove the barrier of containment. **Licensee to justify not part of guidance**
FFTF - see proposed text.

Comment [NRC45]: Under what circumstances is this an acceptable outcome for compliance with the proposed rule? **Change made to clarify** Order and rule require maintaining the key safety functions. **DO we need the rule language to allow not keeping one ksf?**
FFTF - SRM approved the Staff's recommendation 2 which involved targeted or scenario specific mitigating strategies. If ... [7]

guidance in this section ~~evaluates~~ is used for evaluating the existing FLEX strategies to ~~verify~~ ~~confirm they remain practicable are feasible they can be deployed in view of for~~ can be implemented considering the conditions associated with the MSFHI.

The IA-MSA should ~~validate~~ ~~confirm~~ the boundary conditions and ~~initial~~ assumptions of the initial FLEX design as described below. ~~based on the MSFHI.~~

- Flood protection features credited for the existing FLEX strategies ~~should be evaluated in accordance with~~ meet the guidance and performance criteria in Section 5 of this appendix.
- The validation ~~documentation~~ for the existing FLEX strategies ~~should be reviewed with respect to~~ remains unchanged considering the conditions of the MSFHI ~~to determine if additional validation of the deployment actions is necessary. A (i.e., no revised or additional validation of the deployment actions is necessary). would only be needed if the actions changed so then G.4.1 would not apply and would need to be in G.4.2.~~

If the IA-MSA demonstrates that the existing FLEX strategies ~~can be deployed as designed, are feasible for the MSFHI~~ can be deployed as designed, then this IA-MSA is considered complete and ~~should be is~~ documented per Section 6 of this appendix. ~~Keep the original wording.~~

If this IA-MSA demonstrates that the existing FLEX strategies ~~cannot be implemented as designed, are not feasible for the MSFHI, cannot be implemented as designed, those aspects of the FLEX strategies that could not be implemented (i.e., vulnerabilities) are documented, and the integrated assessment proceeds to Section 4.2 of this appendix. Keep original wording.~~ either FLEX must be modified, or an AMS or THMS developed. Guidance for these three options are in Sections G.4.2 through G.4.4 below.

G.4.2 MODIFIED FLEX STRATEGY REVIEW

~~This section applies to the condition where the current FLEX strategies will need to be modified based on the review conducted in Sections 3.0 and/or 4.1. This section provides guidance on for modifying the FLEX strategies to address the conditions associated with the MSFHI and performing an IA-MSA to evaluate the effectiveness of modified FLEX strategies.~~

The process to ~~revis~~ ~~modify~~ ~~develop~~ the ~~revised~~ FLEX strategies should mirror the original analysis used to determine FLEX baseline capabilities only using the MSFHI when completing Sections 2, 3, 4, 6 and 10 of the main body of this document. ~~The~~ ~~If~~ the ~~vulnerabilities~~ impacts of the MSFHI have not already been accounted for in the current FLEX design, they ~~identified in Sections 3.0 and/or in Section 4.1 of this appendix~~ need to be addressed and alternatives ~~such~~ as early deployment, modifications to the flood protection features, procedures or operator actions should be considered. The sequence of events timeline established for the current FLEX design must be modified as necessary to reflect the change based on the MSFHI. ~~If it is determined that revising the FLEX strategies is practical/practicable, then documentation~~ Documentation of these modifications should be performed in accordance with Section 11.8 Configuration Control. ~~If a~~ Any changes are proposed to the FLEX strategies, then it must be ensured

Comment [NRC46]: Again, this is a poor choice of words because we are discussing a validation activity. It's also a bit uncertain what is to be done to meet this guidance. **Changed to confirm**
FFTF - see revised text

Comment [NRC47]: This covers the water for plants that have already validated their strategies, but would be improved if it were modified to cover future validation as well. **FFTF - Not necessary will be addressed by the validation process for future as well as existing FLEX designs**

Comment [NRC48]: "are feasible for the MSFHI"
FFTF - no, this is a "go-no go" decision. If changes are made the process goes to 4.2.

Comment [NRC49]: "are not feasible for the MSFHI"
FFTF - no, this is a "go-no go" decision. If changes are made the process goes to 4.2.

Comment [NRC50]: It is a bit tempting to change the words we use to describe things for the sake of not sounding repetitive, but that runs the risk of introducing confusion. You might consider treating "modified FLEX strategies" as the name of the thing being developed or picking a different name that indicates it's for flooding since there may be other modifications necessary for seismic, etc. **noted not changing**
FFTF - OK

Comment [NRC51]: Where in Section 3.0 is there guidance on identifying vulnerabilities? Need to coordinate sections 3.0 and 4.0 Section 3.0 does the comparison of the MSFHI to the CDB to determine the impacts. 4.1 doesn't determine the impacts, it determines if the current FLEX strategies can function with the impacts.
FFTF - removed the reference to a particular section. The section is not important, the fact that they exist is what needs to be addressed, no matter what identified the problem.

Comment [NRC52]: It is requested that the text be more explicit regarding what this means. For example, is this permitting strategies to "go straight to Phase 2" without a requirement to protect Phase 1 equipment from the reevaluated hazard? If so, a straightforward statement of such would increase clarity. All 3 phases would be reviewed and evaluated. What does this mean? Early deployment ... [8]

Comment [NRC53]: See my comment on the fourth paragraph of Section 4.0. In that section, this appendix is setting the bar at "practicable" rather than "practical."
FFTF - Changed to **practicable practical** ... [9]

Comment [SSP54]: Returning to "practical"... correct?
FFTF - Yes, change made.

~~that the required baseline capabilities of FLEX to cope with an ELAP and LUHS are maintained for all screened in hazards.~~

The ~~assessment~~ MSA then evaluates the resulting design using a process similar to that discussed in Section 4.1. The following guidance aids in that evaluation:

- Each ~~vulnerability-identified impact~~ should be evaluated ~~separately~~. However it is acceptable for a change to a strategy to address more than one ~~vulnerability-identified impact~~.
- Evaluation of the flood protection features that are required to support FLEX strategies should meet the performance criteria provided in Section 5 of this appendix.
- Validation of new or modified actions related to FLEX strategies will be performed per App. E.
 - Timelines showing necessary manual actions, including cues, indications, notifications and dependencies of actions that need to be performed in series or parallel need to be reviewed and revised if necessary.
 - An integrated review must be performed to include all actions required to accomplish the FLEX strategy as a whole.
 - .
- ~~If Any changes to the use of warning time was not credited in the original FLEX strategy, but is used in the modified FLEX strategy, the integrated action timeline must be modified to include~~ should be included in the sequence of events along with the appropriate actions. Evaluation of the effectiveness of warning time includes review of the flooding event and warning time triggers needed to implement any flood protection or FLEX mitigation measure. Multiple triggers or a single trigger can be established for milestones if the response to a flood hazard is done in graduated steps (e.g. stage equipment, assemble equipment, and complete implementation). It must be documented in the ~~IA-MSA~~ that all triggers and resulting implementation steps are achievable, proceduralized and can be performed in a sequence that supports a timeline that allows FLEX strategies to be implemented. ~~The inclusion of warning time in the FLEX strategies should not invalidate the required baseline capabilities of FLEX to cope with an ELAP and LUHS.~~
- Information on the approach that may be utilized to evaluate appropriate warning time for the local intense precipitation flooding hazard is presented in NEI white paper “Warning Time for Maximum Precipitation Events”, reference ~~xx~~. In addition, the National Weather Service and the National Hurricane Center offer additional tools that can be helpful when establishing warning time. Warning time for other hazards such as dam failures and river forecasts should be defined based on the site’s communication plans with dam operators or other organizations responsible for providing this information.
- Document the ~~IA-MSA~~ per Section 6 of this appendix.

Comment [NRC55]: This sounds odd. Not changing I agree this sounds odd. Why would we go back to 4..1?
FFTF – no change made to text

Comment [NRC56]: Does this mean that combined/correlated aspects will not be addressed in combination?
No the combined aspects of MSFHI will be addressed as described in section 2 of App G
FFTF - deleted the word "separately"

Comment [NRC57]: What is this intended to convey? Seems clear, need to discuss
+Noted – review for removal
FFTF – text unchanged. It helps hold the intent of the section together even if it is repetitive to App E.

Comment [NRC58]: I interpret this as meaning that the integrated review of Appendix E, Section 6.5, should be reperformed in order to ensure adequate resources are available to accomplish the modified FLEX strategy as a whole.
FFTF - Correct

Comment [NRC59]: It is not clear upon what basis licensees will be crediting warning time if it was not previously appropriate to credit it. Moreover, technical justification must be provided to crediting warning time, including cases where “lesser floods” may be consequential to the FLEX strategy but associated with shorter warning times. This comments applies to Sections 4.3 and 4.4 as well, but will not be repeated. Need further discussion. Warning time was described in the FHRR the NRC has agreed to accept as discussed in section 2 of App G.
+Noted – OK as is

FFTF – text unchanged. It is not whether warning time is appropriate to credit or not (if it isn't it will not stand up to the validation process), it is whether the licensee choose to credit it in their original design and if not, it they intend to credit it with the FHRR. If their strategy changes, they need to confirm that the new strategy works.

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Comment [NRC60]: It is unclear what is meant by this sentence. Does this apply to the “baseline capabilities” for hazards other than the MSFHI? This comment applies to other places where this statement is repeated. Intent is to ensure actions taken due to warning time do not impact FLEX strategy for ELAP and LUHS

FFTF – This sentence and others like it in sections G 4.2, G 4.3, and G 4.4 were deleted and instead the statement was included at the end of section G 4.0 since it applies to all of these sections.

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If the IA MSA demonstrates that a modified FLEX strategy would not be effective, for some flood events or attributes, the vulnerabilities and basis for this conclusion are documented and the IA proceeds to evaluate an AMS as described in Section 4.3 is pursued.

G.4.3 ASSESSMENT OF ALTERNATE MITIGATION STRATEGIES

This section provides guidance for developing and evaluating the effectiveness of an Alternate Mitigation Strategy's (AMS) developed to address the MSFHI. The catalyst for development of an AMS is the vulnerabilities identified in the previous sections and the objective is to develop mitigating strategies specific to the MSFHI. These strategies would be supplemental to the existing FLEX strategies.

This section addresses performing the MSA for the purpose of demonstrating the key safety functions can be maintained or restored by implementation of an AMS to accommodate the MSFHI. For some scenarios it may be more effective to address the MSFHI through the development of an AMS separate from the FLEX mitigating strategies. In this case the AMS would be based upon the flood as the initiating event and would determine the sequence of events and plant impacts from the flood for determining the necessary strategies for mitigating the event (e.g., the AMS would not assume an ELAP and LUHS unless or until such time as the flood event caused such consequences).

Figure 2 below illustrates the evaluation process and necessary steps in performing developing an IA MSA on an AMS.

The guidance of Sections 2 through 9 in the main body of this document should be used to develop the AMS. However, in this case the AMS would be based upon the flood as the initiating event and would determine the sequence of events and plant impacts from the flood for determining the necessary strategies for mitigating the event. The AMS would not assume an ELAP and LUHS at the start of the event unless or until such time as the flood event caused such consequences. The boundary conditions and initial assumptions associated with an ELAP and LUHS would not apply unless these were consequences of the flood event. The evaluation to develop the AMS must ensure that the required baseline capabilities of FLEX to cope with an ELAP and LUHS are maintained for all other screened-in hazards.

The scenario should consider maximum flood height, associated effects and flood progression timeline event duration. Once the scenario is clearly understood, the baseline capabilities of the AMS should be defined based on the mitigating strategies flood hazard specific information. The FLEX boundary conditions may not apply, depending on the mitigating strategies flood hazard conditions. The following plant conditions should be evaluated for the entire flood event duration:

- Warning time for advanced preparation
- Availability of offsite and on-site power
- Elevation, location, availability and capability of safety related SSCs credited to support key safety functions
- Location and protection level of FLEX equipment

Comment [NRC61]: It is unclear what options are available to licensees when significant warning time is not available.
FFTF - Noted no change. This will have to be determined on a licensee-by-licensee basis as necessary.

Comment [NRC62]: This section seems problematic. It doesn't strike me as providing much in the way of guidance as to what an AMS is.

FFTF - Noted no change. We will ensure AMS and THMS are defined in App A of NEI 12-06

Comment [NRC63]: Please note NRC's general comments regarding the differences between AMS and THMS and FLEX strategies. It is unclear that existing FLEX guidance (particularly App. E) remains appropriate and applicable. See proposed actions at end of document

FFTF - Originally FLEX was required to be designed to the design basis flood. The difference between the design basis flood and the MSFHI is only the differences in the various flooding parameters (such as water height, warning time, etc.). There are no fundamental differences in the mechanics of flooding that would require a change to the FLEX validation process.

Industry will review the FLEX validation guidance to determine if changes to it (Appendix E in this document) are necessary to address a flooding scenario.

Comment [nrxp64]: NRC58 comment – Is LOOP part of the assumed initial condition? What is the timing
FFTF - No LOOP or ELAP unless caused by the flood event. See text.

Comment [nrxp65]: NRC58 comment – Is LOOP part of the assumed initial condition? What is the timing
FFTF - No LOOP or ELAP unless caused by the flood event. See text.

Comment [NRC66]: In addition to the list below, other relevant considerations include credible flood protection failures and associated consequences.

FFTF - No only consider failures caused by the flood event
+Noted – OK as is

Comment [NRC67]: Why is this limited to safety-related SSCs?
FFTF - changed as shown - only SSC's that support KSF's
+Noted – ok as is

- Site access

The IA-MSA then evaluates the resulting design using a process similar to that discussed above. The following ~~guidance aids in that evaluation should be considered:~~

- ~~Evaluation~~ Design and evaluation of the flood protection features that are required to support FLEX-AMS strategies should meet the performance criteria provided in Section 5 of this appendix.
- Validation of new or modified actions related to FLEX-AMS strategies will be performed per App. E.
 - Timelines showing necessary manual actions, including cues, indications, notifications and dependencies of actions that need to be performed in series or parallel need to be reviewed and revised if necessary.
 - An integrated review must be performed to include all actions required to accomplish the FLEX strategy as a whole.
- If warning time ~~was not credited in the original FLEX strategy, but~~ is used in the ~~modified~~ FLEX-AMS strategy, ~~the integrated action timeline~~ sequence of events must be modified to include the appropriate actions. Evaluation of the effectiveness of warning time includes review of the flooding event and warning time triggers needed to implement any flood protection or FLEX mitigation measure. Multiple triggers or a single trigger can be established for milestones if the response to a flood hazard is done in graduated steps (e.g. stage equipment, assemble equipment, and complete implementation). ~~It must be documented in the IA-MSA that all~~ All triggers and resulting implementation steps are ~~to be~~ achievable, proceduralized and can be performed in a sequence that supports a timeline that allows FLEX strategies to be implemented. ~~The inclusion of warning time in the FLEX strategies should not invalidate the required baseline capabilities of FLEX to cope with an ELAP and LUHS.~~
- Information on the approach that may be utilized to evaluate appropriate warning time for the local intense precipitation flooding hazard is presented in NEI ~~white paper~~ 15-05 “Warning Time for ~~Maximum-Local Intense Precipitation Events~~”, reference xx. In addition, the National Weather Service and the National Hurricane Center offer additional tools that can be helpful when establishing warning time. Warning time for other hazards such as dam failures and river forecasts should be defined based on the site’s communication plans with dam operators or other organizations responsible for providing this information.
- ~~The next step in this evaluation is to determine~~ Demonstrate the effectiveness of the AMS’s ~~ability~~ to maintain key safety functions for the entire event duration utilizing the scenario specific baseline capabilities. ~~This evaluation shall should include consider~~ the following attributes:
 - the plant conditions

Comment [NRC68]: It is unclear what this phrase means in the context of guidance (e.g., is the following list guidance “that should be followed” or simply “considerations for the user”)? ~~Simply considerations~~
FFTF – The guidance should be followed. Text changed accordingly.

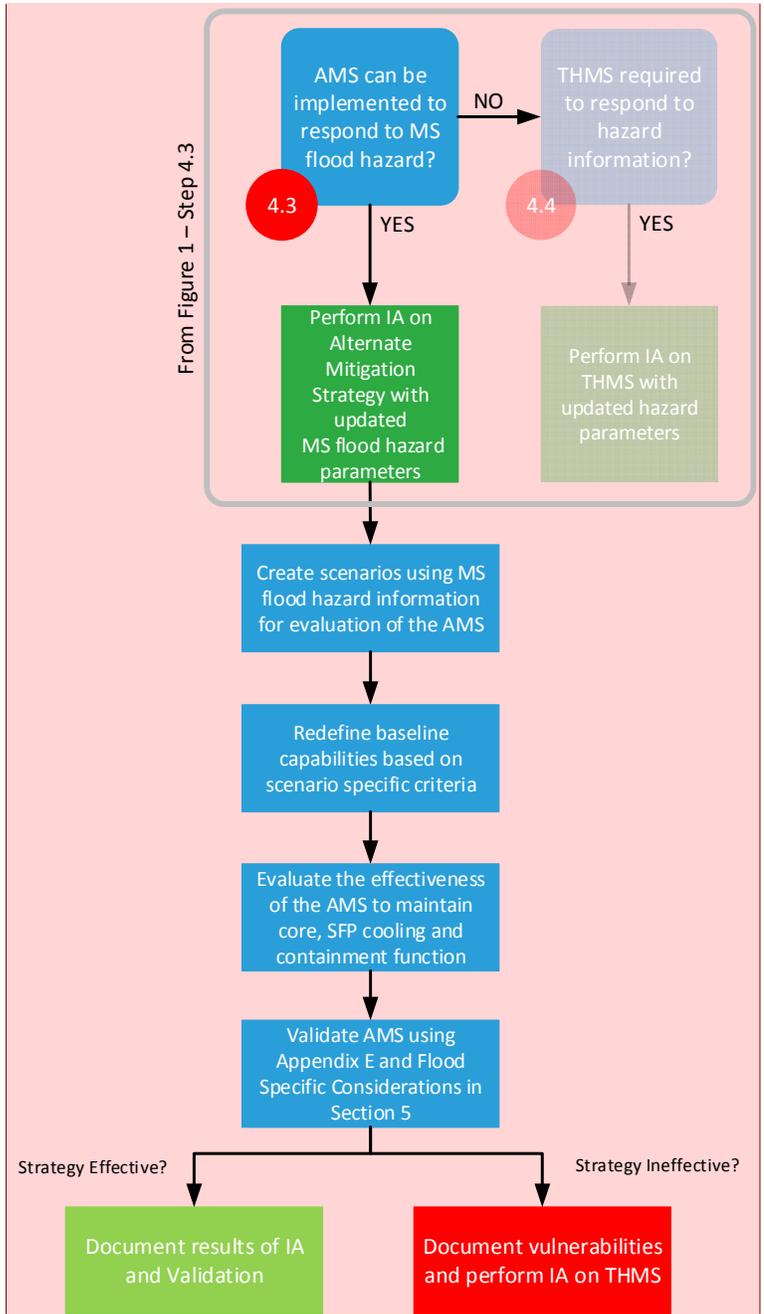
Comment [SSP69]: To clarify the original comment:
How should a future inspector or reviewer take into account whether or not a licensee has considered the individual elements of guidance in this list? If these are “simply considerations,” I don’t believe there is any guidance here that would need to be endorsed by the agency because the items listed are merely things someone might think about. It might be worth considering modifying this phrase to reflect what you expect licensees to actually do and what you want inspectors/reviewers to take into account in evaluating what was done.
FFTF - OK, Text changed as shown.

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Comment [NRC70]: This bullet seems to imply that the AMS is established first and then “tested against” the scenario. Instead, it is generally more appropriate and effective to first define the scenario (including plant conditions) and use that scenario information and evaluation tools to develop the strategy. Logic trees are useful tools for performing such an analysis. It is requested that this document provide additional clarification for the process used to develop the AMS. ~~Main intent of the appendix is for evaluation. The body of the document sections 2-9 are used for development. See second paragraph of App G 4.3 I agree with the NRC’s comment.—This step carries over the concept that this appendix was doing an IA of developed strategies.~~
+Noted –
FFTF – OK. Changed “determine” to “demonstrate” and “shall” to “should consider”. See text.

- plant at power or shutdown as a result of the pending flood
- equipment affected by the consequences of scenario parameters
- availability of offsite and on-site power
- a detailed description of the scenario and its key components
- a description of the approach(es) used for mitigation
- a timeline showing necessary manual actions, including cues, indications, notifications
- dependencies of actions that need to be performed in series or parallel
- an evaluation of the effectiveness of active components and flood protection features in accordance with Section 5 of this appendix
- a validation of manual actions in accordance with Appendix E
- Document the ~~IA-MSA~~ per Section 6 of this appendix.

Following the evaluation of the AMS, document the results as described in section 6 and determine if the strategy is effective in maintaining the key safety functions. If effective, the IA-MSA process is complete and no further evaluation is required. If the IA-MSA demonstrates that as a result of the mitigating strategies flood hazard an AMS would not be effective in addressing the MSFHI, the vulnerabilities are documented and the IA-MSA proceeds to develop a Targeted Hazard Mitigation Strategy (THMS) as described in Section 4.4.



Comment [SSP71]: Change IA to MSA.
 Change section numbers and "Step" numbers to G.x, etc...
 FFTF _ OK, will change the figure after the rest of the appendix is finalized.

Figure 2 – Alternate Mitigation Strategy Evaluation Flowchart

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G.4.4 DEVELOPMENT OF ASSESSMENT OF TARGETED HAZARD MITIGATING STRATEGIES

This section provides guidance on developing and evaluating the effectiveness of a Targeted Hazard Mitigation Strategy (THMS) to address the MSFHI. For some scenarios it may be necessary to address the MSFHI through the development of a THMS because of the inability to develop an AMS that can effectively address the effects of the MSFHI. As in the case of the AMS, the THMS would be based upon the flood as the initiating event and would determine the sequence of events and plant impacts from the flood for determining the necessary strategies for mitigating the event (e.g., the THMS would not assume an ELAP and LUHS unless or until such time as the flood event caused such consequences). The difference between an AMS and THMS is that for the THMS there will be a need to open containment as an element of the strategy to perform the core cooling function and, as such, only the key safety functions of core and spent fuel pool cooling would be maintained.

~~The catalyst for development of a THMS is the vulnerabilities identified in the previous sections and the objective is to define mitigating strategies to use in place of an AMS.~~ Figure 3 below illustrates the evaluation process and necessary steps in performing an IA-MSA on a THMS.

The guidance of Sections 2 through 9 in the main body of this document should be used to develop the THMS. ~~As in the case of the AMS, the THMS would be based upon the flood as the initiating event and would determine the sequence of events, plant impacts and the necessary strategies for mitigating the event. The THMS would not assume an ELAP and LUHS unless the flood event caused such consequences. Similarly, the boundary conditions and initial assumptions associated with an ELAP and LUHS would not apply unless these were consequences of the flood event. The difference between the THMS and AMS is that for the THMS there will be a need to open containment as an element of the strategy to perform the core cooling function. The THMS does not maintain the key safety function of containment. A justification for not maintaining the containment function must be provided. This provides additional options that can be considered in the development of the strategies. The evaluation to develop the THMS must ensure that the required baseline capabilities of FLEX to cope with an ELAP and LUHS are maintained for all other screened-in hazards.~~

The IA-MSA evaluates the resulting design using a process similar to that discussed for AMS above. The following guidance ~~also~~ should be followed in that evaluation:

- Evaluation of the flood protection features that are required to support ~~FLEX~~ THMS strategies should meet the performance criteria provided in Section 5 of this appendix.
- Validation of new or modified actions related to ~~FLEX~~-THMS strategies will be performed per Appendix E.
 - Timelines showing necessary manual actions, including cues, indications, notifications and dependencies of actions that need to be performed in series or parallel need to be reviewed and revised if necessary.

Comment [NRC72]: Comments provided on AMS (Section 4.3) are also applicable here.
Noted

Comment [npx73]: NRC58 comment – Is LOOP part of the assumed initial condition? What is the timing
FFTF - No LOOP or ELAP unless caused by the flood event. See text.

Comment [SSP74]: Impacts?

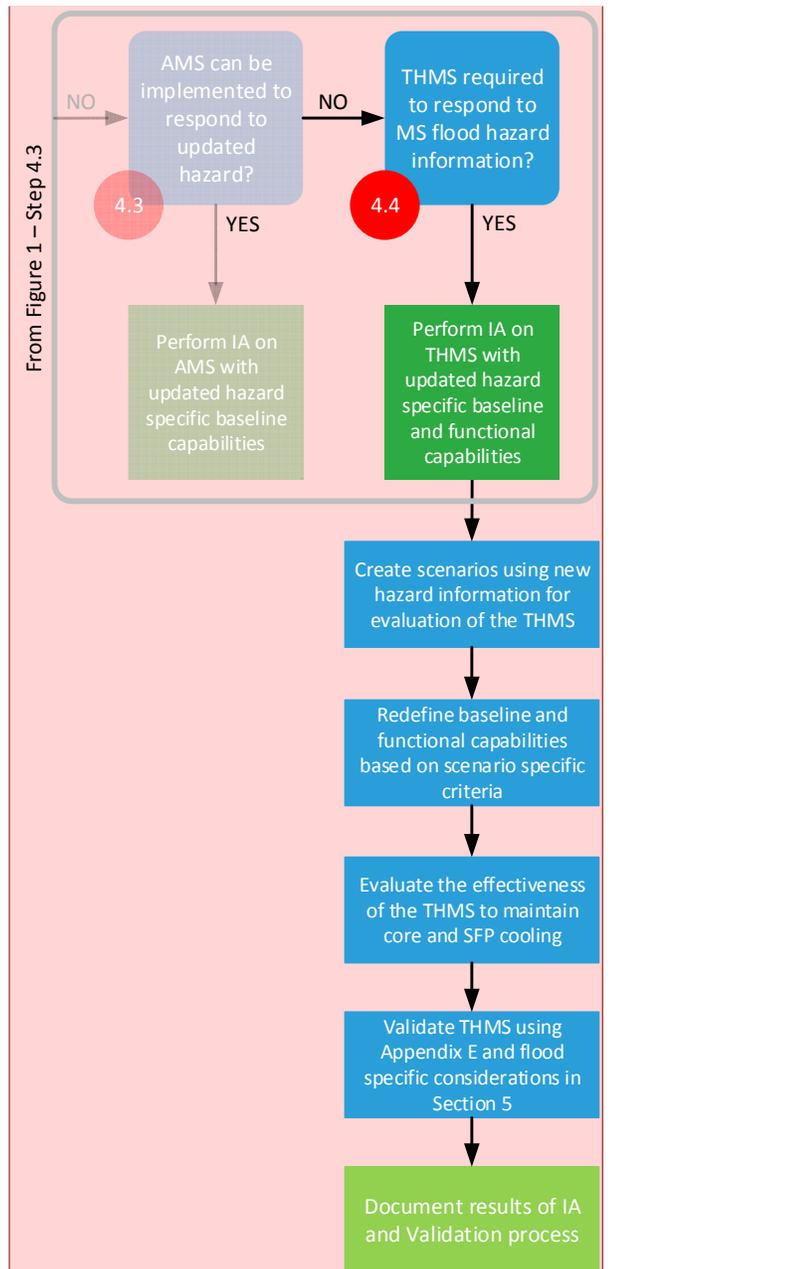
Comment [SSP75]: LOOP?
As discussed in previous section on AMS.
FFTF – OK, added

Comment [NRC76]: The THMS does not maintain containment, but the analysis appears essentially the same as that used for AMS. This does not appear consistent with statements earlier in the document regarding "increased justification" when moving from Sections 4.1 to 4.4
FFTF – Noted; removed word "increased". This word had misleading connotations; the intent is to require that the use justify less complicated strategies that are not used.

- An integrated review must be performed to include all actions required to accomplish the ~~FLEX-THMS~~ strategy as a whole.
- If warning time ~~was not credited in the original FLEX~~ is used in the THMS strategy, but is used in the modified FLEX strategy, the ~~integrated action timeline must be modified to~~ sequence of events should include the appropriate actions. Evaluation of the effectiveness of warning time includes review of the flooding event and warning time triggers needed to implement any flood protection or ~~FLEX-THMS~~ mitigation measure. Multiple triggers or a single trigger can be established for milestones if the response to a flood hazard is done in graduated steps (e.g. stage equipment, assemble equipment, and complete implementation). It must be documented in the ~~IA-MSA~~ that all triggers and resulting implementation steps are achievable, proceduralized and can be performed in a sequence that supports a timeline that allows ~~FLEX-THMS~~ strategies to be implemented. ~~The inclusion of warning time in the FLEX strategies should not invalidate the required baseline capabilities of FLEX to cope with an ELAP and LUHS.~~
- Information on the approach that may be utilized to evaluate appropriate warning time for the local intense precipitation flooding hazard is presented in NEI ~~15-05 white paper~~ “Warning Time for ~~Maximum-Local Intense Precipitation Events~~”, reference xx. In addition, the National Weather Service and the National Hurricane Center offer additional tools that can be helpful when establishing warning time. Warning time for other hazards such as dam failures and river forecasts should be defined based on the site’s communication plans with dam operators or other organizations responsible for providing this information.
- The next step in this evaluation is to determine the effectiveness of the THMS’s ability to maintain the core cooling and spent fuel pool cooling for the entire event duration utilizing the scenario specific baseline capabilities. This evaluation shall include the following attributes:
 - the plant conditions
 - plant at power or shutdown as a result of the pending flood
 - equipment affected by the consequences of scenario parameters
 - availability of offsite and on-site power
 - a detailed description of the scenario and its key components
 - a description of the approach(es) used for mitigation
 - a timeline showing necessary manual actions, including cues, indications, notifications
 - dependencies of actions that need to be performed in series or parallel
 - an evaluation of the effectiveness of active components and flood protection features in accordance with Section 5 of this appendix

- a validation of manual actions in accordance with Appendix E

Following the evaluation of the THMS, document the results in accordance with Section 6.



Comment [SSP77]: Change IA to MSA.

Section numbers, "Step," etc. to G.x.

FFTF – OK, figures will be revised to be consistent with the final text.

Figure 3 – Targeted Hazard Mitigation Strategy Evaluation Flowchart

G.5 PERFORMANCE CRITERIA FOR FLOOD PROTECTION

This section provides guidance on the evaluation of the capability of existing and new flood protection features required for successful implementation of a flood mitigation strategy. The LA-MSA process requires the evaluation of the effectiveness of mitigating strategies to maintain key safety functions. Throughout Section 4 above, it may be necessary to evaluate flood protection features as they pertain to the overall effectiveness of the strategy.

The evaluation is required to demonstrate that the flood protection features can accommodate the flood scenario parameters defined in Section 2.0, and justify and document the integrity of the system.

Flood protection evaluations should consider the following for any flood protection feature necessary to protect equipment or actions required to maintain key safety functions where the MSFHI exceeds the design basis flood hazard at the flood protection feature's location¹:

- Demonstrate the soundness of the individual flood protection features under the loads (i.e., flood height and associated effects) due to the flood scenario parameters and confirm that the features are:
 - in satisfactory condition;
 - higher than the MSFHI height; and
 - structurally adequate based on quantitative engineering evaluations.
- Demonstrate that the performance, characteristics, and configuration of the flood protection feature(s) conforms to accepted practices and is sufficiently robust (e.g., demonstrates an appropriate factor of safety)
- Perform a qualitative assessment of operational requirements such as surveillance, inspection, design control, maintenance, procurement, and testing.
- Ensure that the capacity of pumping or drainage systems is sufficient to handle any inflow through flood protection features for the entire flood event duration.

The evaluation of flood protection features should use the guidance of the appropriate codes and standards to assess whether in place or planned features conform to accepted engineering practices. The evaluation should demonstrate that the flood protection feature can perform its function when required for successful implementation of the mitigation strategy.

Permanent and Passive Features

Passive flood protection features may be incorporated, exterior, or temporary and do not require a change in state of a component in order for it to perform as intended. The following individual flood protection features are considered permanent and passive are:

- earthen embankments (e.g., earth dams, levees and dikes)
- floodwalls

¹ Flood protection features where the MSFHI does not exceed its existing design basis need not be evaluated.

Comment [NRC78]: Additional key considerations include:
(1)Evaluation of manual actions associated with flood protection, including actions not associated with temporary barriers.
FFTF – This section deals with features, not actions. Consider the section on validation of flood actions
(2)Incorporation of any required actions into the overall response timeline (including necessary cues/notifications)
FFTF – This section deals with features, not actions. Consider the section on validation of flood actions
(3)Assessment of necessary active features
FFTF - Covered in bullets 2-4
(4)Ensuring necessary support systems and consumables are available (e.g., as required to run sump pumps)
FFTF - Covered in bullets 2,3

Comment [NRC79]: What are we doing here?
Refers to the specific feature.
FFTF – If the local flood parameters as determined by the MSFHI are bounded by the parameters associated with the design basis flood, no further evaluation of the flood protection feature is necessary since they and FLEX were designed for the design basis flood.

Comment [NRC80]: This and the next sections provide a definition but essentially no guidance for evaluation of features.
FFTF - Guidance provided in previous bulleted items

- seawalls
- concrete barriers
- plugs and penetration seals *
- storm drainage systems

*For the purposes of evaluating the adequacy of plugs and penetration seals, it is sufficient to use the guidance prepared for the flooding design basis walkdowns performed in response to Near Term Task Force (NTTF) Recommendation 2.3. This guidance is described in NEI 12-07 and consideration of recent operating experience should be used when applying this guidance. (Reference xxx).

Active Components

Active flood protection features may be incorporated, exterior or temporary features that requires the change in a components state in order for it to perform as intended. The following flood protection features are considered as active components:

- Rotating equipment (e.g. pumps, generators)
- Valves
- Flood Gates
- Doors
- Hatches

TEMPORARY FEATURES

Temporary flood protection features may be passive or active within the immediate area of the plant and their installation is done prior to the advent of the beyond design basis flood. It must be demonstrated that a temporary flood feature can be moved to the location where needed and installed.

Standards, codes, and guidance documents should be consulted to determine whether the configuration of the temporary barrier (e.g., configuration of a sandbag wall) conforms to accepted engineering practices. Justification of feature reliability may require laboratory- or field-testing, analytical modeling, or demonstrations. If an assessment and evaluation of temporary features reveals deficiencies and shortcomings in their capability to perform adequately as a flood barrier, the implications of the deficiencies should be summarized.

Moreover, it should be demonstrated that temporary features can be moved to the location where needed and installed. The validation process guidance found in Appendix E should be used to evaluate manual actions associated with construction or installation of temporary protective measures.

Comment [NRC81]: Isn't there already NRC guidance on this in RG 1.102 in section C.1? Why are we discussing this here (and using different words without definitions)?
FFTF - List came from ISG Adequacy of evaluation is the responsibility of the plant and the applicable codes and standards
+Cross-reference with RG1.102
+May include but not limited to:

Comment [NRC82]: It is requested to consider recent operating experience involving seal failures (including missing seals) when providing this guidance.
FFTF - Noted Separate projects are underway to address seal performance.

Comment [NRC83]: During the last discussion, an EPRI program was mentioned with the possibility of mentioning it here
Program still in development – too speculative...

FFTF – The industry effort is kicking off now, but it does not seem appropriate to add information on projects of this nature to a guidance document, especially when this guidance is being developed for the long term and the status of this effort will change over time.

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G.6 DOCUMENTATION

Describe the mitigating strategies flood information identified for the site and state the specific flood scenario parameters as identified in Section 2.0 for that hazard (or hazards). Identify if a controlling flood hazard or bounding parameters are utilized.

~~Document and justify an evaluation that the mitigating strategies flood information is bounded or not bounded by the CDB. Document a description of any situation not bounded by the CDB and the reason as to why an IA is required.~~

Document whether the ~~mitigating strategies flood information~~ MSFHI is bounded or not bounded by the CDB. Describe any situation not bounded by the CDB and the reason as to why an assessment is required.

Document in the manner of normal plant processes the results of the evaluation applicable to the strategy that is developed (i.e., FLEX, modified FLEX, AMS or THMS) as follows:

6.1 FLEX: Document and justify the evaluation that demonstrates existing FLEX strategies are acceptable without modification for the MSFHI. Document that the set of equipment, operator actions and procedures required to successfully implement the FLEX strategies remains valid and that it can be implemented as documented in the plants BDB program document for a mitigating strategies flood hazard.

6.2 Modified FLEX: Document and justify the evaluation that identifies the ~~vulnerabilities~~ ~~impacts~~ to the existing FLEX strategy and how proposed modifications enable FLEX ~~to~~ ~~the~~ strategies to be implemented with the MSFHI ~~mitigating strategies flood information, including~~. The following items should be addressed:

- identification of the ~~vulnerabilities~~ ~~impacts~~,
- description and justification of the modifications (equipment, procedures, etc.) to address each ~~vulnerability~~ ~~impact~~,
- description of ~~required~~ modifications to the timeline
- documentation requirements of Appendix E to this document
- describe and justify the use of early deployment/warning time if utilized

6.3 AMS or THMS Document and justify the evaluation that identifies an alternate mitigating strategy or a targeted hazard mitigated strategy in response to a mitigating strategies flood hazard including:

- a detailed description of the scenario and its key components
- a description and justification of the approach(es) used for mitigation
- a timeline showing necessary ~~manual~~ actions, including cues, indications, notifications
- dependencies of actions that need to be performed in series or parallel
- a validation of manual actions in accordance with Appendix E
- A description of the flood protection features (system) that is credited in support of the respective mitigating strategy under evaluation,

Comment [NRC84]: This section seems to focus on internal documents. Should consider what documentation licensees propose to submit to the NRC. Possible options for consideration:

- Doc 1: Summary describing safety improvements (desired sooner) – to support MS SEs as schedule supports?
- Doc 2: Documentation to show compliance with proposed MBDBE (probably to be defined later).
- Doc 3: IA (much later)

Need to include in FIP &/or BDB program document, or as decided.

FFTF – At the present time, there is no regulatory direction to perform a MSA or to submit its results to the NRC. Until the information request is developed, there is no basis to develop guidance on a NRC submittal

Goal is that this documentation will be adequate to describe how the plant complies with the draft MBDBE rulemaking. However, those documentation requirements will be further defined as the rulemaking proceeds.

Note that the IA IAW 2.1 will be defined in another document.

Comment [NRC85]: Consider also including documentation requirements for the scenario in which the MSFHI is found to be completely bounded.

FFTF - adopted

Comment [NRC86]: Justification for the effectiveness of the modifications should also be provided.

FFTF – OK, added, but Part of normal plant processes

Comment [NRC87]: Justification for warning time should also be provided

FFTF – OK, added, but part of normal plant processes

Comment [NRC88]: Justification for the effectiveness of the approaches should also be provided.

FFTF – OK, added, but part of normal plant processes

- The criteria including, as applicable, codes and standards that the flood protection feature (system) is designed to,
- The ratings, as applicable, of any flood protection feature (sump pumps).
-

6.4 THMS: Provide the results with justification of an evaluation demonstrating the acceptance of any flood protection feature (system) credited to include:

- A description of the flood protection features (system) that is credited in support of the respective mitigating strategy under evaluation;
- The particular manner in which the core cooling and spent fuel pool cooling is being performed and supporting equipment for those functions are being protected,
- The criteria including, as applicable, codes and standards that the flood protection feature (system) is designed to,
- The ratings, as applicable, of any flood protection feature (sump pumps).

6.5 Document the validation results

6.6 Update the appropriate sections of the BDB-overall Program Document.

Comment [NRC89]: Why is this documentation only required for THMS (and not also AMS)?
Documentation of the flood protection evaluation (including justification) results should be provided for all approaches, not just THMS.
FFTF – OK, Clarified THMS specific item.

Comment [NRC90]: In 6.2, you've got "documentation requirements of Appendix E to this document." In 6.3, you've got "a validation of manual actions in accordance with Appendix E" (I added the "E.") 6.4 doesn't reference Appendix E, but is about THMS, which is also covered in 6.3. What value does 6.5 add to the documentation?
FFTF – repetitive, but the purpose of this section is to summarize the documentation requirements. Leave in

Comment [NRC91]: This is an undefined term.
FFTF - Common terminology in FLEX changed to reflect consistent terminology

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PLACEKEEPER

~~VALIDATION OF FLOOD ACTIONS~~

~~THIS SECTION CLARIFIES THE FLEX VALIDATION PROCESS DESCRIBED IN APPENDIX E FOR APPLICATION TO A FLOOD HAZARD. A VALIDATION PLAN SHOULD BE DEVELOPED TO PROVIDE REASONABLE CONFIDENCE IN THE ABILITY TO EXECUTE EACH VALIDATED ITEM IN THE PLAN WITH RESPECT TO THE MSFHI.~~

~~THE DIFFERENCE IN APPLYING THE FLEX VALIDATION PROCESS AS DESCRIBED IN APPENDIX E TO A FLOODING EVENT IS RELATED TO THE FACT THAT THE PROGRESSION OF THE FLOODING EVENT DIFFERS FROM SITE TO SITE AND THE ACTIONS TAKEN TO RESPOND TO A FLOOD MAY CHANGE NOT ONLY THE ACTIONS NECESSARY FOR FLEX IMPLEMENTATION, BUT ALSO THOSE REQUIRED FOR SITE FLOOD RESPONSE. THESE NEW OR CHANGED ACTIONS MUST BE VALIDATED USING THE PROCESS IN APPENDIX E.~~

~~SITES WITH WARNING TIME MAY REQUIRE ACTIONS IN ADVANCE OF AN ELAP (E.G., PRE-STAGING EQUIPMENT IN FLOOD PROTECTED AREAS) TO ALLOW THE FLEX STRATEGIES TO BE IMPLEMENTED. THESE ACTIONS ARE TYPICALLY BASED ON FLOOD PROGRESSION, AND MAY NOT BE DIRECTLY TIED TO THE ELAP EVENT, I.E., T=0. THEREFORE, ACTIONS TAKEN TO PROTECT AND IMPLEMENT MITIGATING STRATEGIES PRIOR TO (WARNING TIME) AND DURING THE EVENT WILL BE CONSIDERED AS TIME SENSITIVE ACTIONS (TSAS) UNLESS OTHERWISE JUSTIFIED.~~

~~ALL TSAS THAT ARE AFFECTED BY THE MITIGATING STRATEGIES FLOOD HAZARD WILL BE VALIDATED IN ACCORDANCE WITH THE METHODOLOGY AND PROCESS IDENTIFIED IN APPENDIX E TO THIS DOCUMENT. THIS IS TO INCLUDE:~~

~~NEW MITIGATING STRATEGIES MANUAL ACTION(S)~~

~~MODIFIED MITIGATING STRATEGIES MANUAL ACTIONS RESULTING FROM THE REQUIRED RESPONSE TO THE MSFH INFORMATION I.E., EARLY DEPLOYMENT.~~

~~ANY ACTION NEEDED TO PROTECT MITIGATING STRATEGIES IN RESPONSE TO MSFHI~~

~~IT IS NOT NECESSARY TO REVALIDATE ACTIONS THAT HAVE BEEN PREVIOUSLY VALIDATED AND ARE NOT AFFECTED BY THE FLOOD.~~

~~ALL TSA'S RELATING TO THE ACTIONS IN RESPONSE TO THE MSFHI SHALL BE VALIDATED TO THE RIGOR OF A LEVEL A VALIDATION, UNLESS IT CAN BE DEMONSTRATED THAT THE ACTION CAN BE VALIDATED TO A LESSER CRITERIA AS DEFINED IN APPENDIX E. THIS JUSTIFICATION CAN BE BASED ON CONSIDERATIONS SUCH AS THE AVAILABILITY OF ADDITIONAL MANPOWER BEYOND THAT ASSOCIATED WITH THE OPERATIONAL STAFF.~~

~~THE DEVELOPED TIMELINE FOR THE CHOSEN STRATEGY CONSISTING OF THE REQUIRED SEQUENCE OF ACTIONS AND THE RESULTS OF THE VALIDATION OF EACH ACTION SHOULD BE EVALUATED TO DEMONSTRATE THAT THE TIMELINE IS ACCEPTABLE. IF THE TIMELINE IS UNACCEPTABLE, A DIFFERENT STRATEGY OR MODIFICATION OF AN ACTION MAY BE REQUIRED. IN SUCH A SITUATION, THE TIMELINE SHOULD BE RE-ADJUSTED BY ADDING RESOURCES, TAKING ACTIONS TO PRE-STAGE CONNECTIONS, OR OTHER CHANGES TO THE STRATEGY AND THEN RE-EVALUATED UNTIL ACCEPTABLE RESULTS ARE ACHIEVED.~~

~~APPENDIX E SECTION 6.5 PROVIDES ADDITIONAL GUIDANCE FOR PERFORMING AN INTEGRATED REVIEW.~~

BASIS FOR MITIGATING STRATEGIES ASSESSMENT

In most cases, FLEX was originally designed to function in the presence of the site's design basis flood.

This section provides guidance on comparing the MSFHI to the flood hazard used for developing the FLEX mitigating strategies for the purposes of determining the impacts, and also directs you to the sections of the document that explain the evaluation that should be completed for different situations. For the purposes of this explanation, the term CDB will refer to the flood hazard for which FLEX was designed and the term MSFHI will refer to new flood hazard information.

All aspects of the flood hazard must be given consideration when determining if the MSFHI is bounded by the CDB. These parameters include water level, flooding event duration, associated effects, and the identification of new flood mechanisms that were not addressed in the CDB flood analysis. The following guidance applies to the determination:

- The CDB to MSFHI comparison is to be done on a flood mechanism to flood mechanism basis.
- If the MSFHI overall flood level exceeds the design basis flood level for a given flood mechanism, an assessment of the effects of the applicable flood mechanism is required.
 - Only those MSFHI flood mechanisms whose effects exceed the CDB need to be included in the assessment (e.g., if a site's CDB includes river flooding and storm surge, and the MSFHI shows that the design basis flood bounds the river flood results, but not the storm surge results, only the storm surge needs to be evaluated in MSA.)
- If the MSFHI introduces a new flood mechanism, (e.g., local intense precipitation) or a new associated effect (e.g., debris) that was not included in the CDB, then the assessment must be performed on the new mechanism or associated effect.
- If one or more associated effects was not considered in the CDB, those effect(s) would be treated as being not bounded and an assessment of all applicable flooding mechanisms is required, except
 - If only a single associated effect of a flooding mechanism is not bounded by the CDB, the assessment needs to initially consider only the changes introduced by the new or more severe associated effect. It is only necessary to consider all the aspects of the flood hazard when there is reason to believe that the single unbounded associated effect influences other aspects of the evaluation, or when more than one associated effect differs from the CDB.

If it is determined that the MSFHI is bounded by the CDB for a given flood mechanism, then this information is documented in accordance with Section 6 of this appendix and no further action is required for that flood mechanism.

The guidance in sections 4.1 through 4.4 below (as applicable) should be followed for all unbounded flood mechanisms.

Comment [NRC92]: It may also be appropriate to consider flood event duration parameters (e.g., warning time) in understanding whether the DB bounds the MSFHI. For example, if warning time is shorter under the MSFHI than assumed in developing FLEX for the DB, then it is appropriate to reconsider the strategy.
FFTF - OK

Comment [NRC93]: Why is this different than the listing in section 2.0? Is it intentional, or would it be better to merely refer back to that section?
FFTF - Section G.2 describes the information that should be collected, this section describes how to compare that information with the design basis and how extensive an analysis is required.

Comment [NRC94]: It's unclear what determination is being discussed here. The paragraph starts out discussing a determination of whether the CDB bounds the MSFHI, but the bullets below seem to speak about a determination of whether an IA is necessary for some aspects of a flood hazard. Based on Figure 1, I believe this should provide guidance on determining whether the CDB is bounding, but there doesn't seem to be any guidance on that.
FFTF - Revised to clarify the text in this regard.

Comment [SSP95]: Original comment on the meaning and intent of the use of the word "determination" remains valid. The subject of this particular paragraph is "determining if the MSFHI is bounded by the CDB." The list that follows is purported to be guidance that applies to the "determination" but includes guidance on what to do with the output of the "determination" rather than how to make the "determination." For example, the second bullet says that an assessment of the effects of an applicable flood mechanism is required if its overall level exceeds the CDB; this is not guidance on determining whether the CDB bounds the MSFHI. The same holds true ... [10]

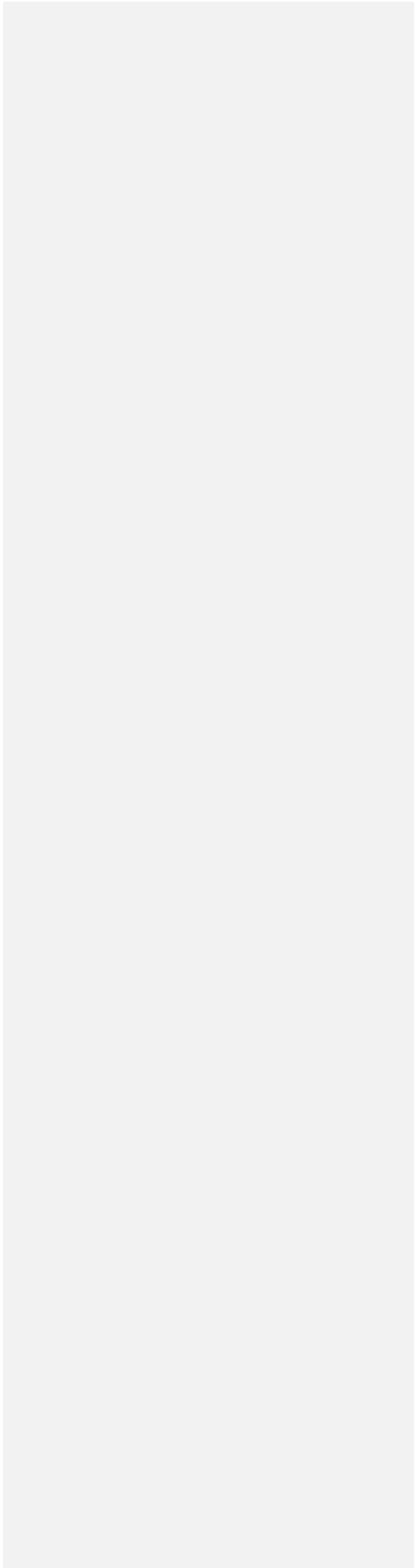
Comment [NRC96]: Recommend deleting this second bullet.
FFTF - rewrote the description to clarify

Comment [NRC97]: There is a certain amount of sense to this as a criteria for conducting the IAs, but it seems out of place here in the portion of the appendix that covers determining if the CDB is bounding for the MSFHI. Is there a better place for this?
FFTF - Section revised to clarify.

Comment [EEB98]: Why are these bullets included in this section rather than in G.4? They affect the content of the assessment, not the basis for conducting it.

FFTF - This section replaces section G 3 in its entirety and is intended to serve as an introduction/explanation for the evaluation ... [11]

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The purpose of this document should be further clarified. Some suggested comments:

- The purpose of this guidance is to assess mitigating strategies in light of the reevaluated flooding hazards. The guidance does not preclude the need to perform an integrated assessment or supersede associated NRC guidance described in JLD-ISG-2012-05 (including any subsequent revisions).

The purpose of this appendix is to provide guidance for developing mitigating strategies and/or other capabilities for plant protection considering revised flood hazard information (FHI) developed in response to the NRC staff's letter under 50.54(f). The process is illustrated in Figure 1.

FFTF - Changed the introduction to reference the 50.54(f) letter. Additional direction with respect to any additional integrated assessment, if needed, is not appropriate for this document.

General acronym comment: Acronyms should be defined / re-defined for this appendix (should not rely on definitions from the rest of NEI 12-06 or other referenced documents). Make sure that the definitions and the use / applicability of these terms within this appendix is clear.

FFTF - The format we have chosen is to not make this appendix is not a 'stand alone' document. It will rely on acronyms and definitions contained within the body of NEI 12-06.

It may also be appropriate to consider flood event duration parameters (e.g., warning time) in understanding whether the DB bounds the MSFHI. For example, if warning time is shorter under the MSFHI than assumed in developing FLEX for the DB, then it is appropriate to reconsider the strategy.

Addressed in Section G2

FFTF - we intend to replace this section in its entirety with the text in the replacement to this section (see immediately below)

Why is this different than the listing in section 2.0? Is it intentional, or would it be better to merely refer back to that section?

FFTF - we intend to replace this section in its entirety with the text in the replacement to this section (see immediately below)

Page 7: [5] Comment [NRC29] NRC 6/10/2015 3:27:00 PM

It's unclear what determination is being discussed here. The paragraph starts out discussing a determination of whether the CDB bounds the MSFHI, but the bullets below seem to speak about a determination of whether an IA is necessary for some aspects of a flood hazard. Based on Figure 1, I believe this should provide guidance on determining whether the CDB is bounding, but there doesn't seem to be any guidance on that.

JHR to review

FFTF - we intend to replace this section in its entirety with the text in the replacement to this section (see immediately below)

Page 7: [6] Comment [NRC30] NRC 6/10/2015 3:27:00 PM

There is a certain amount of sense to this as a criteria for conducting the IAs, but it seems out of place here in the portion of the appendix that covers determining if the CDB is bounding for the MSFHI. Is there a better place for this?

FFTF - we intend to replace this section in its entirety with the text in the replacement to this section (see immediately below)¹

Page 10: [7] Comment [NRC45] NRC 6/3/2015 10:57:00 AM

Under what circumstances is this an acceptable outcome for compliance with the proposed rule? Change made to clarify Order and rule require maintaining the key safety functions. DO we need the rule language to allow not keeping one ksf?

FFTF - SRM approved the Staff's recommendation 2 which involved targeted or scenario specific mitigating strategies. If the draft rule language does not comport with the SRM, the discrepancy needs to be addressed.

Page 11: [8] Comment [NRC52] NRC 6/8/2015 3:26:00 PM

It is requested that the text be more explicit regarding what this means. For example, is this permitting strategies to "go straight to Phase 2" without a requirement to protect Phase 1 equipment from the reevaluated hazard? If so, a straightforward statement of such would increase clarity. All 3 phases would be reviewed and evaluated. What does this mean? Early deployment is already allowed by Section 6 and may mean going directly to Phase 2.

FFTF - no changes to the text are proposed. Early deployment is already allowed by Section 6 and may mean going directly to Phase 2. The new timeline would need to show that early deployment is possible given the warning time available in the MSFHI and validation would be completed to show that the timeline is feasible.

Page 11: [9] Comment [NRC53] NRC 6/3/2015 11:24:00 AM

