

# **INSTRUMENT READINESS PLAN (IRP)**

**FOR THE**

## **NSLS-II 6-BM (BMM) FRONT END AND INSERTION DEVICE**



JUNE 2017

NSLSII-6BM-PLN-001

PREPARED BY

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FOR THE

U.S. DEPARTMENT OF ENERGY  
OFFICE OF SCIENCE BASIC ENERGY SCIENCE  
UNDER CONTRACT DE-SC0012704

# INSTRUMENT READINESS PLAN (IRP)

FOR THE

## NSLS-II 6-BM (BMM) FRONT END AND INSERTION DEVICE

JUNE 2017

PREPARED BY:



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A. Ackerman, Instrument Readiness Coordinator

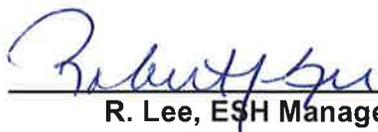
APPROVED AS A PLAN TO ACHIEVE READINESS BY:

 4/28/17

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T. Shaftan, IRR Technical Authority

CONCURRENCE BY:

 5-3-17

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R. Lee, ESH Manager

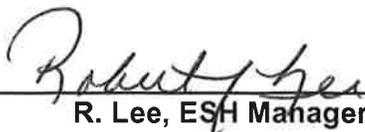
APPROVED – IRP HAS BEEN FULLY IMPLEMENTED AND INSTRUMENT IS READY FOR COMMISSIONING:



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T. Shaftan, IRR Technical Authority

CONCURRENCE BY:

 5/3/17

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R. Lee, ESH Manager

## REVISION HISTORY

REVISION	DESCRIPTION	LIST OF REVIEWERS	DATE
1	First Issue	See completed tables	June 2017

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## ATTACHMENTS

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Attachment B, *Pillar II Hardware, 6-BM Front End and Insertion Device*

Attachment C, *Pillar III Personnel, 6-BM Front End and Insertion Device*

Attachment D, *Completion of IRR Pre-Start Findings*

## **1.0 INTRODUCTION**

### **1.1 Purpose and Scope**

The purpose of this Instrument Readiness Plan (IRP) is to establish the readiness criteria required to declare the NSLS-II 6-BM (Beamline for Materials Measurement [BMM]) Front End and Insertion Device ready for commissioning. The scope of this IRP includes the 6-BM Front End and Insertion Device, and was prepared in accordance with the *Instrument Readiness Review Procedure* (PS-C-ESH-PRC-001). The 6-BM Beamline will undergo an IRR at a later date.

This IRP will be used as a tool for planning and certifying readiness. The completion of this IRP requires that all procedures, documentation and hardware listed in the plan are completed, tested, and where required, independently certified. In addition, Staff and Users that will be involved in commissioning shall be trained and qualified to conduct their work safely, securely and in an environmentally sound manner.

### **1.2 Instrument Readiness Review (IRR)**

As part of the verification of readiness for commissioning, an IRR is required in accordance with the *Instrument Readiness Review Procedure* (PS-C-ESH-PRC-001). An independent IRR Team will use the readiness criteria developed as part of this IRP to verify that the 6-BM Front End and Insertion Device are ready for commissioning in accordance with the appropriate Commissioning Plans. Pre-start and post-start findings will be identified by the team.

### **1.3 Authorization to Proceed with Commissioning**

The completion of this IRP, together with closure of any pre-start findings from the IRR, is used as the basis for the NSLS-II Director to authorize the start of commissioning of the 6-BM Front End and Insertion Device.

## **2.0 INSTRUMENT READINESS PLAN**

### **2.1 Readiness Criteria**

Readiness criteria are provided in Attachments A through D. The criteria were developed by the Instrument Readiness Coordinator (IRC) and Readiness Team members, using the *General Readiness Criteria* provided in Attachment A and the *Instrument Readiness Guide* provided in Attachment C of the *Instrument Readiness Review Procedure* (PS-C-ESH-PRC-001).

The readiness criteria are grouped into the following categories:

- Pillar I – Documentation
- Pillar II – Hardware
- Pillar III – Personnel
- Completion of IRR Pre–Start Findings

### **3.0 IRP IMPLEMENTATION**

#### **3.1 Readiness Team**

A Readiness Team will be appointed by the NSLS-II Director in accordance with the *Instrument Readiness Review Procedure* (PS-C-ESH-PRC-001). The Readiness Team members that have responsibility for completing the IRP are listed as the Responsible Person in the Attachments.

#### **3.2 Achieving Readiness – Responsibilities**

The Readiness Team members are responsible for ensuring that their specific readiness criteria are achieved.

The Insertion Devices Group Leader and the Mechanical Engineering Group Leader are responsible for certifying that all of the readiness criteria associated with the subject Front End and Insertion Device are achieved.

#### **3.3 Execution of the IRP**

The Readiness Team members shall execute this IRP by preparing, installing, documenting, or training (as appropriate), the specific scope of work (readiness criteria) assigned to them as listed in the Attachments. The Readiness Team members shall develop, compile or assemble the documented evidence that clearly demonstrates that the readiness criteria have been met. This evidence shall be listed on the Attachments.

#### **3.4 Certifying Readiness**

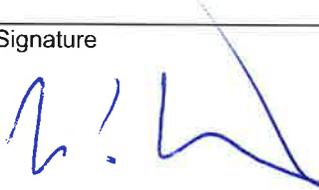
Upon completion of the readiness criteria, the Readiness Team members will certify that the criteria for which they are responsible for are complete by signing the Attachments in the appropriate section. The Attachments shall not be signed until the readiness criteria have been fully achieved.

For completion of the IRR pre-start findings, if identified, the IRR Technical Authorities and the ESH Manager will certify that all IRR pre-start findings relative to the 6-BM Front End and Insertion Device have been completed, and that the associated ATS Actions have been closed by signing Attachment D in the appropriate section. The Independent Verifier will concur that these actions have been adequately completed and closed by signing Attachment D in the appropriate section.

### **4.0 REFERENCES**

- 4.1 PS-C-ESH-PRC-001, *Instrument Readiness Review Procedure*
- 4.2 PS-C-ESH-ROASE-001, *NSLS-II Accelerator Safety Envelope (ASE)*

**ATTACHMENT A – PILLAR I DOCUMENTATION  
6-BM FRONT END AND INSERTION DEVICE**

	READINESS CRITERIA	RESPONSIBLE PERSON	ACTIONS	DOCUMENTED EVIDENCE	CERTIFICATION OF READINESS*
<b>PILLAR I DOCUMENTATION (PLANNING &amp; PROCEDURES)</b>	<b>Functional Description</b> An overview presentation is prepared that defines the scope of the IRR and includes the following FE and 3PW specific information: <ul style="list-style-type: none"> <li>- Primary capabilities</li> <li>- Physical layout and location</li> <li>- Radiation Safety Components</li> <li>- Summary of design performance parameters</li> <li>- List of credited controls</li> <li>- Self-identified pre-start findings</li> <li>- Description and status for each item listed in this Instrument Readiness Plan</li> </ul>	G. Fries Accelerator Division Liaison Engineer	<ul style="list-style-type: none"> <li>• Develop the presentation described for the FE and 3PW</li> </ul>	FE and 3PW: <ul style="list-style-type: none"> <li>• Presentation</li> </ul>	Signature: 
		J. Woicik NIST	<ul style="list-style-type: none"> <li>• Develop the presentation described for the M1 mirror</li> </ul>	M1 Mirror: <ul style="list-style-type: none"> <li>• Presentation</li> </ul>	Signature 
	<b>FE &amp; 3PW Design</b> Components are designed in accordance with PS-QAP-0412, <i>Design Reviews</i> and PS-C-QAS-PRC-010, <i>Engineering Design by Others</i> .	Front End: S. Sharma Mechanical Engineering Group Leader	<ul style="list-style-type: none"> <li>• Complete Engineering Design Reviews for the Mirror, FE and 3PW that address thermal management, mechanical support, configuration control, and vacuum</li> </ul>	FE and 3PW: <ul style="list-style-type: none"> <li>• Requirements, Specifications, and Interface report (RSI)</li> <li>• Internal design review documents</li> </ul>	Signature: 
		3PW: T. Tanabe ID Group Leader			Signature: 
		M1 Mirror: J. Woicik NIST			Signature: 

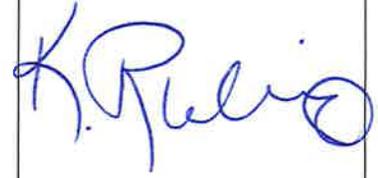
\*Signature certifies that the readiness criteria are met. The Responsible Person shall not sign prior to completion.

**ATTACHMENT A – PILLAR I DOCUMENTATION  
6-BM FRONT END AND INSERTION DEVICE**

	READINESS CRITERIA	RESPONSIBLE PERSON	ACTIONS	DOCUMENTED EVIDENCE	CERTIFICATION OF READINESS*
<b>PILLAR I DOCUMENTATION (PLANNING &amp; PROCEDURES)</b>	<p><b>Radiation Safety Components Design</b> Radiation Safety Components for the FE designed in accordance with NLSII requirements, PS-QAP-0412, <i>Design Reviews</i> and PS-C-QAS-PRC-010, <i>Engineering Design by Others</i>.</p>	<p>M. Breitfeller Mechanical Engineer</p>	<ul style="list-style-type: none"> <li>• Complete requirements analysis and design of radiation safety components for the FE</li> </ul>	<ul style="list-style-type: none"> <li>• Internal design review documents</li> <li>• RSC Report</li> </ul>	<p>Signature:  5-19-17</p>
	<p><b>Ray Traces</b> Bremsstrahlung and Synchrotron Ray Traces generated in accordance with PS-C-ASD-PRC-147, <i>Insertion Device and Front End Ray Tracing Procedure</i></p>	<p>M. Breitfeller Mechanical Engineer</p>	<ul style="list-style-type: none"> <li>• Prepare the Ray Traces for the FE</li> </ul>	<ul style="list-style-type: none"> <li>• Approved Primary Bremsstrahlung Ray Traces</li> <li>• Approved Maximum Synchrotron Ray Traces</li> </ul>	<p>Signature:  5-19-17</p>
	<p><b>Unreviewed Safety Issue (USI) Evaluations/Screenings</b> Authorization basis hazard identification is managed through USI evaluation/screening.</p>	<p>S. Moss Authorization Basis Manager</p>	<ul style="list-style-type: none"> <li>• Verify that the SAD and ASE accurately cover the hazards associated with the subject, FE and 3PW</li> <li>• Complete any associated USI evaluations/screenings</li> </ul>	<ul style="list-style-type: none"> <li>• SAD and ASE USI screenings/evaluations</li> <li>• Applicable waivers</li> </ul>	<p>Signature:  Covered under SAD Section 3.3.3.8 photon sources</p>

\*Signature certifies that the readiness criteria are met. The Responsible Person shall not sign prior to completion.

**ATTACHMENT A – PILLAR I DOCUMENTATION  
6-BM FRONT END AND INSERTION DEVICE**

	READINESS CRITERIA	RESPONSIBLE PERSON	ACTIONS	DOCUMENTED EVIDENCE	CERTIFICATION OF READINESS*
<b>PILLAR I DOCUMENTATION (PLANNING &amp; PROCEDURES)</b>	<p><b>Resolution of Open Action Tracking System (ATS) Actions</b> Instrument specific action items from previous internal and external oversight groups (e.g., RSC, Design Reviews, etc.) are addressed.</p> <p>Previous IRR action items are addressed.</p>	E. Cheswick QA Engineer	<ul style="list-style-type: none"> <li>• ATS action items for the FE and 3PW shown as closed with supporting evidence</li> </ul>	<ul style="list-style-type: none"> <li>• ATS System 8653.37</li> </ul>	Signature:  5/22/17
	<p><b>Procedures</b> Procedures needed for safe, secure, and environmentally sound commissioning have been developed, reviewed, validated (where applicable), and approved. Existing procedures are verified as sufficient for new hazards introduced by this FE and ID, if any.</p>	K. Rubino Procedure Support	<ul style="list-style-type: none"> <li>• Develop any system specific procedures</li> <li>• Verify that existing procedure are sufficient for any new hazards introduced</li> </ul>	<ul style="list-style-type: none"> <li>• 3PW LOTO Procedure</li> <li>• M1 Mirror Procedure:                             <ul style="list-style-type: none"> <li>◦ Opening &amp; closing</li> <li>◦ Gallium refilling</li> <li>◦ Evacuating</li> <li>◦ Baking</li> </ul> </li> </ul> <p>* Written into operating manual</p>	Signature: 
	<p><b>Commissioning Plans</b> A commissioning plan has been developed in accordance with PS-C-CMD-PLN-001, <i>NSLS-II Process Description: Review Process for Facility Additions and Modifications</i>.</p>	G. Wang Accelerator Coordination Group Leader	<ul style="list-style-type: none"> <li>• Verify that NSLS-II Insertion Device and Front End Commissioning Sequence (PS-C-ASD-PRC-166) adequately covers commissioning for the FE and 3PW</li> </ul>	<ul style="list-style-type: none"> <li>• NSLS-II Insertion Device and Front End Commissioning Sequence (PS-C-ASD-PRC-166)</li> </ul>	Signature: 

\*Signature certifies that the readiness criteria are met. The Responsible Person shall not sign prior to completion.

**ATTACHMENT A – PILLAR I DOCUMENTATION  
6-BM FRONT END AND INSERTION DEVICE**

	READINESS CRITERIA	RESPONSIBLE PERSON	ACTIONS	DOCUMENTED EVIDENCE	CERTIFICATION OF READINESS*
<b>PILLAR I DOCUMENTATION (PLANNING &amp; PROCEDURES)</b>	<p><b>Radiation Survey Procedures</b> A plan describing the steps required during commissioning has been generated and includes component testing with beam, radiation surveys, hold points, plans for ramping up electron beam current.</p>	<p>M. Benmerrouche Radiation Physicist</p>	<ul style="list-style-type: none"> <li>Verify that the NSLS-II Insertion Devices and Front End Radiation Survey Plan (PS-C-ESH-PRC-061) adequately covers commissioning for the FE and 3PW</li> </ul>	<ul style="list-style-type: none"> <li>NSLS-II Insertion Devices and Front End Radiation Survey Plan (PS-C-ESH-PRC-061)</li> </ul>	<p>Signature: </p>

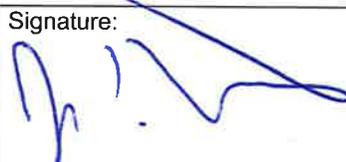
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**ATTACHMENT B – PILLAR II HARDWARE  
6-BM FRONT END AND INSERTION DEVICE**

	READINESS CRITERIA	RESPONSIBLE PERSON	ACTIONS	DOCUMENTED EVIDENCE	CERTIFICATION OF READINESS*
<b>PILLAR II SAFETY CRITICAL HARDWARE (INSTALLATION)</b>	<b>Radiation Safety Components: Installation</b> Radiation Safety Components are installed in accordance with the Traveler.	M. Breittfeller Mechanical Engineer	<ul style="list-style-type: none"> <li>• Generate and execute Top Level Traveler</li> </ul>	FE: <ul style="list-style-type: none"> <li>• Completed Traveler</li> </ul>	Signature:  5.19.17
	<b>Radiation Safety Components: Configuration Control</b> A Radiation Safety Component Checklist template is generated in accordance with NSLSII-ESH-PRC-004, <i>NSLS-II Radiation Safety Component Inspection Procedure</i> .	L. Doom Accelerator Coordination Group Engineer	<ul style="list-style-type: none"> <li>• Verify that the existing FE Radiation Safety Component checklist includes the subject FE and 3PW</li> </ul>	<ul style="list-style-type: none"> <li>• Approved Storage Ring Radiation Safety Component Checklist Template</li> </ul>	Signature:  5/22/17
	<b>Electrical Power</b> SBMS electrical power distribution requirements are satisfied. SBMS Electrical Equipment Inspection (EEI) requirements are satisfied.	A. Boerner Electrical Distribution Engineer	<ul style="list-style-type: none"> <li>• Generate and approve one-line drawings</li> <li>• Complete system electrical inspection</li> <li>• Complete needed EEI inspections</li> </ul>	<ul style="list-style-type: none"> <li>• Approved AC Power one-line drawings</li> <li>• EEI database entries</li> </ul>	Signature:  5/24/17
	<b>Utilities</b> Permanent utility systems are installed and tested (i.e., Compressed Air, DI Water, Gaseous Nitrogen, Process Chilled Water) in accordance with design drawings.	J. Gosman Mechanical Utilities Group Leader	<ul style="list-style-type: none"> <li>• Generate system schematics</li> <li>• Perform pressure test</li> </ul>	<ul style="list-style-type: none"> <li>• Approved system schematics</li> <li>• System pressure testing reports</li> </ul>	Signature:  5/24/17 For John Gosman

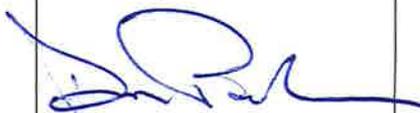
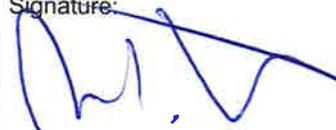
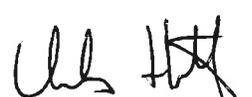
\*Signature certifies that the readiness criteria are met. The Responsible Person shall not sign prior to completion.

**ATTACHMENT B – PILLAR II HARDWARE  
6-BM FRONT END AND INSERTION DEVICE**

READINESS CRITERIA		RESPONSIBLE PERSON	ACTIONS	DOCUMENTED EVIDENCE	CERTIFICATION OF READINESS*
<b>PILLAR II OTHER HARDWARE (INSTALLATION)</b>	<b>Other Front End Components</b> All FE components that are not radiation safety components are installed and tested in accordance with the Travelers.	M. Breiffeller Mechanical Engineer	<ul style="list-style-type: none"> <li>• Generate Traveler and drawing</li> <li>• Execute Traveler</li> <li>• Perform pressure test</li> </ul>	FE: <ul style="list-style-type: none"> <li>• Completed Traveler</li> <li>• System pressure testing reports</li> </ul>	Signature:  5.22.17
		J. Rank Insertion Devices Engineer	<ul style="list-style-type: none"> <li>• Generate Traveler and drawing</li> <li>• Execute Traveler</li> </ul>	3PW: <ul style="list-style-type: none"> <li>• Completed Traveler</li> </ul>	Signature: 
		J. Woicik NIST	<ul style="list-style-type: none"> <li>• Generate Traveler and drawing</li> <li>• Execute Traveler</li> <li>• Pressure Test</li> </ul>	M1 Mirror: <ul style="list-style-type: none"> <li>• Completed Traveler</li> <li>• System pressure testing reports</li> </ul>	Signature: 
	<b>Equipment Protection System (EPS) Interlocks</b> (Phase 1 installation for 3PW operation only) Hardware/Software installed and tested in accordance with PS-C-ASD-SPC-EPS-001, <i>Equipment Protection System (EPS) Design Description</i> and confirmed.	G. Ganetis Electrical Engineering Group Leader	<ul style="list-style-type: none"> <li>• Verify EPICS integration</li> <li>• Test system performance</li> </ul>	<ul style="list-style-type: none"> <li>• Test Report Phase 1 Installation</li> </ul>	Signature: 

\*Signature certifies that the readiness criteria are met. The Responsible Person shall not sign prior to completion.

**ATTACHMENT B – PILLAR II HARDWARE  
6-BM FRONT END AND INSERTION DEVICE**

READINESS CRITERIA		RESPONSIBLE PERSON	ACTIONS	DOCUMENTED EVIDENCE	CERTIFICATION OF READINESS*
PILLAR II OTHER HARDWARE (INSTALLATION)	<b>Controls and Diagnostics</b> Hardware/Software installed and tested in accordance with NSLS-II requirements.	D. Padrazo <del>Deputy</del> Instrumentation Group Leader	<ul style="list-style-type: none"> <li>• Test system performance</li> <li>• Complete integral testing</li> </ul>	FE: <ul style="list-style-type: none"> <li>• Performance and integral testing checklist</li> </ul>	Signature: 
		J. Woicik NIST	<ul style="list-style-type: none"> <li>• Generate and execute traveler</li> <li>• Test system performance</li> <li>• Complete integral testing</li> </ul>	M1 Mirror: <ul style="list-style-type: none"> <li>• Performance and integral testing - Traveler</li> </ul>	Signature: 
		H. Bassan Controls Group Engineer	<ul style="list-style-type: none"> <li>• Test system performance</li> <li>• Complete integral testing</li> </ul>	3PW: <ul style="list-style-type: none"> <li>• Performance and integral testing documentation</li> </ul>	Signature: 
	<b>Vacuum</b> Vacuum hardware has been installed and tested in accordance with the Traveler and has the capability of achieving full vacuum needed during commissioning.	C. Hetzel Vacuum Group Leader	<ul style="list-style-type: none"> <li>• Generate and execute Top Level Traveler</li> <li>• Identify overpressure devices</li> <li>• Test system performance</li> </ul>	<ul style="list-style-type: none"> <li>• Completed Top Level Traveler</li> <li>• Test Report</li> <li>• Completed Mirror Traveler</li> </ul>	Signature: 

\*Signature certifies that the readiness criteria are met. The Responsible Person shall not sign prior to completion.

**ATTACHMENT C – PILLAR III PERSONNEL  
6-BM FRONT END AND INSERTION DEVICE**

READINESS CRITERIA		RESPONSIBLE PERSON	ACTIONS	DOCUMENTED EVIDENCE	CERTIFICATION OF READINESS*
<b>PILLAR III PERSONNEL</b>	<b>Lead Operators, Scientific Operators &amp; FLOCOS</b> Trained/Qualified to commission the FE and 3PW.	B. Lein Training Group Leader	<ul style="list-style-type: none"> <li>• Train Operators</li> </ul>	<ul style="list-style-type: none"> <li>• BTMS record</li> </ul>	Signature: 
	<b>Support Staff</b> Staff needed to support FE and 3PW commissioning.	B. Lein Training Group Leader	<ul style="list-style-type: none"> <li>• Identify Support Staff</li> <li>• Assign JTAs and train</li> </ul>	<ul style="list-style-type: none"> <li>• BTMS record that sufficient number of staff are trained to support commissioning</li> </ul>	Signature: 

* READINESS CERTIFICATION	<b>S. Sharma - Mechanical Engineering Group Leader</b>	Signature: 
* READINESS CERTIFICATION	<b>T. Tanabe - Insertion Devices Group Leader</b>	Signature:  5/30/17

\*Signature certifies that the readiness criteria are met. The Responsible Person shall not sign prior to completion.

**ATTACHMENT D – COMPLETION OF IRR PRE-START FINDINGS  
6-BM FRONT END AND INSERTION DEVICE**

READINESS CRITERIA		RESPONSIBLE PERSON	DOCUMENTED EVIDENCE	CERTIFICATION OF READINESS*
<b>IRR PRE-START FINDINGS</b>	<b>Actions Complete</b> All actions associated with the 6-BM FE and 3PW IRR pre-start findings are completed and the ATS Actions are closed.	T. Shaftan IRR Technical Authority	<ul style="list-style-type: none"> <li>• ATS</li> </ul>	Signature:
	<b>Actions Closed</b> All actions associated with the 6-BM FE and 3PW IRR pre-start findings have been verified complete and the ATS Condition is closed.  (ATS Condition No. _____)	R. Lee ESH Manager	<ul style="list-style-type: none"> <li>• ATS</li> </ul>	Signature:
	Actions associated with the 6-BM FE and 3PW IRR pre-start findings have been satisfactorily completed.	M. Hauptmann Independent Verifier	<ul style="list-style-type: none"> <li>• ATS</li> </ul>	Signature:
	<b>No Pre-Start Findings Identified</b> No pre-start findings have been identified by the Review Team and therefore the previous lines do not require sign-off.	R. Lee ESH Manager	<ul style="list-style-type: none"> <li>• IRR Preliminary Report</li> </ul>	Signature:
		M. Hauptmann Independent Verifier	<ul style="list-style-type: none"> <li>• IRR Preliminary Report</li> </ul>	Signature:

– END –

\*Signature certifies that the readiness criteria are met. The Responsible Person shall not sign prior to completion.  
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