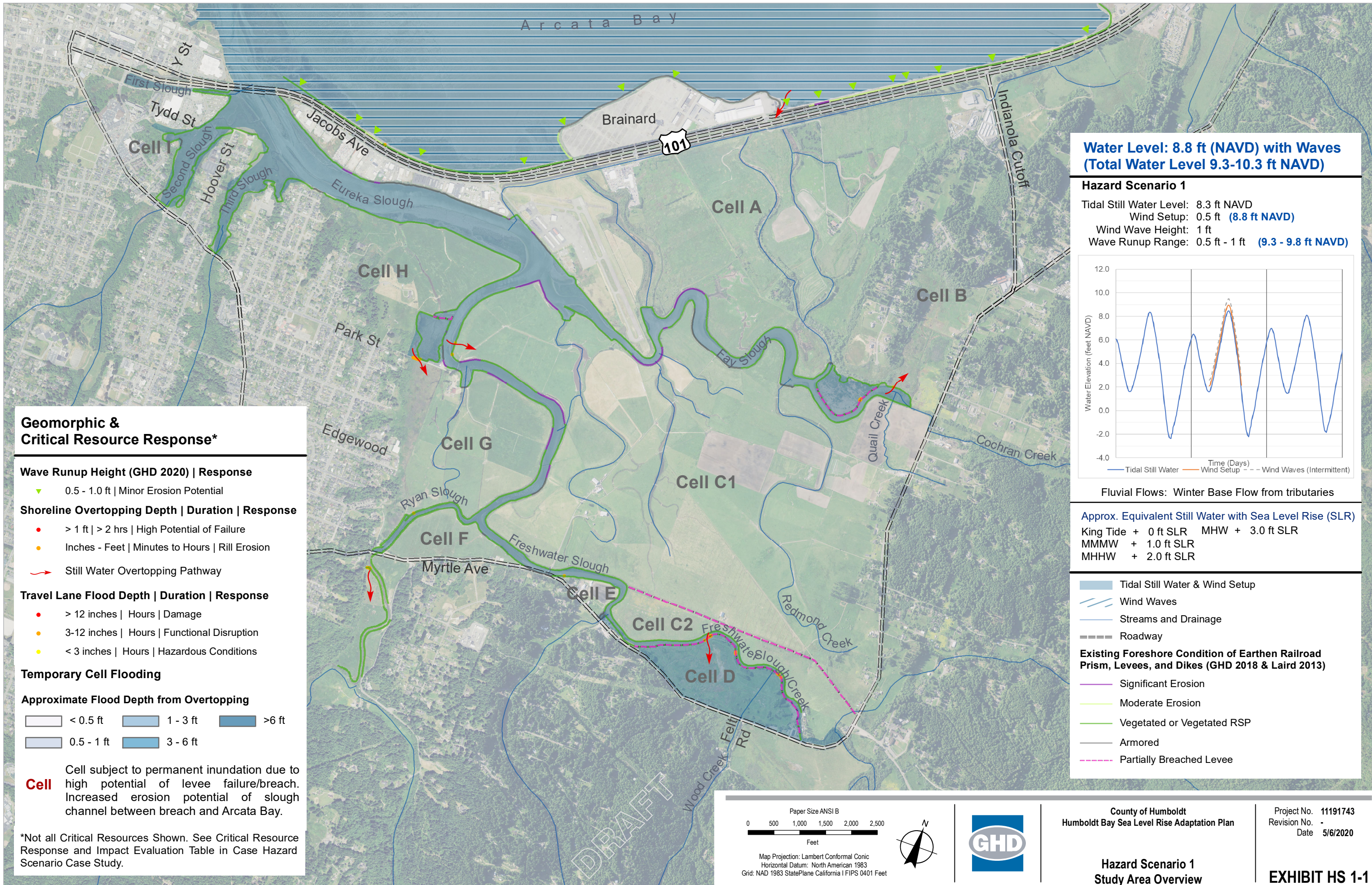


# Table D-1. Summary of Hazard Scenarios

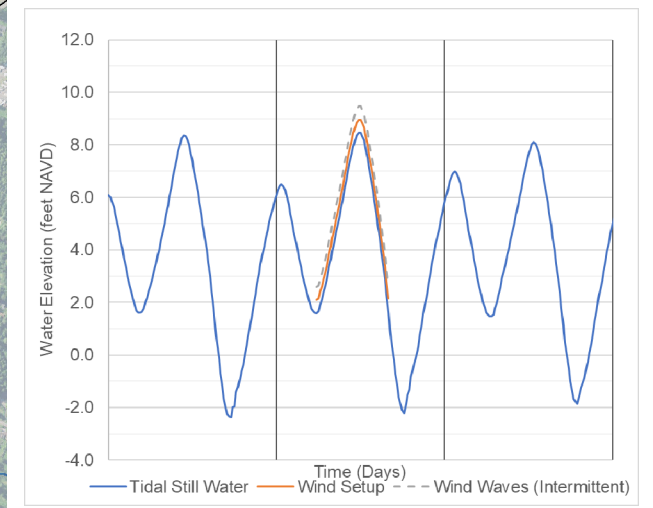
Tidal Hydraulics, Wind, Sea Level Rise, Resource Response and Impacts

SCENARIO ELEMENTS	Tidal Extreme Events with Fluvial Winter Base Flow, Variable Wind, and Shoreline Conditions									
	1 Typical King Tide with Wind	2 Extreme Tide	3 Extreme Tide with Wind	4 Extreme Tide	5 Extreme Tide	5a Armor and Elevate Shoreline	6 Extreme Tide	6a Armor and Elevate Shoreline	7 Extreme Tide	8 Extreme Tide
<b>HYDRAULICS AND SEA LEVEL RISE (SLR)</b>										
Tidal Still Water Level (NAVD)	8.3ft	9.3ft	9.3ft	9.9ft	10.6ft	10.6ft	11.6ft	11.6ft	12.6ft	13.6ft
Wind Set-up	0.5ft (8.8ft NAVD)	0	1ft (10.3ft NAVD)	0	0	0	0	0	0	0
Wind Wave Height	1ft	0	2.4ft	0	0	0	0	0	0	0
Wave Runup	0.5ft – 1ft	0	1.5ft – 4.5ft	0	0	0	0	0	0	0
Total Water Level (TWL) NAVD (Bay Shoreline)	9.3-10.3ft	9.3ft	12-15ft	9.9ft	10.6ft	10.6ft	11.6ft	11.6ft	12.6ft	13.6ft
Approximate Equivalent Still Water Event with SLR	King Tide + 0ft SLR MMMW + 1ft SLR MHHW + 2ft SLR MHW + 3ft SLR	2-yr + 0ft SLR MMMW + 1ft SLR MHHW + 2.5ft SLR MHW + 3.5ft SLR	50-yr + 0ft SLR 10-yr + 0.5ft SLR 2-yr + 1.0ft SLR MMMW + 2.0ft SLR MHHW + 3.5ft SLR	10-yr + 0ft SLR 2-yr + 0.5ft SLR MMMW + 1.5ft SLR MHHW + 3.0ft SLR	100-yr + 0ft SLR 10-yr + 0.5ft SLR 2-yr + 1.0ft SLR MMMW + 2.0ft SLR MHHW + 3.5ft SLR	100-yr + 1ft SLR 10-yr + 1.5ft SLR 2-yr + 2.0ft SLR MMMW + 3.0ft SLR MHHW + 4.5ft SLR	100-yr + 2ft SLR 10-yr + 2.5ft SLR 2-yr + 3.0ft SLR MMMW + 4.0ft SLR MHHW + 5.5ft SLR	100-yr + 3ft SLR 10-yr + 3.5ft SLR 2-yr + 4.0ft SLR MMMW + 5.0ft SLR MHHW + 6.5ft SLR		
<b>RESOURCE RESPONSE &amp; IMPACT SUMMARY (see case study descriptions)</b>										
Overtopping	Limited, Select, Isolated Locations	Limited, Select, Isolated Locations	Rail Prism, Brainard, Interior Levees	Rail Prism, Brainard, Interior Levees	Rail Prism, Brainard, Interior Levees	Interior Levees	Rail Prism, Brainard, Interior Levees	Rail Prism, Brainard, Interior Levees	Rail Prism, Brainard, Interior Levees	Rail Prism, Brainard, Interior Levees
Cell A Bay Shoreline	< 0.1 mi, < 0.1 ac-ft	< 0.1 mi, < 0.1 ac-ft	1.9 mi, 460 ac-ft	1 mi, 37 ac-ft	2.2 mi, 940 ac-ft	0	2.7 mi, 4,700 ac-ft	1.4 mi, 10 ac-ft	3.0 mi, 6,300 ac-ft	3.3 mi, 6,600 ac-ft
Cell A Interior Shoreline	0	30 ft, 0.7 ac-ft	1,300 ft, 60 ac-ft	900 ft, 12 ac-ft	2,200 ft, 110 ac-ft	2,200 ft, 110 ac-ft	1.7 mi, 300 ac-ft	1.7 mi, 300 ac-ft	2.6 mi, 2,300 ac-ft	2.9 mi, 4,900 ac-ft
All other Cells	< 0.1 mi	0.5 mi	1.6 mi	1.2 mi	2.6 mi	2.6 mi	5.4 mi	5.4 mi	9.8 mi	10.6 mi
Shoreline Erosion Potential	Low	Wind Waves	N/A	Wind Waves	N/A	N/A	N/A	N/A	N/A	N/A
	Moderate	Rill	Rill	Wind Waves, Rill	Rill	Rill	Rill	Rill	Rill	Rill
	High	None	None	Wind Waves, Potential Breach-75ft, Cells A,B,C,E,G	Potential Breach-75ft, Cells B,C,E,G	Potential Breach-270ft, Cells A,B,C,E,G	Potential Breach-270ft, Cells A,B,C,E,G	Potential Breach-4,000ft, Cells A,B,C,E,F,G	Potential Breach-1,200ft, Cells A,B,C,E,F,G	Potential Breach-4 miles, Cells A,B,C,E,F,G
Transportation Resources Impacted	Usability Disruption: Park Street	Usability Disruption: Park Street	Usability Disruption: Tydd Street Jacobs Avenue Murray Field Access 2 <sup>nd</sup> and Y Street  Repair/Closure: Hwy 101 SB Park Street	Usability Disruption: Murray Field Access 2 <sup>nd</sup> and Y Street Tydd Street  Repair/Closure: Hwy 101 SB Park Street	Partial/Temp Closure: Jacobs Ave Hwy 255 (Alt Route) 2 <sup>nd</sup> and Y Street Tydd Street  Repair/Closure: Hwy 101 SB Murray Field Access Hoover Street Park Street	Partial/Temp Closure: Murray Field Access 2 <sup>nd</sup> and Y Street Tydd Street Hwy 255 (Alt Route)  Repair/Closure: Hoover Street Park Street	Partial/Temp Closure: Myrtle Ave 4 <sup>th</sup> Street  Repair/Closure: Hwy 101 SB & NB, Murray Field Access Jacobs Ave, Hoover Street, Tydd Street, 2 <sup>nd</sup> and Y Streets, Park Street, Hwy 255 (Alt Route)	Partial/Temp Closure: Murray Field Access Myrtle Ave 4 <sup>th</sup> Street  Repair/Closure: Hoover Street, Tydd Street, 2 <sup>nd</sup> and Y Streets, Park Street, Hwy 255 (Alt Route)	Partial/Temp Closure: 4 <sup>th</sup> , 5 <sup>th</sup> & 6 <sup>th</sup> Streets  Repair/Closure: Hwy 101 SB & NB, Murray Field Access, Jacobs Ave, Hoover Street, Tydd Street, 2 <sup>nd</sup> and Y Street, Indianola Cutoff, Park Street, Myrtle Ave, Hwy 255 (Alt Route)	Partial/Temp Closure: 4 <sup>th</sup> , 5 <sup>th</sup> & 6 <sup>th</sup> Streets  Repair/Closure: Hwy 101 SB & NB, Murray Field Access, Jacobs Ave, Hoover Street, Tydd Street, 2 <sup>nd</sup> and Y Street, Indianola Cutoff, Park Street, Myrtle Ave, Hwy 255 (Alt Route)
Other Critical Resources Impacted	No Observable Impacts, similar to typical winter conditions	Initiation: Underground Utilities  Increasing: Agricultural Lands	Initiation: Underground Utilities Water Booster Station  Increasing: Sewer Pump Stations  Increasing to Most Severe: Agricultural Lands	Initiation: Underground Utilities Sewer Pump Stations  Increasing to Most Severe: Agricultural Lands	Initiation to Most Severe: Underground Utilities  Increasing: Sewer Pump Stations Water Booster Station  Increasing to Most Severe: Residential Areas Commercial Areas Agricultural Lands	Initiation to Most Severe: Underground Utilities  Increasing: Sewer Pump Stations Water Booster Station Residential Areas Commercial Areas  Increasing to Most Severe: Agricultural Lands	Increasing to Most Severe: Underground Utilities Sewer Pump Stations Water Booster Station  Most Severe: Residential Areas Commercial Areas Agricultural Lands	Increasing: Residential Areas Commercial Areas  Increasing to Most Severe: Underground Utilities Sewer Pump Stations Water Booster Station  Most Severe: Agricultural Lands	Most Severe: Residential Areas Commercial Areas Agricultural Lands Underground Utilities Sewer Pump Stations Water Booster Station	Most Severe: Residential Areas Commercial Areas Agricultural Lands Underground Utilities Sewer Pump Stations Water Booster Station
Key Findings and Conclusions	No significant episodic impacts. Typical long-term erosion and geomorphic processes. Minor flooding of Park Street.	Approximate elevation when overtopping begins. Existing drainage infrastructure has capacity to convey overtopping flow.	Temporary closure of Hwy 101 southbound. Alternate route required. Significant damage to shoreline rail prism	Temporary closure of Hwy 101 southbound. Alternate route required. Significant damage to shoreline rail prism.	Temporary closure of Hwy 101 southbound. Alternate route required. Widespread damage to shoreline structures and flooding.	Overtopping along Bay Shoreline does not occur, preventing closure of Hwy 101 and significantly reducing flooding of Cell A.	Closure of Hwy 101 and alternate routes around Humboldt Bay. Widespread damage to shoreline structures. Most severe flooding of all Protected Lands.	Overtopping along Bay Shoreline is reduced, preventing closure of Hwy 101 and significantly reducing flooding of Cell A.	Closure of Hwy 101 and alternate routes around Humboldt Bay. Widespread damage to shoreline structures. Most severe flooding of all Protected Lands.	Closure of Hwy 101 and alternate routes around Humboldt Bay. Widespread damage to shoreline structures. Most severe flooding of all Protected Lands.



**Water Level: 8.8 ft (NAVD) with Waves  
(Total Water Level 9.3-10.3 ft NAVD)**

**Hazard Scenario 1**  
 Tidal Still Water Level: 8.3 ft NAVD  
 Wind Setup: 0.5 ft (8.8 ft NAVD)  
 Wind Wave Height: 1 ft  
 Wave Runup Range: 0.5 ft - 1 ft (9.3 - 9.8 ft NAVD)



Fluvial Flows: Winter Base Flow from tributaries

**Approx. Equivalent Still Water with Sea Level Rise (SLR)**  
 King Tide + 0 ft SLR MHW + 3.0 ft SLR  
 MMMW + 1.0 ft SLR  
 MHHW + 2.0 ft SLR

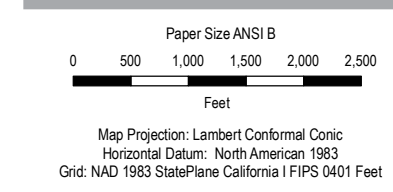
- Tidal Still Water & Wind Setup
- Wind Waves
- Streams and Drainage
- Roadway
- Significant Erosion
- Moderate Erosion
- Vegetated or Vegetated RSP
- Armored
- Partially Breached Levee

**Geomorphic & Critical Resource Response\***

- Wave Runup Height (GHD 2020) | Response**
- ▼ 0.5 - 1.0 ft | Minor Erosion Potential
- Shoreline Overtopping Depth | Duration | Response**
- > 1 ft | > 2 hrs | High Potential of Failure
  - Inches - Feet | Minutes to Hours | Rill Erosion
  - Still Water Overtopping Pathway
- Travel Lane Flood Depth | Duration | Response**
- > 12 inches | Hours | Damage
  - 3-12 inches | Hours | Functional Disruption
  - < 3 inches | Hours | Hazardous Conditions
- Temporary Cell Flooding**
- Approximate Flood Depth from Overtopping**
- |   |   |   |
|---|---|---|
| <span style="display: inline-block; width: 20px; height: 10px; background-color: #D3D3D3; border: 1px solid black; margin-right: 5px;"></span> < 0.5 ft   | <span style="display: inline-block; width: 20px; height: 10px; background-color: #ADD8E6; border: 1px solid black; margin-right: 5px;"></span> 1 - 3 ft | <span style="display: inline-block; width: 20px; height: 10px; background-color: #4682B4; border: 1px solid black; margin-right: 5px;"></span> > 6 ft |
| <span style="display: inline-block; width: 20px; height: 10px; background-color: #B0C4DE; border: 1px solid black; margin-right: 5px;"></span> 0.5 - 1 ft | <span style="display: inline-block; width: 20px; height: 10px; background-color: #6495ED; border: 1px solid black; margin-right: 5px;"></span> 3 - 6 ft |   |

**Cell** Cell subject to permanent inundation due to high potential of levee failure/breach. Increased erosion potential of slough channel between breach and Arcata Bay.

\*Not all Critical Resources Shown. See Critical Resource Response and Impact Evaluation Table in Case Hazard Scenario Case Study.

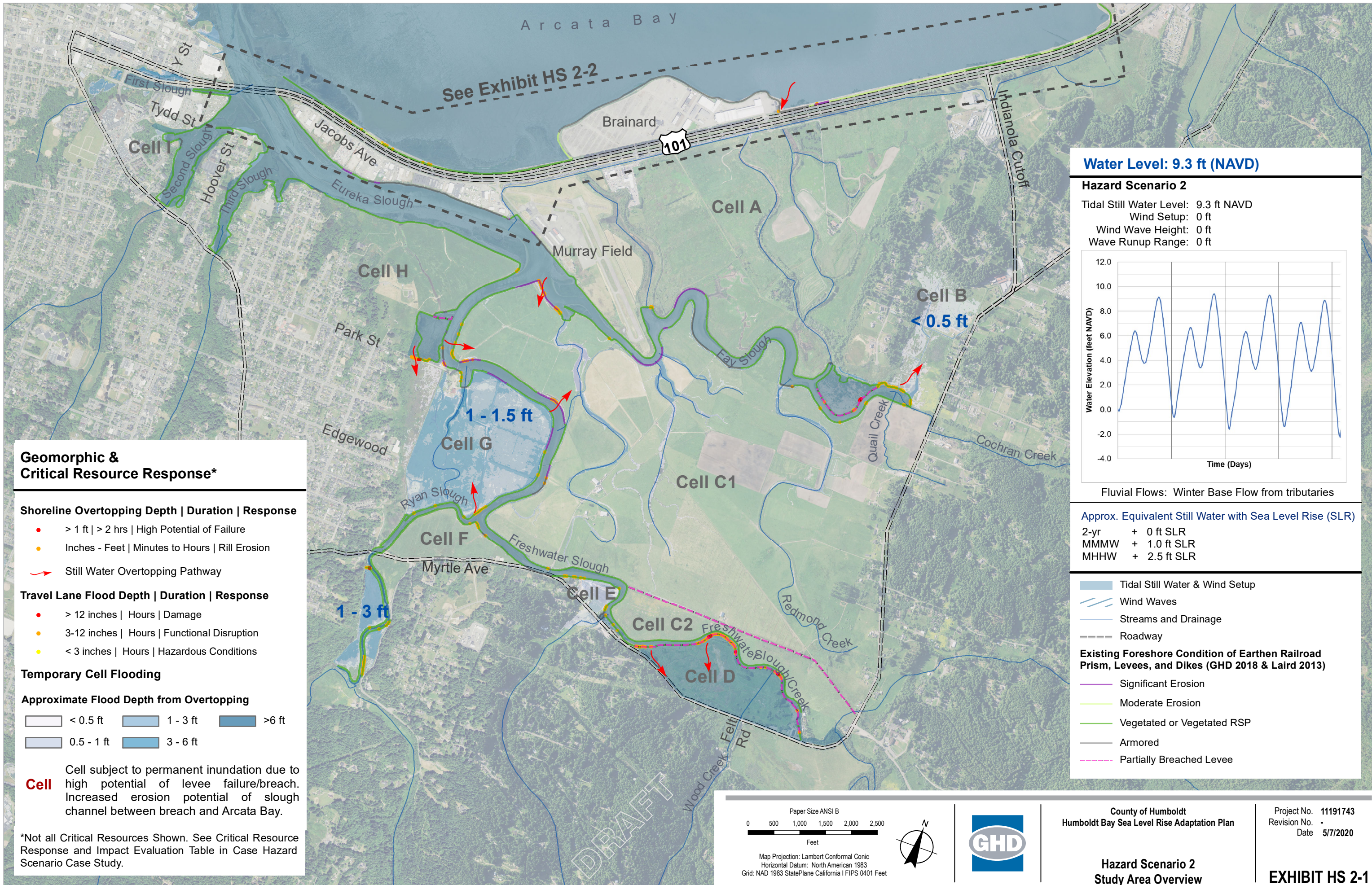


County of Humboldt  
 Humboldt Bay Sea Level Rise Adaptation Plan

**Hazard Scenario 1  
 Study Area Overview**

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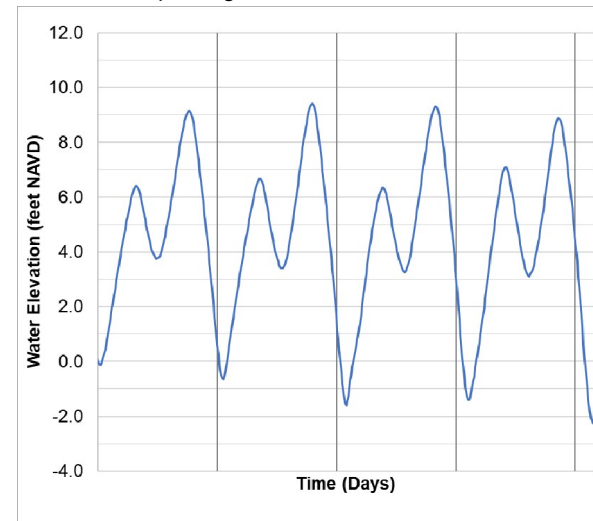
**EXHIBIT HS 1-1**



**Water Level: 9.3 ft (NAVD)**

**Hazard Scenario 2**

Tidal Still Water Level: 9.3 ft NAVD  
 Wind Setup: 0 ft  
 Wind Wave Height: 0 ft  
 Wave Runup Range: 0 ft



Fluvial Flows: Winter Base Flow from tributaries

**Approx. Equivalent Still Water with Sea Level Rise (SLR)**

2-yr	+ 0 ft SLR
MMMW	+ 1.0 ft SLR
MHHW	+ 2.5 ft SLR

- Tidal Still Water & Wind Setup
- Wind Waves
- Streams and Drainage
- Roadway

**Existing Foreshore Condition of Earthen Railroad Prism, Levees, and Dikes (GHD 2018 & Laird 2013)**

- Significant Erosion
- Moderate Erosion
- Vegetated or Vegetated RSP
- Armored
- Partially Breached Levee

**Geomorphic & Critical Resource Response\***

**Shoreline Overtopping Depth | Duration | Response**

- > 1 ft | > 2 hrs | High Potential of Failure
- Inches - Feet | Minutes to Hours | Rill Erosion
- Still Water Overtopping Pathway

**Travel Lane Flood Depth | Duration | Response**

- > 12 inches | Hours | Damage
- 3-12 inches | Hours | Functional Disruption
- < 3 inches | Hours | Hazardous Conditions

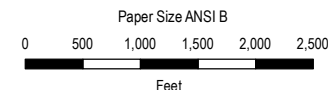
**Temporary Cell Flooding**

**Approximate Flood Depth from Overtopping**

< 0.5 ft	1 - 3 ft	> 6 ft
0.5 - 1 ft	3 - 6 ft	

**Cell** Cell subject to permanent inundation due to high potential of levee failure/breach. Increased erosion potential of slough channel between breach and Arcata Bay.

\*Not all Critical Resources Shown. See Critical Resource Response and Impact Evaluation Table in Case Hazard Scenario Case Study.



County of Humboldt  
 Humboldt Bay Sea Level Rise Adaptation Plan

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**Hazard Scenario 2  
 Study Area Overview**

**EXHIBIT HS 2-1**

**Water Level: 9.3 ft (NAVD)**

**Hazard Scenario 2**

See Exhibit HS 2-1 for Water Level Detail

- Tidal Still Water & Wind Set-up
- Wind Waves
- Streams and Drainage
- Roadway

**Existing Foreshore Condition of Earthen Railroad Prism, Levees, and Dikes (GHD 2018 & Laird 2013)**

- Significant Erosion
- Moderate Erosion
- Vegetated or Vegetated RSP
- Armored
- Partially Breached Levee

**Drainage**

- Drainage Swale/Ditch
- Culvert
- Culvert with Flash Board Riser
- Drop Inlet
- Culvert with Flap Gate or Tide Gate

**Geomorphic & Critical Resource Response\***

**Shoreline Overtopping Depth | Duration | Response**

- > 1 ft | > 2 hrs | High Potential of Failure
- Inches - Feet | Minutes to Hours | Rill Erosion

**Travel Lane Flood Depth | Duration | Response**

- > 12 inches | Hours | Damage
- 3-12 inches | Hours | Functional Disruption
- < 3 inches | Hours | Hazardous Conditions

**Temporary Cell Flooding**

**Approximate Flood Depth from Overtopping**

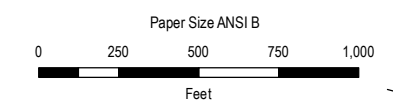
- < 0.5 ft
- 1 - 3 ft
- > 6 ft
- 0.5 - 1 ft
- 3 - 6 ft

**Cell** Cell subject to permanent inundation due to high potential of levee failure/breach. Increased erosion potential of slough channel between breach and Arcata Bay.

\*Not all Critical Resources Shown. See Critical Resource Response and Impact Evaluation Table in Case Hazard Scenario Case Study.



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Map Projection: Lambert Conformal Conic  
Horizontal Datum: North American 1983  
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet



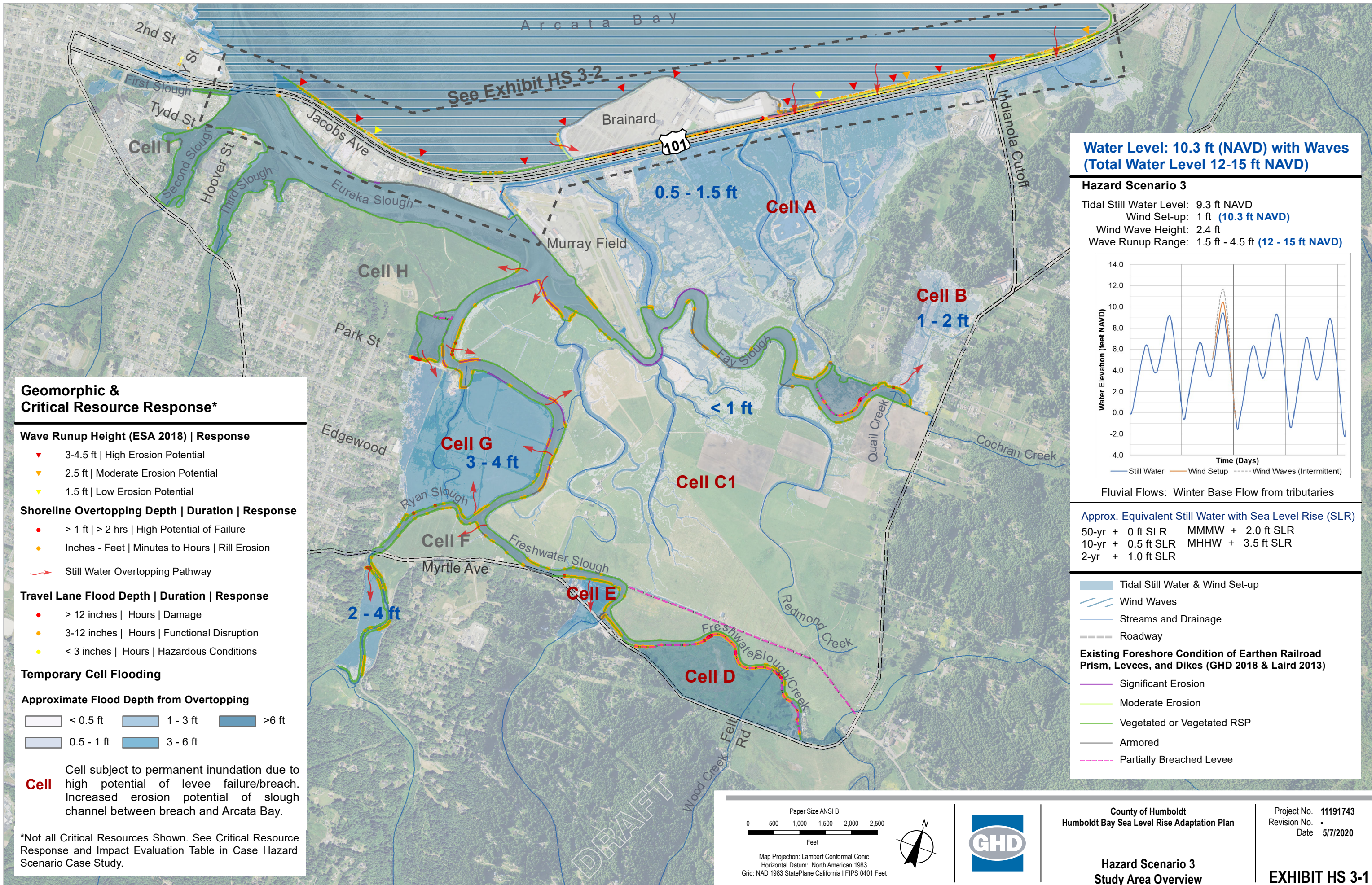
County of Humboldt  
Humboldt Bay Sea Level Rise Adaptation Plan

**Hazard Scenario 2**  
**Bay Shoreline**

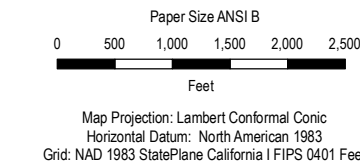
Project No. 11191743  
Revision No. -  
Date 4/22/2020

**EXHIBIT HS 2-2**

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Print date: 22 Apr 2020 - 16:31 Created by: bviyyan



\*Not all Critical Resources Shown. See Critical Resource Response and Impact Evaluation Table in Case Hazard Scenario Case Study.



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 Humboldt Bay Sea Level Rise Adaptation Plan

**Hazard Scenario 3**  
**Study Area Overview**

Project No. 11191743  
 Revision No. -  
 Date 5/7/2020

**EXHIBIT HS 3-1**

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 Created by: bviyan

**Water Level: 10.3 ft (NAVD) with Waves  
(Total Water Level 12-15 ft NAVD)**

**Hazard Scenario 3**

See Exhibit HS 3-1 for Water Level Detail

- Tidal Still Water & Wind Set-up
- Wind Waves
- Streams and Drainage
- Roadway

**Existing Foreshore Condition of Earthen Railroad Prism, Levees, and Dikes (GHD 2018 & Laird 2013)**

- Significant Erosion
- Moderate Erosion
- Vegetated or Vegetated RSP
- Armored
- Partially Breached Levee

**Drainage**

- Drainage Swale/Ditch
- Culvert
- Culvert with Flash Board Riser
- Drop Inlet
- Culvert with Flap Gate or Tide Gate

**Geomorphic & Critical Resource Response\***

**Wave Runup Height (ESA 2018) | Response**

- 3-4.5 ft | High Erosion Potential
- 2.5 ft | Moderate Erosion Potential
- 1.5 ft | Low Erosion Potential

**Shoreline Overtopping Depth | Duration | Response**

- > 1 ft | > 2 hrs | High Potential of Failure
- Inches - Feet | Minutes to Hours | Rill Erosion

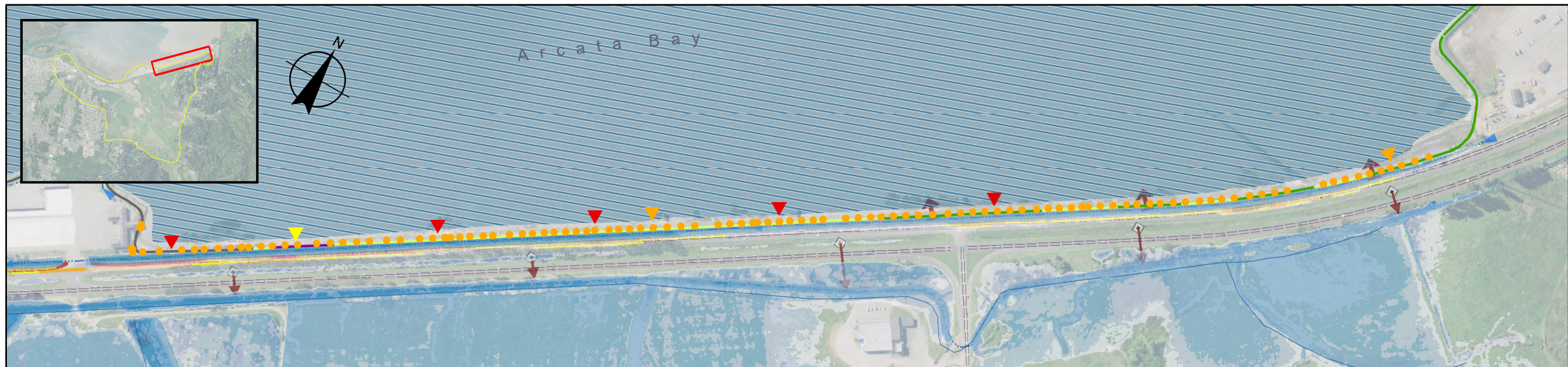
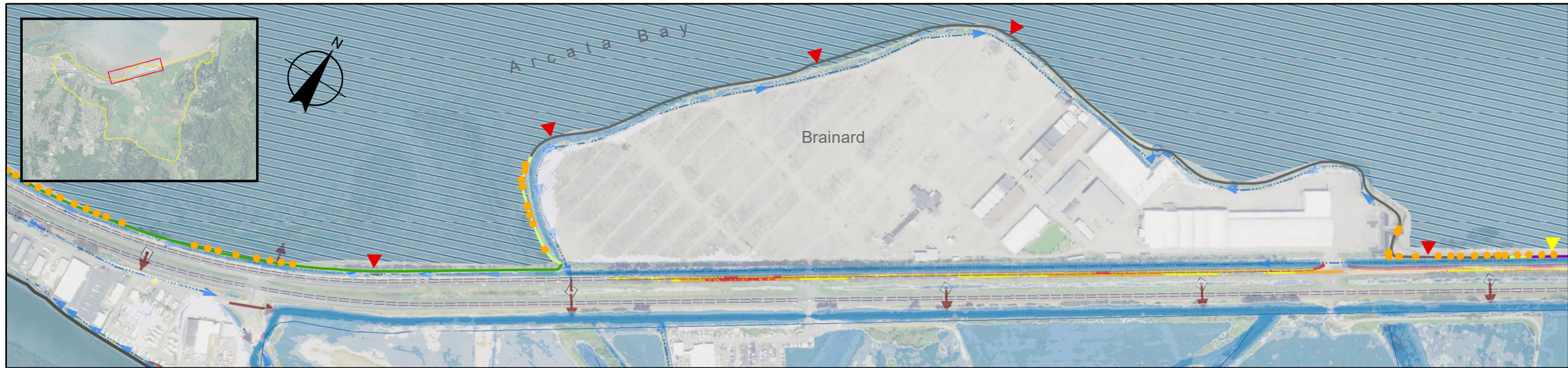
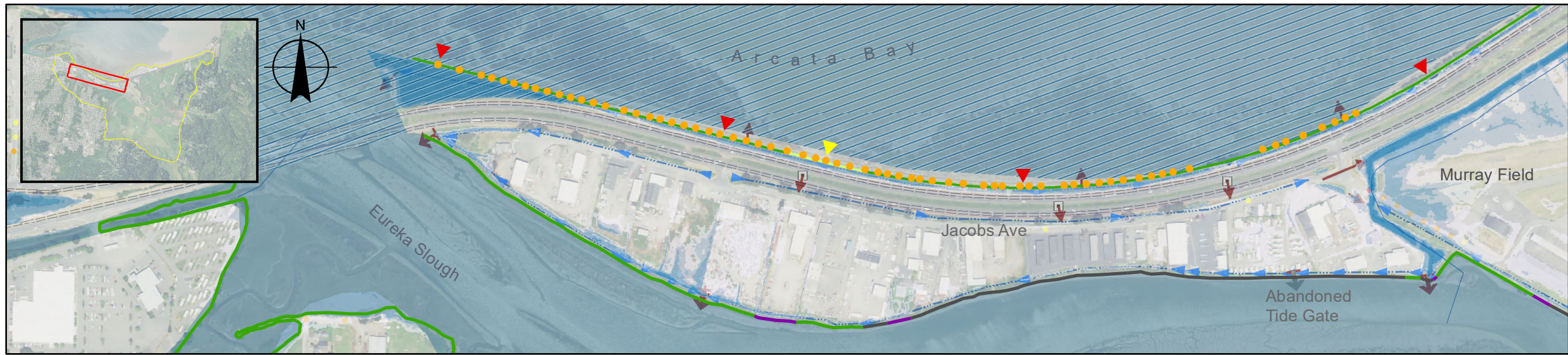
**Travel Lane Flood Depth | Duration | Response**

- > 12 inches | Hours | Damage
- 3-12 inches | Hours | Functional Disruption
- < 3 inches | Hours | Hazardous Conditions

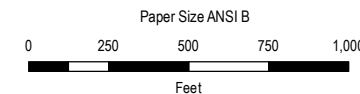
**Approximate Flood Depth from Overtopping**

- < 0.5 ft
- 1 - 3 ft
- > 6 ft
- 0.5 - 1 ft
- 3 - 6 ft

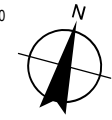
\*Not all Critical Resources Shown. See Critical Resource Response and Impact Evaluation Table in Case Hazard Scenario Case Study.



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Horizontal Datum: North American 1983  
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

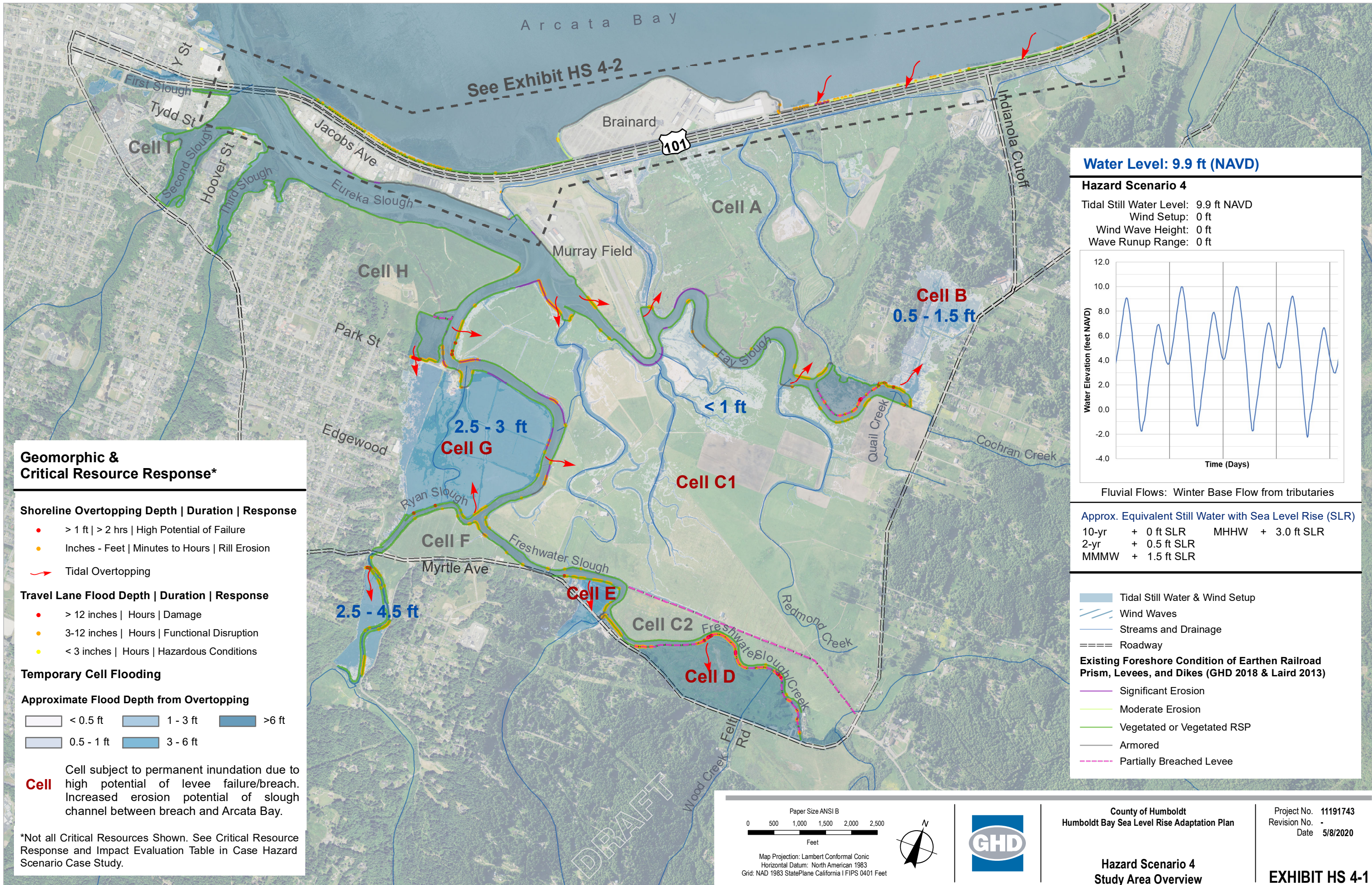


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Humboldt Bay Sea Level Rise Adaptation Plan

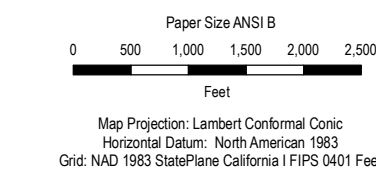
**Hazard Scenario 3  
Bay Shoreline**

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**EXHIBIT HS 3-2**



\*Not all Critical Resources Shown. See Critical Resource Response and Impact Evaluation Table in Case Hazard Scenario Case Study.



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 Humboldt Bay Sea Level Rise Adaptation Plan

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 Date 5/8/2020

**Hazard Scenario 4  
 Study Area Overview**

**EXHIBIT HS 4-1**

**Water Level: 9.9 ft (NAVD)**

**Hazard Scenario 4**

See Exhibit HS 4-1 for Water Level Detail

- Tidal Still Water  
(Wind Setup and Wind Waves Not Present)
- Streams and Drainage
- Roadway

**Existing Foreshore Condition of Earthen Railroad Prism, Levees, and Dikes (GHD 2018 & Laird 2013)**

- Significant Erosion
- Moderate Erosion
- Vegetated or Vegetated RSP
- Armored
- Partially Breached Levee

**Drainage**

- Drainage Swale/Ditch
- Culvert
- Culvert with Flash Board Riser
- Drop Inlet
- Culvert with Flap Gate or Tide Gate

**Geomorphic & Critical Resource Response\***

**Shoreline Overtopping Depth | Duration | Response**

- > 1 ft | > 2 hrs | High Potential of Failure
- Inches - Feet | Minutes to Hours | Rill Erosion

**Travel Lane Flood Depth | Duration | Response**

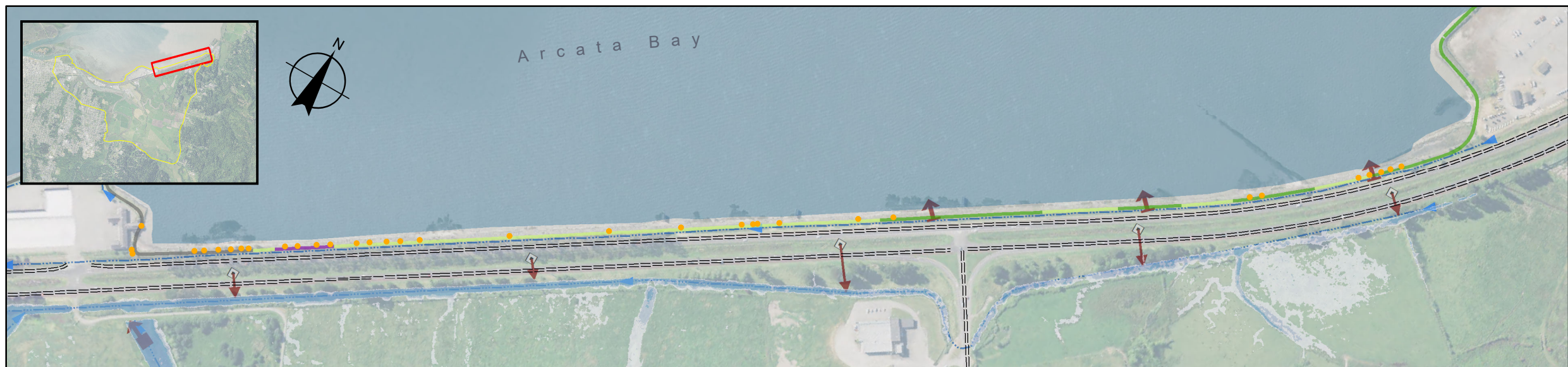
- > 12 inches | Hours | Damage
- 3-12 inches | Hours | Functional Disruption
- < 3 inches | Hours | Hazardous Conditions

**Temporary Cell Flooding**

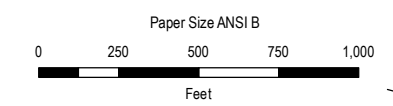
**Approximate Flood Depth from Overtopping**

- < 0.5 ft
- 1 - 3 ft
- > 6 ft
- 0.5 - 1 ft
- 3 - 6 ft

\*Not all Critical Resources Shown. See Critical Resource Response and Impact Evaluation Table in Case Hazard Scenario Case Study.



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Map Projection: Lambert Conformal Conic  
Horizontal Datum: North American 1983  
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet



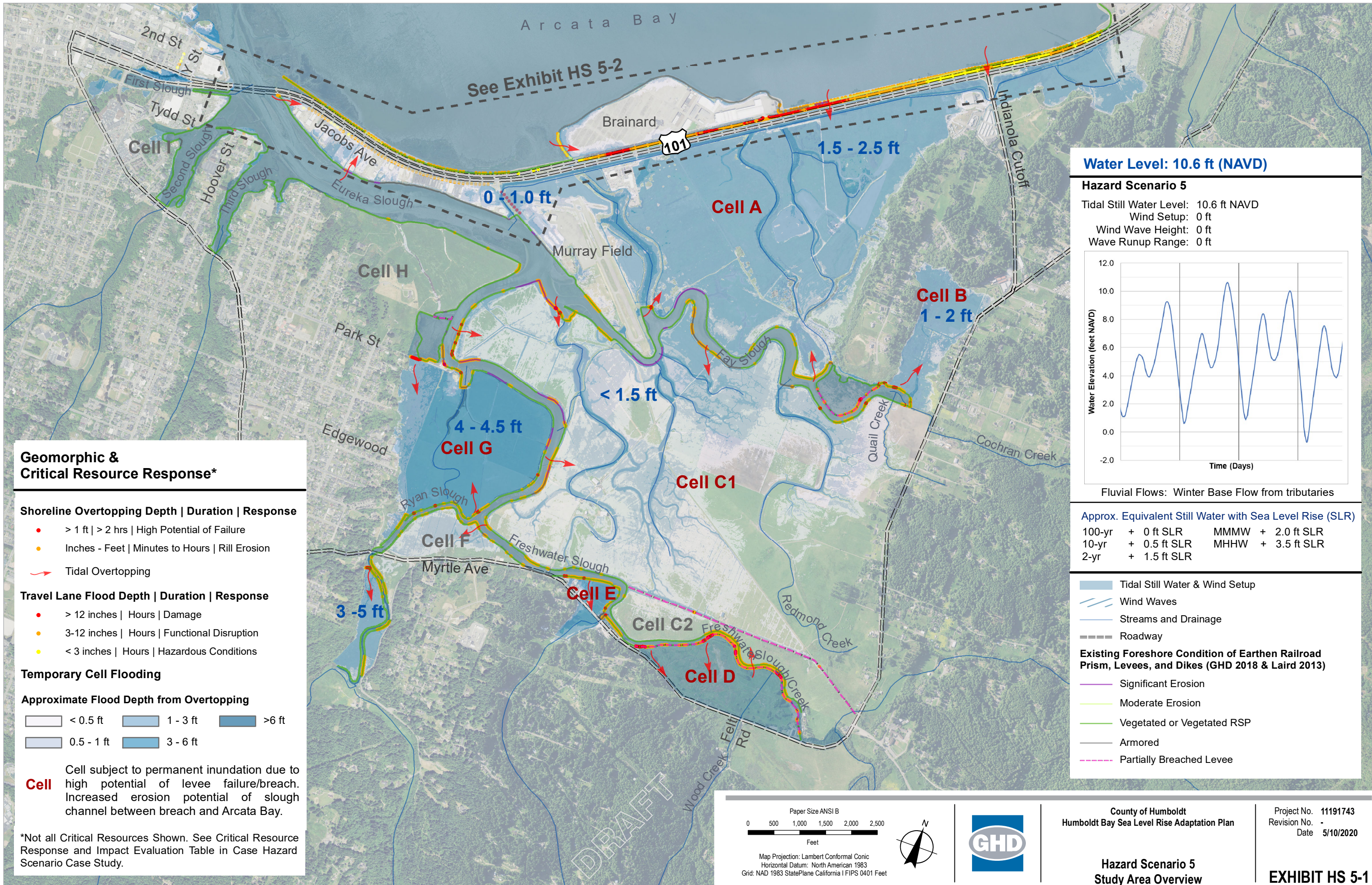
County of Humboldt  
Humboldt Bay Sea Level Rise Adaptation Plan

**Hazard Scenario 4  
Bay Shoreline**

Project No. 11191743  
Revision No. -  
Date 5/8/2020

**EXHIBIT HS 4-2**

\\ghdnet\ghd\US\Eureka\Projects\56111191743\GIS\Map\Deliverables\Hazard Scenario\11191743\_Hazard\_Scenario\_4\_9-9ft\_inset.mxd Print date: 08 May 2020 - 14:59 Data source: Shoreline Elevation, NOAA, 2014; Study area, Humboldt County, 2/28/2019; Roads data, US Census, 2013; Creeks, Humboldt County 2015; Orthoimagery, 2016; NAIP; - Created by: bviyyan



\*Not all Critical Resources Shown. See Critical Resource Response and Impact Evaluation Table in Case Hazard Scenario Case Study.

## Water Level: 10.6 ft (NAVD)

### Hazard Scenario 5

See Exhibit HS 5-1 for Water Level Detail

- Tidal Still Water  
(Wind Setup and Wind Waves Not Present)
- Streams and Drainage
- Roadway

### Existing Foreshore Condition of Earthen Railroad Prism, Levees, and Dikes (GHD 2018 & Laird 2013)

- Significant Erosion
- Moderate Erosion
- Vegetated or Vegetated RSP
- Armored
- Partially Breached Levee

### Drainage

- Drainage Swale/Ditch
- Culvert
- Culvert with Flash Board Riser
- Drop Inlet
- Culvert with Flap Gate or Tide Gate

### Geomorphic & Critical Resource Response\*

#### Shoreline Overtopping Depth | Duration | Response

- > 1 ft | > 2 hrs | High Potential of Failure
- Inches - Feet | Minutes to Hours | Rill Erosion

#### Travel Lane Flood Depth | Duration | Response

- > 12 inches | Hours | Damage
- 3-12 inches | Hours | Functional Disruption
- < 3 inches | Hours | Hazardous Conditions

#### Temporary Cell Flooding

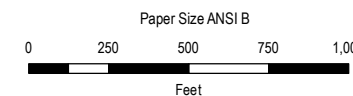
##### Approximate Flood Depth from Overtopping

- < 0.5 ft
- 1 - 3 ft
- > 6 ft
- 0.5 - 1 ft
- 3 - 6 ft

\*Not all Critical Resources Shown. See Critical Resource Response and Impact Evaluation Table in Case Hazard Scenario Case Study.



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Map Projection: Lambert Conformal Conic  
Horizontal Datum: North American 1983  
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

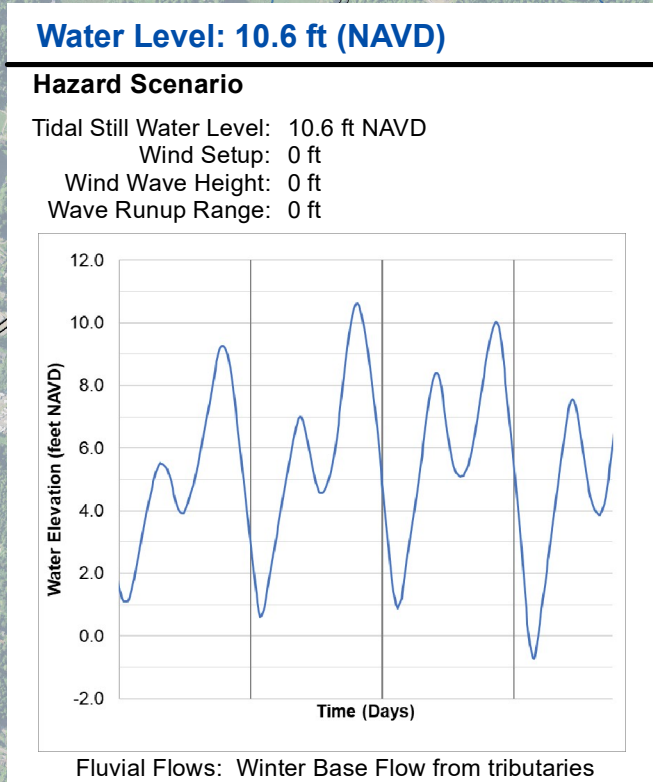
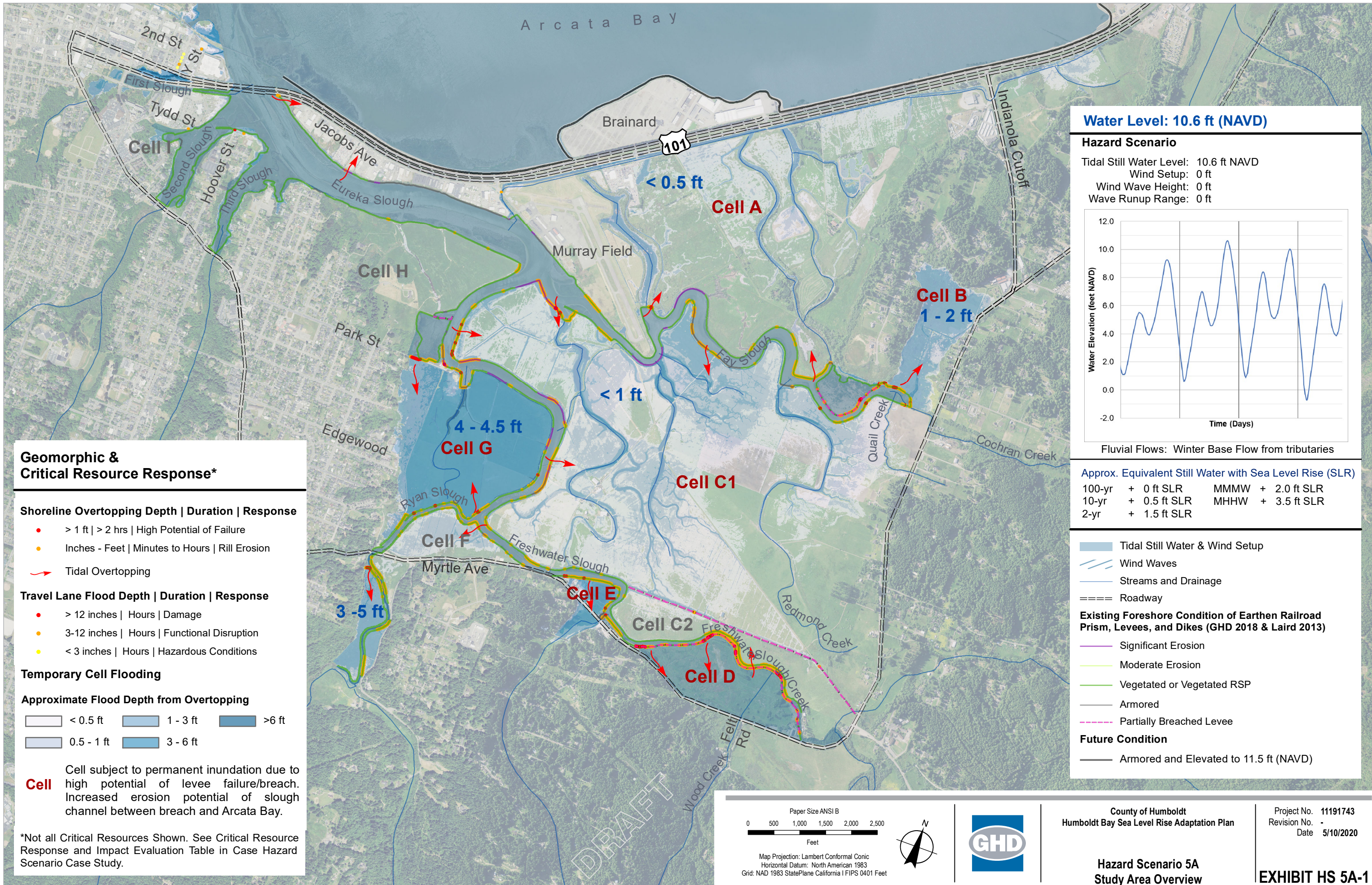


County of Humboldt  
Humboldt Bay Sea Level Rise Adaptation Plan

Hazard Scenario 5  
Bay Shoreline

Project No. 11191743  
Revision No. -  
Date 4/22/2020

EXHIBIT HS 5-2



Approx. Equivalent Still Water with Sea Level Rise (SLR)

100-yr	+ 0 ft SLR	MMMW	+ 2.0 ft SLR
10-yr	+ 0.5 ft SLR	MHHW	+ 3.5 ft SLR
2-yr	+ 1.5 ft SLR		

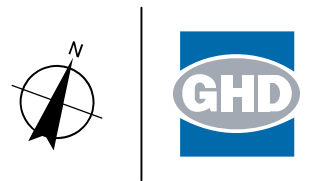
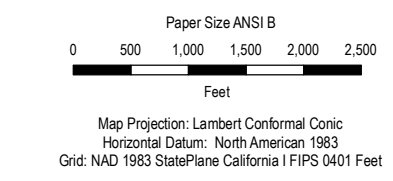
### Geomorphic & Critical Resource Response\*

- #### Shoreline Overtopping Depth | Duration | Response
- > 1 ft | > 2 hrs | High Potential of Failure
  - Inches - Feet | Minutes to Hours | Rill Erosion
  - ➔ Tidal Overtopping
- #### Travel Lane Flood Depth | Duration | Response
- > 12 inches | Hours | Damage
  - 3-12 inches | Hours | Functional Disruption
  - < 3 inches | Hours | Hazardous Conditions

- #### Temporary Cell Flooding
- ##### Approximate Flood Depth from Overtopping
- |              |            |          |
|--------------|------------|----------|
| □ < 0.5 ft   | □ 1 - 3 ft | □ > 6 ft |
| □ 0.5 - 1 ft | □ 3 - 6 ft |          |

**Cell** Cell subject to permanent inundation due to high potential of levee failure/breach. Increased erosion potential of slough channel between breach and Arcata Bay.

\*Not all Critical Resources Shown. See Critical Resource Response and Impact Evaluation Table in Case Hazard Scenario Case Study.



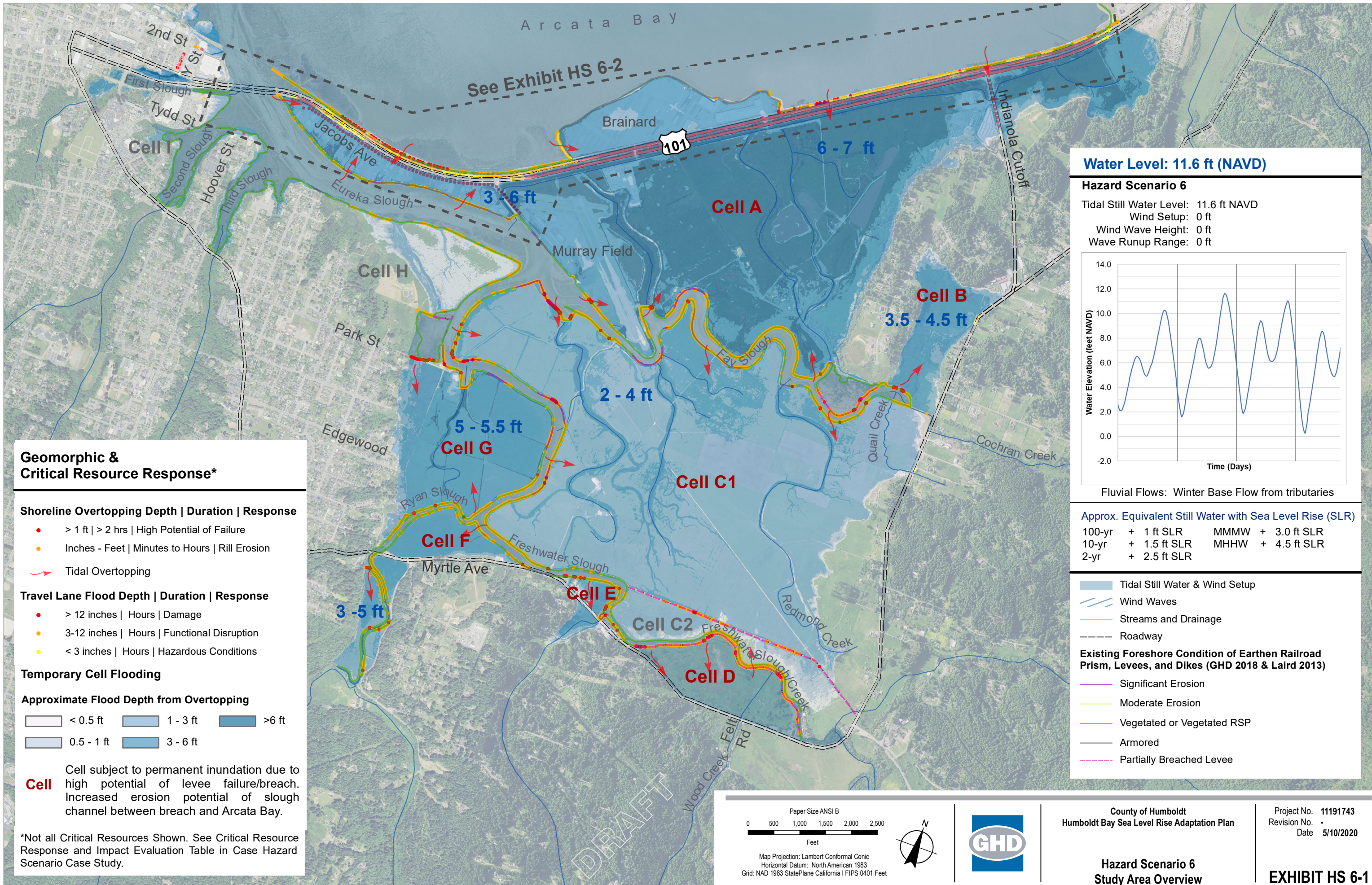
County of Humboldt  
 Humboldt Bay Sea Level Rise Adaptation Plan

Project No. 11191743  
 Revision No. -  
 Date 5/10/2020

**Hazard Scenario 5A  
 Study Area Overview**

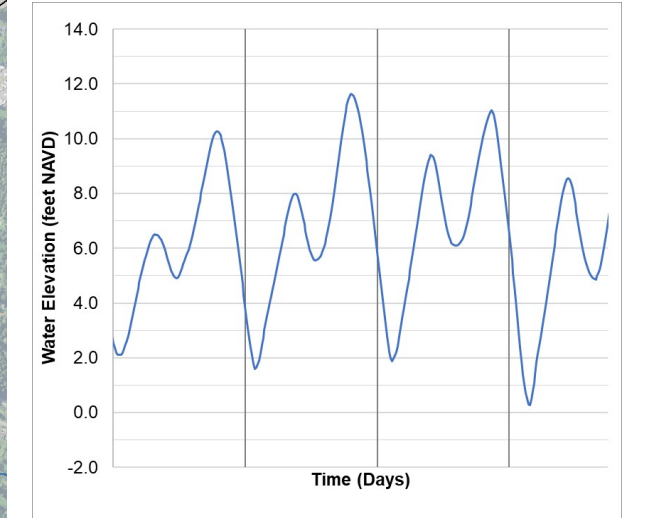
**EXHIBIT HS 5A-1**

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 Data source: Shoreline Elevation, NOAA, 2014; Study area, Humboldt County, 2/28/2019; Roads data, US Census, 2013; Creeks, Humboldt County 2015; Orthoimagery, 2016; NAIP; -  
 Created by: bviyan



**Water Level: 11.6 ft (NAVD)**

**Hazard Scenario 6**  
 Tidal Still Water Level: 11.6 ft NAVD  
 Wind Setup: 0 ft  
 Wind Wave Height: 0 ft  
 Wave Runup Range: 0 ft



Approx. Equivalent Still Water with Sea Level Rise (SLR)

100-yr	+ 1 ft SLR	MMMW	+ 3.0 ft SLR
10-yr	+ 1.5 ft SLR	MHHW	+ 4.5 ft SLR
2-yr	+ 2.5 ft SLR		

**Geomorphic & Critical Resource Response\***

**Shoreline Overtopping Depth | Duration | Response**

- > 1 ft | > 2 hrs | High Potential of Failure
- Inches - Feet | Minutes to Hours | Rill Erosion
- ➔ Tidal Overtopping

**Travel Lane Flood Depth | Duration | Response**

- > 12 inches | Hours | Damage
- 3-12 inches | Hours | Functional Disruption
- < 3 inches | Hours | Hazardous Conditions

**Temporary Cell Flooding**

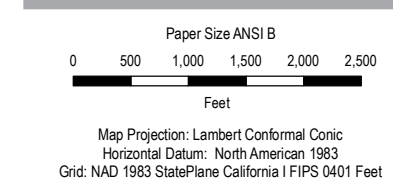
**Approximate Flood Depth from Overtopping**

< 0.5 ft	1 - 3 ft	> 6 ft
0.5 - 1 ft	3 - 6 ft	

**Cell** Cell subject to permanent inundation due to high potential of levee failure/breach. Increased erosion potential of slough channel between breach and Arcata Bay.

\*Not all Critical Resources Shown. See Critical Resource Response and Impact Evaluation Table in Case Hazard Scenario Case Study.

- Tidal Still Water & Wind Setup
  - 〰 Wind Waves
  - Streams and Drainage
  - ==== Roadway
- Existing Foreshore Condition of Earthen Railroad Prism, Levees, and Dikes (GHD 2018 & Laird 2013)**
- Significant Erosion
  - Moderate Erosion
  - Vegetated or Vegetated RSP
  - Armored
  - Partially Breached Levee



County of Humboldt  
 Humboldt Bay Sea Level Rise Adaptation Plan

**Hazard Scenario 6  
 Study Area Overview**

Project No. 11191743  
 Revision No. -  
 Date 5/10/2020

**EXHIBIT HS 6-1**

**Water Level: 11.6 ft (NAVD)**

**Hazard Scenario 6**

See Exhibit HS 6-1 for Water Level Detail

- Tidal Still Water  
(Wind Setup and Wind Waves Not Present)
- Streams and Drainage
- Roadway

**Existing Foreshore Condition of Earthen Railroad Prism, Levees, and Dikes (GHD 2018 & Laird 2013)**

- Significant Erosion
- Moderate Erosion
- Vegetated or Vegetated RSP
- Armored
- Partially Breached Levee

**Drainage**

- Drainage Swale/Ditch
- Culvert
- Culvert with Flash Board Riser
- Culvert with Flap Gate or Tide Gate
- Drop Inlet

**Geomorphic & Critical Resource Response\***

**Shoreline Overtopping Depth | Duration | Response**

- > 1 ft | > 2 hrs | High Potential of Failure
- Inches - Feet | Minutes to Hours | Rill Erosion

**Travel Lane Flood Depth | Duration | Response**

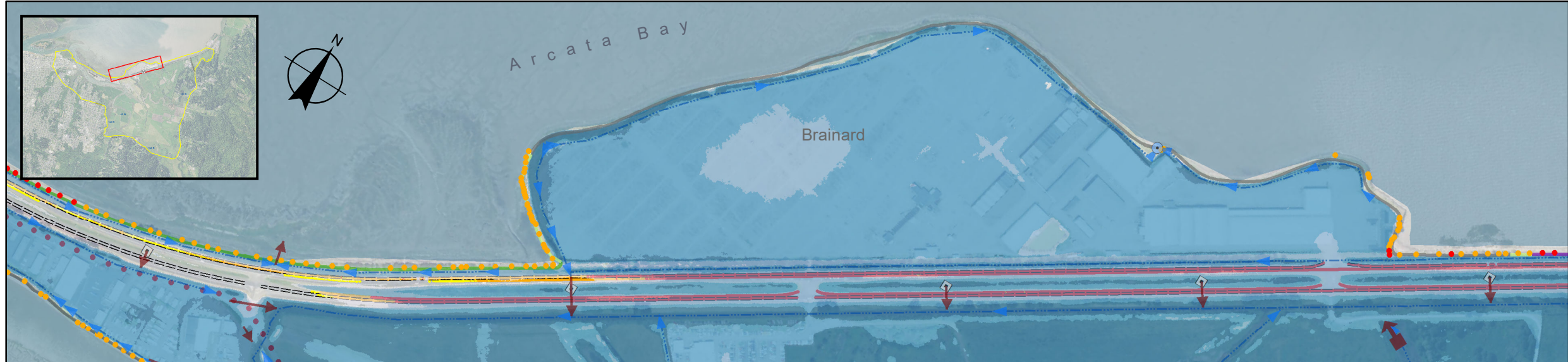
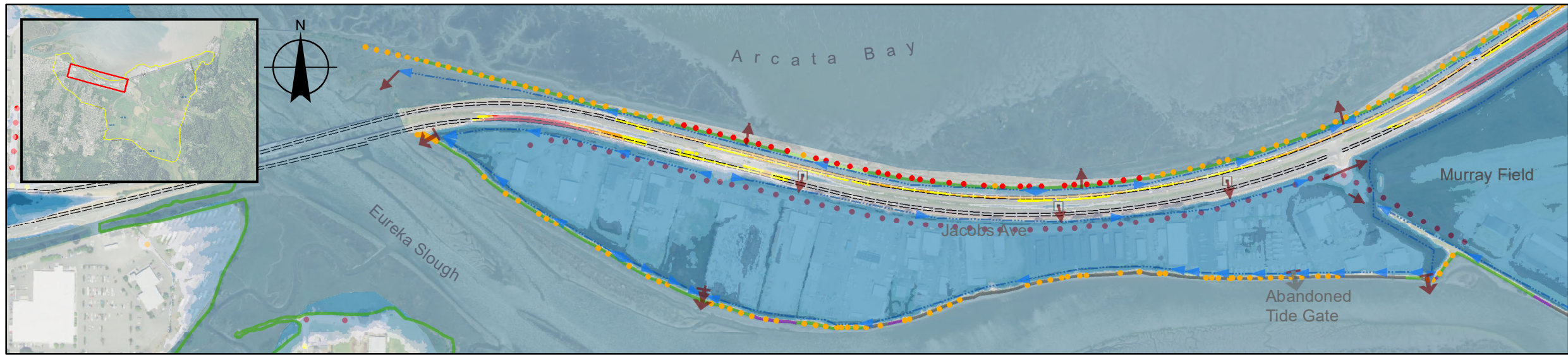
- > 12 inches | Hours | Damage
- 3-12 inches | Hours | Functional Disruption
- < 3 inches | Hours | Hazardous Conditions

**Temporary Cell Flooding**

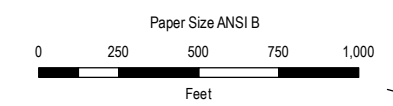
**Approximate Flood Depth from Overtopping**

- < 0.5 ft
- 1 - 3 ft
- > 6 ft
- 0.5 - 1 ft
- 3 - 6 ft

\*Not all Critical Resources Shown. See Critical Resource Response and Impact Evaluation Table in Case Hazard Scenario Case Study.



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Map Projection: Lambert Conformal Conic  
Horizontal Datum: North American 1983  
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet



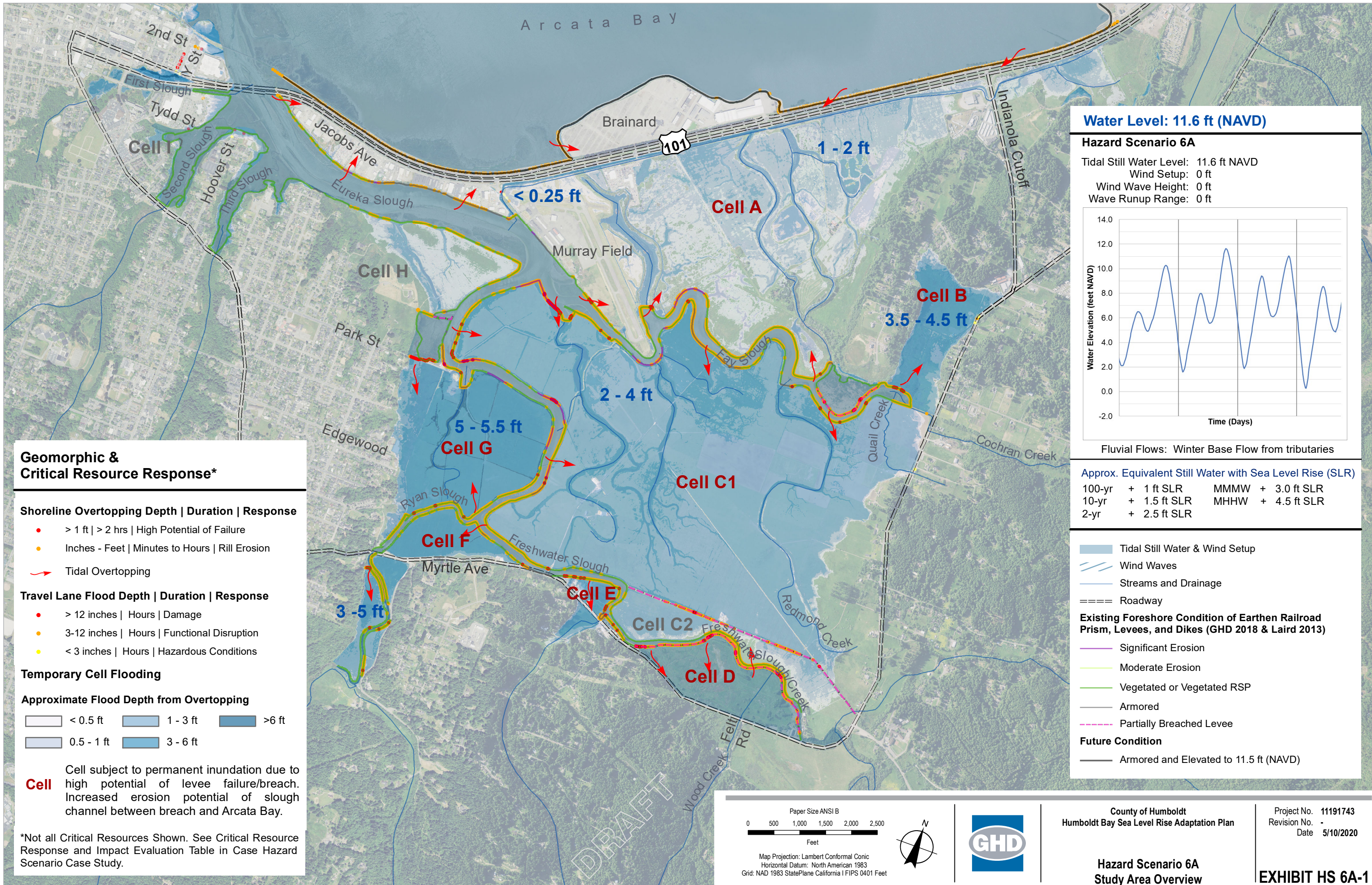
County of Humboldt  
Humboldt Bay Sea Level Rise Adaptation Plan

Project No. 11191743  
Revision No. -  
Date 4/17/2020

**Hazard Scenario 6  
Bay Shoreline**

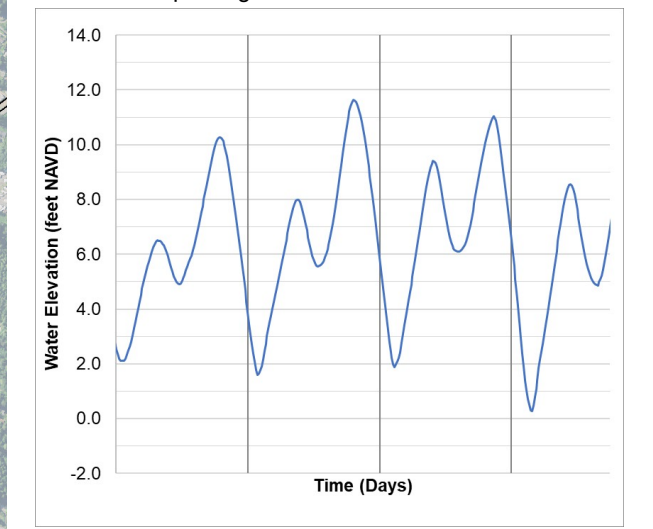
**EXHIBIT HS 6-2**

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Print date: 17 Apr 2020 - 17:38 Created by: bviyyan



**Water Level: 11.6 ft (NAVD)**

**Hazard Scenario 6A**  
 Tidal Still Water Level: 11.6 ft NAVD  
 Wind Setup: 0 ft  
 Wind Wave Height: 0 ft  
 Wave Runup Range: 0 ft



Fluvial Flows: Winter Base Flow from tributaries

Approx. Equivalent Still Water with Sea Level Rise (SLR)

100-yr	+ 1 ft SLR	MMMW	+ 3.0 ft SLR
10-yr	+ 1.5 ft SLR	MHHW	+ 4.5 ft SLR
2-yr	+ 2.5 ft SLR		

**Geomorphic & Critical Resource Response\***

**Shoreline Overtopping Depth | Duration | Response**

- > 1 ft | > 2 hrs | High Potential of Failure
- Inches - Feet | Minutes to Hours | Rill Erosion
- ➔ Tidal Overtopping

**Travel Lane Flood Depth | Duration | Response**

- > 12 inches | Hours | Damage
- 3-12 inches | Hours | Functional Disruption
- < 3 inches | Hours | Hazardous Conditions

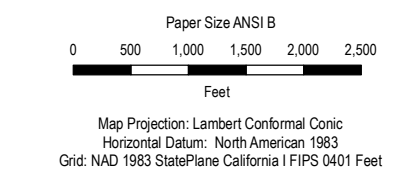
**Temporary Cell Flooding**

**Approximate Flood Depth from Overtopping**

< 0.5 ft	1 - 3 ft	> 6 ft
0.5 - 1 ft	3 - 6 ft	

**Cell** Cell subject to permanent inundation due to high potential of levee failure/breach. Increased erosion potential of slough channel between breach and Arcata Bay.

\*Not all Critical Resources Shown. See Critical Resource Response and Impact Evaluation Table in Case Hazard Scenario Case Study.



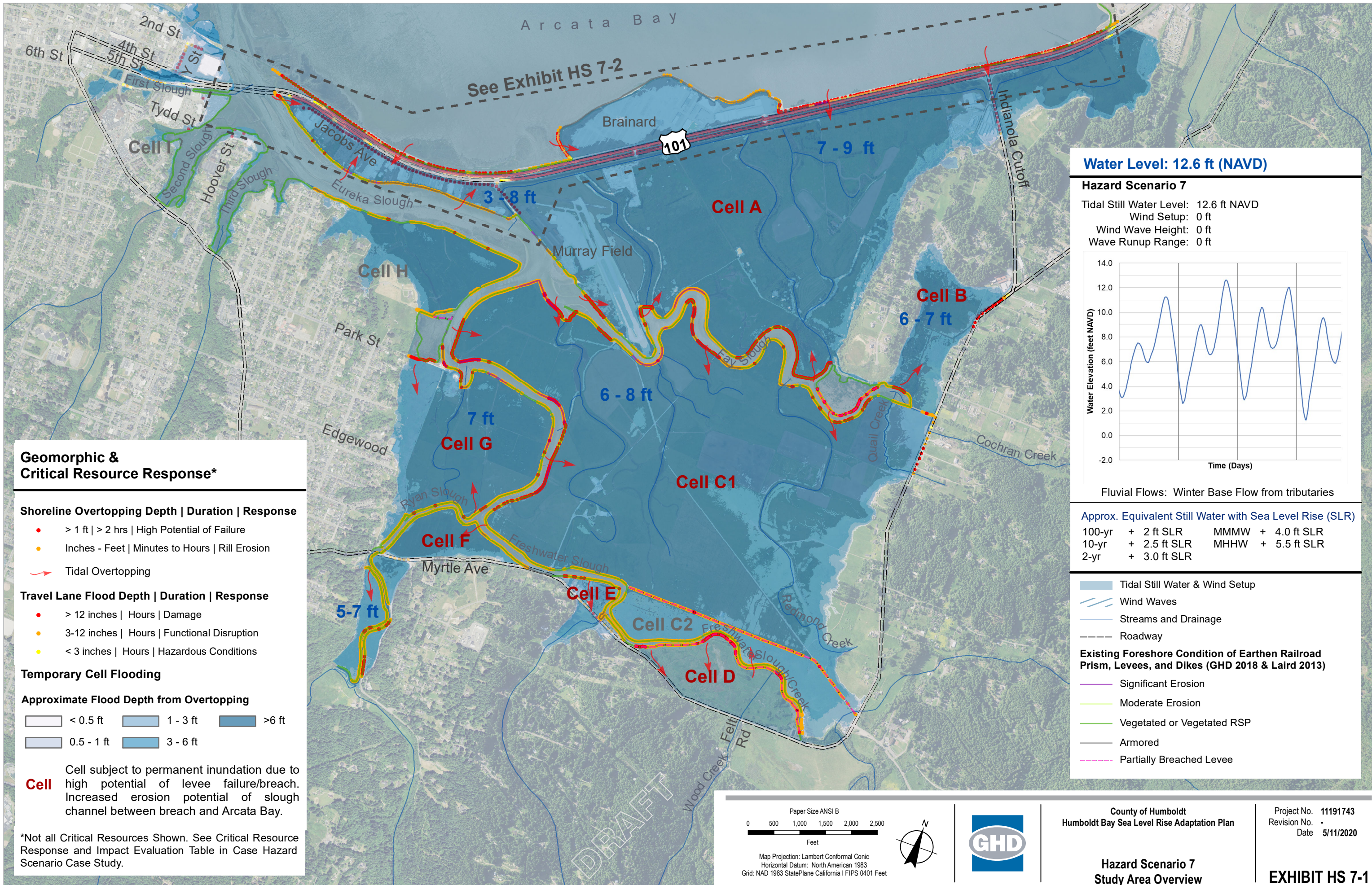
County of Humboldt  
 Humboldt Bay Sea Level Rise Adaptation Plan

**Hazard Scenario 6A**  
**Study Area Overview**

Project No. 11191743  
 Revision No. -  
 Date 5/10/2020

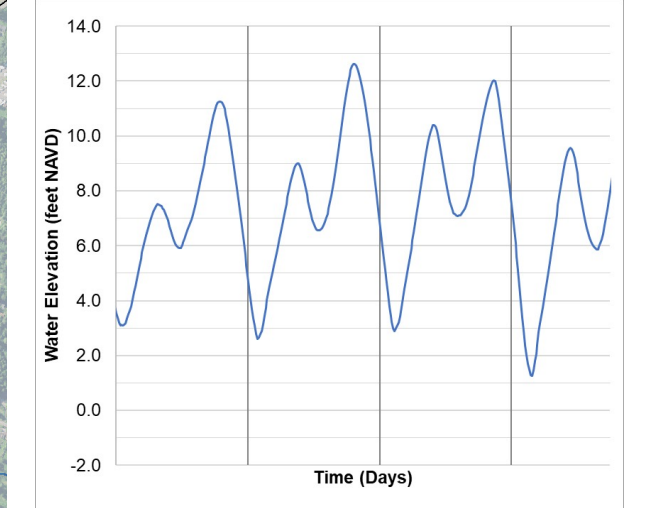
**EXHIBIT HS 6A-1**

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**Water Level: 12.6 ft (NAVD)**

**Hazard Scenario 7**  
 Tidal Still Water Level: 12.6 ft NAVD  
 Wind Setup: 0 ft  
 Wind Wave Height: 0 ft  
 Wave Runup Range: 0 ft



Fluvial Flows: Winter Base Flow from tributaries

Approx. Equivalent Still Water with Sea Level Rise (SLR)

100-yr	+ 2 ft SLR	MMMW	+ 4.0 ft SLR
10-yr	+ 2.5 ft SLR	MHHW	+ 5.5 ft SLR
2-yr	+ 3.0 ft SLR		

- Tidal Still Water & Wind Setup
- ~ Wind Waves
- Streams and Drainage
- = Roadway
- Existing Foreshore Condition of Earthen Railroad Prism, Levees, and Dikes (GHD 2018 & Laird 2013)**
- Significant Erosion
- Moderate Erosion
- Vegetated or Vegetated RSP
- Armored
- - - Partially Breached Levee

**Geomorphic & Critical Resource Response\***

**Shoreline Overtopping Depth | Duration | Response**

- > 1 ft | > 2 hrs | High Potential of Failure
- Inches - Feet | Minutes to Hours | Rill Erosion
- ➔ Tidal Overtopping

**Travel Lane Flood Depth | Duration | Response**

- > 12 inches | Hours | Damage
- 3-12 inches | Hours | Functional Disruption
- < 3 inches | Hours | Hazardous Conditions

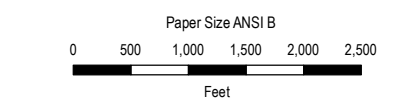
**Temporary Cell Flooding**

**Approximate Flood Depth from Overtopping**

- |   |   |   |
|---|---|---|
| <span style="background-color: #e0e0e0; border: 1px solid black; padding: 2px;"> </span> < 0.5 ft   | <span style="background-color: #a0c0ff; border: 1px solid black; padding: 2px;"> </span> 1 - 3 ft | <span style="background-color: #0070c0; border: 1px solid black; padding: 2px;"> </span> > 6 ft |
| <span style="background-color: #c0c0c0; border: 1px solid black; padding: 2px;"> </span> 0.5 - 1 ft | <span style="background-color: #0070c0; border: 1px solid black; padding: 2px;"> </span> 3 - 6 ft |   |

**Cell** Cell subject to permanent inundation due to high potential of levee failure/breach. Increased erosion potential of slough channel between breach and Arcata Bay.

\*Not all Critical Resources Shown. See Critical Resource Response and Impact Evaluation Table in Case Hazard Scenario Case Study.



County of Humboldt  
 Humboldt Bay Sea Level Rise Adaptation Plan

**Hazard Scenario 7**  
**Study Area Overview**

Project No. 11191743  
 Revision No. -  
 Date 5/11/2020

**EXHIBIT HS 7-1**

**Water Level: 12.6 ft (NAVD)**

**Hazard Scenario 7**

See Exhibit HS 7-1 for Water Level Detail

- Tidal Still Water  
(Wind Setup and Wind Waves Not Present)
- Streams and Drainage
- Roadway

**Existing Foreshore Condition of Earthen Railroad Prism, Levees, and Dikes (GHD 2018 & Laird 2013)**

- Significant Erosion
- Moderate Erosion
- Vegetated or Vegetated RSP
- Armored
- Partially Breached Levee

**Drainage**

- Drainage Swale/Ditch
- Culvert
- Culvert with Flash Board Riser
- Drop Inlet
- Culvert with Flap Gate or Tide Gate

**Geomorphic & Critical Resource Response\***

**Shoreline Overtopping Depth | Duration | Response**

- > 1 ft | > 2 hrs | High Potential of Failure
- Inches - Feet | Minutes to Hours | Rill Erosion

**Travel Lane Flood Depth | Duration | Response**

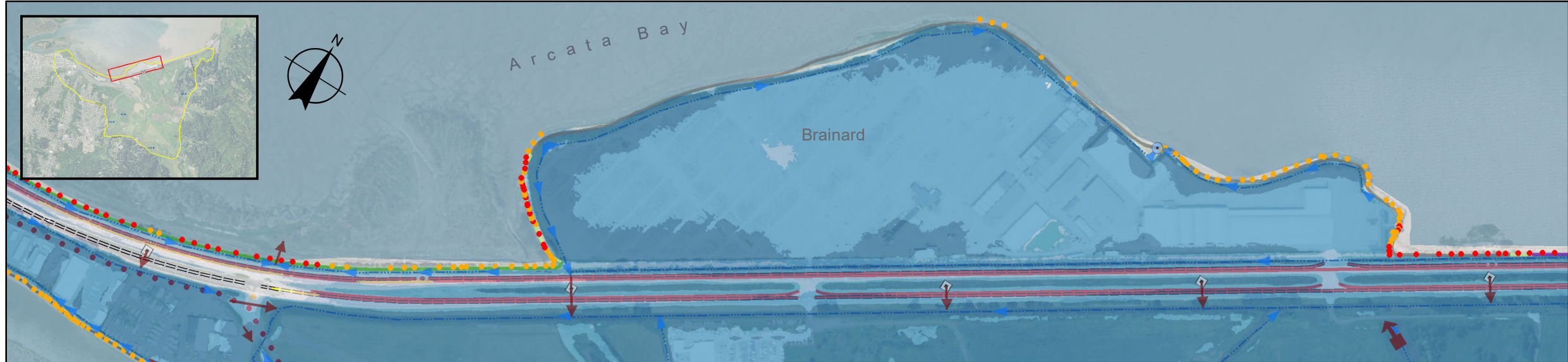
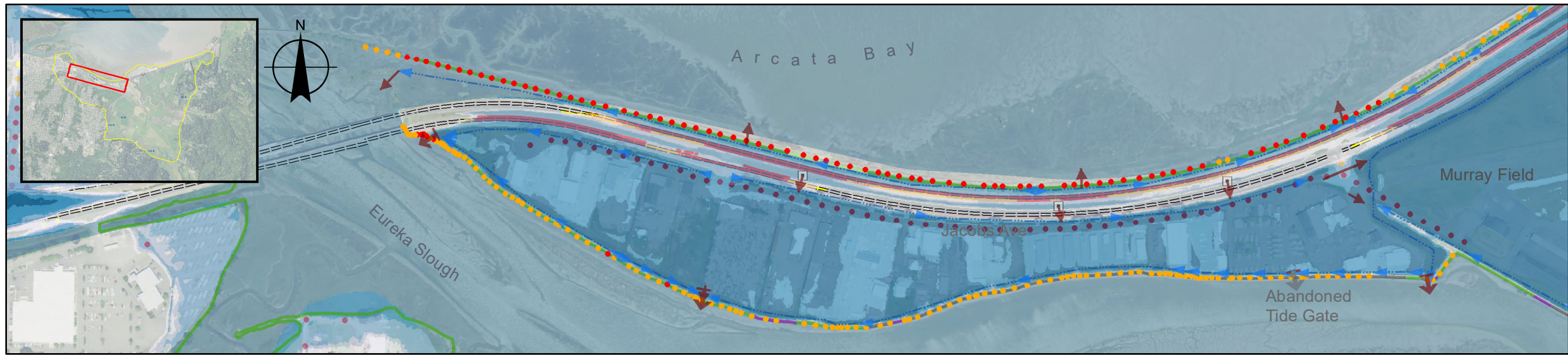
- > 12 inches | Hours | Damage
- 3-12 inches | Hours | Functional Disruption
- < 3 inches | Hours | Hazardous Conditions

**Temporary Cell Flooding**

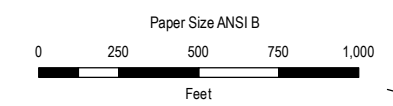
**Approximate Flood Depth from Overtopping**

- < 0.5 ft
- 1 - 3 ft
- > 6 ft
- 0.5 - 1 ft
- 3 - 6 ft

\*Not all Critical Resources Shown. See Critical Resource Response and Impact Evaluation Table in Case Hazard Scenario Case Study.



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Map Projection: Lambert Conformal Conic  
Horizontal Datum: North American 1983  
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet



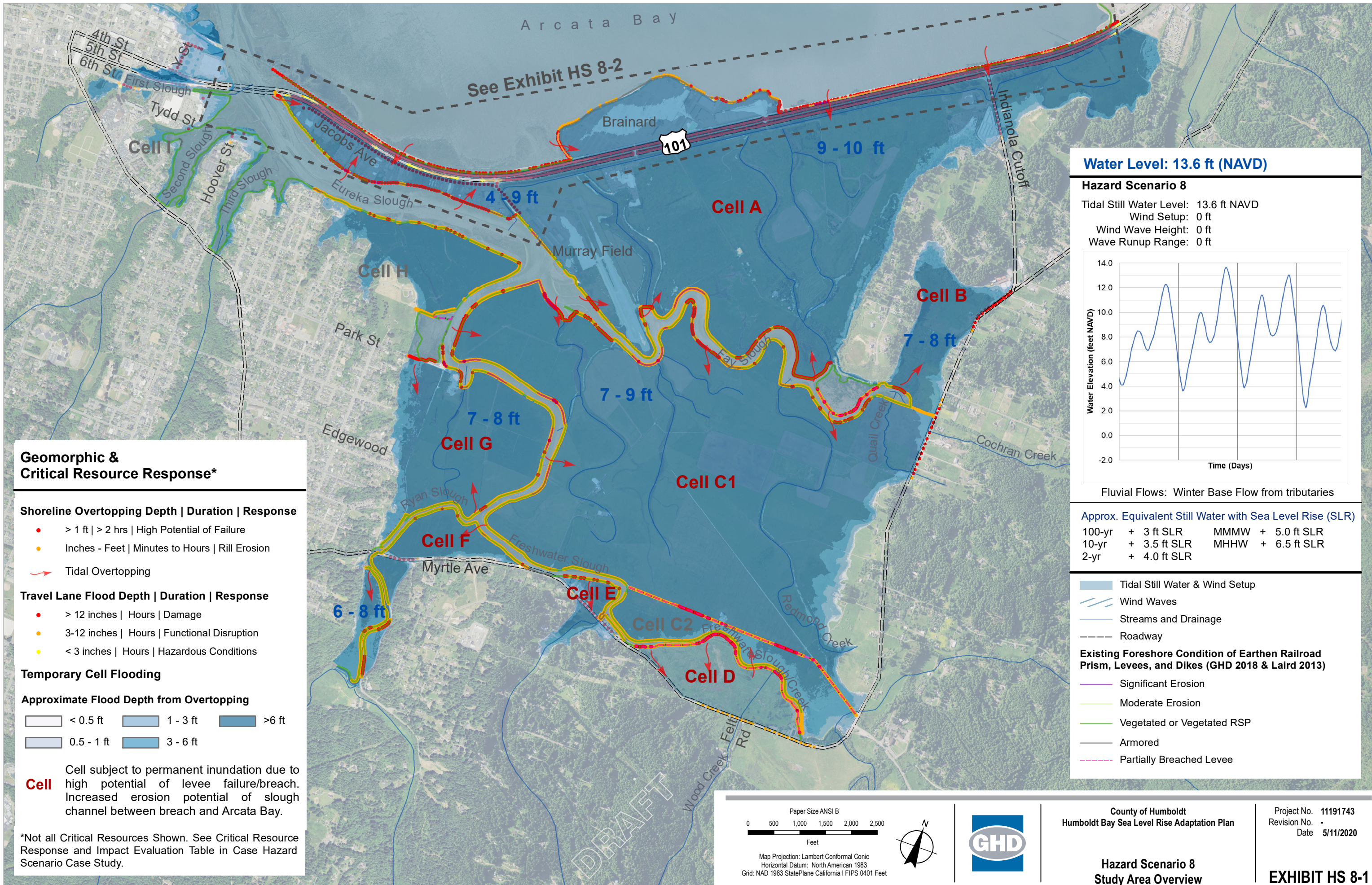
County of Humboldt  
Humboldt Bay Sea Level Rise Adaptation Plan

Project No. 11191743  
Revision No. -  
Date 4/17/2020

**Hazard Scenario 7  
Bay Shoreline**

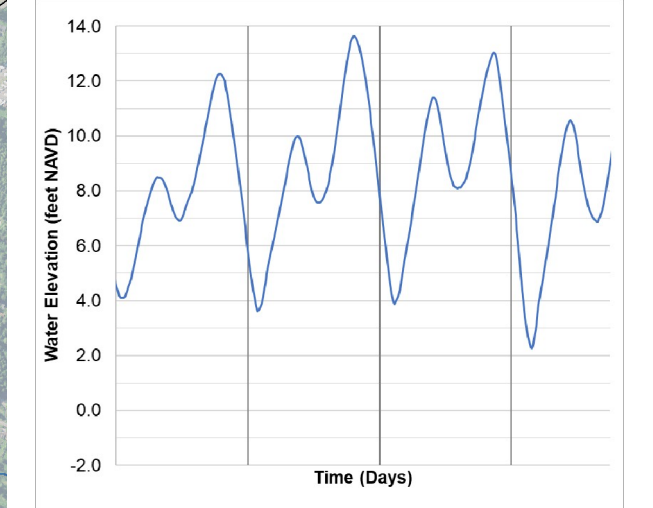
**EXHIBIT HS 7-2**

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Print date: 17 Apr 2020 - 18:02 Created by: bviyyan



**Water Level: 13.6 ft (NAVD)**

**Hazard Scenario 8**  
 Tidal Still Water Level: 13.6 ft NAVD  
 Wind Setup: 0 ft  
 Wind Wave Height: 0 ft  
 Wave Runup Range: 0 ft



Fluvial Flows: Winter Base Flow from tributaries

Approx. Equivalent Still Water with Sea Level Rise (SLR)

100-yr	+ 3 ft SLR	MMMW	+ 5.0 ft SLR
10-yr	+ 3.5 ft SLR	MHHW	+ 6.5 ft SLR
2-yr	+ 4.0 ft SLR		

**Geomorphic & Critical Resource Response\***

**Shoreline Overtopping Depth | Duration | Response**

- > 1 ft | > 2 hrs | High Potential of Failure
- Inches - Feet | Minutes to Hours | Rill Erosion
- ➔ Tidal Overtopping

**Travel Lane Flood Depth | Duration | Response**

- > 12 inches | Hours | Damage
- 3-12 inches | Hours | Functional Disruption
- < 3 inches | Hours | Hazardous Conditions

**Temporary Cell Flooding**

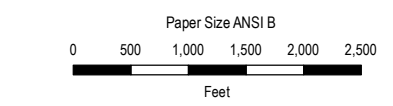
**Approximate Flood Depth from Overtopping**

- < 0.5 ft
- 0.5 - 1 ft
- 1 - 3 ft
- 3 - 6 ft
- > 6 ft

**Cell** Cell subject to permanent inundation due to high potential of levee failure/breach. Increased erosion potential of slough channel between breach and Arcata Bay.

\*Not all Critical Resources Shown. See Critical Resource Response and Impact Evaluation Table in Case Hazard Scenario Case Study.

- Tidal Still Water & Wind Setup
  - Wind Waves
  - Streams and Drainage
  - Roadway
- Existing Foreshore Condition of Earthen Railroad Prism, Levees, and Dikes (GHD 2018 & Laird 2013)**
- Significant Erosion
  - Moderate Erosion
  - Vegetated or Vegetated RSP
  - Armored
  - Partially Breached Levee



County of Humboldt  
 Humboldt Bay Sea Level Rise Adaptation Plan

**Hazard Scenario 8**  
**Study Area Overview**

Project No. 11191743  
 Revision No. -  
 Date 5/11/2020

**EXHIBIT HS 8-1**

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 Created by: bviyan

## Water Level: 13.6 ft (NAVD)

### Hazard Scenario 8

See Exhibit HS 8-1 for Water Level Detail

- Tidal Still Water  
(Wind Setup and Wind Waves Not Present)
- Streams and Drainage
- Roadway

### Existing Foreshore Condition of Earthen Railroad Prism, Levees, and Dikes (GHD 2018 & Laird 2013)

- Significant Erosion
- Moderate Erosion
- Vegetated or Vegetated RSP
- Armored
- Partially Breached Levee

### Drainage

- Drainage Swale/Ditch
- Culvert
- Culvert with Flash Board Riser
- Drop Inlet
- Culvert with Flap Gate or Tide Gate

### Geomorphic & Critical Resource Response\*

#### Shoreline Overtopping Depth | Duration | Response

- > 1 ft | > 2 hrs | High Potential of Failure
- Inches - Feet | Minutes to Hours | Rill Erosion

#### Travel Lane Flood Depth | Duration | Response

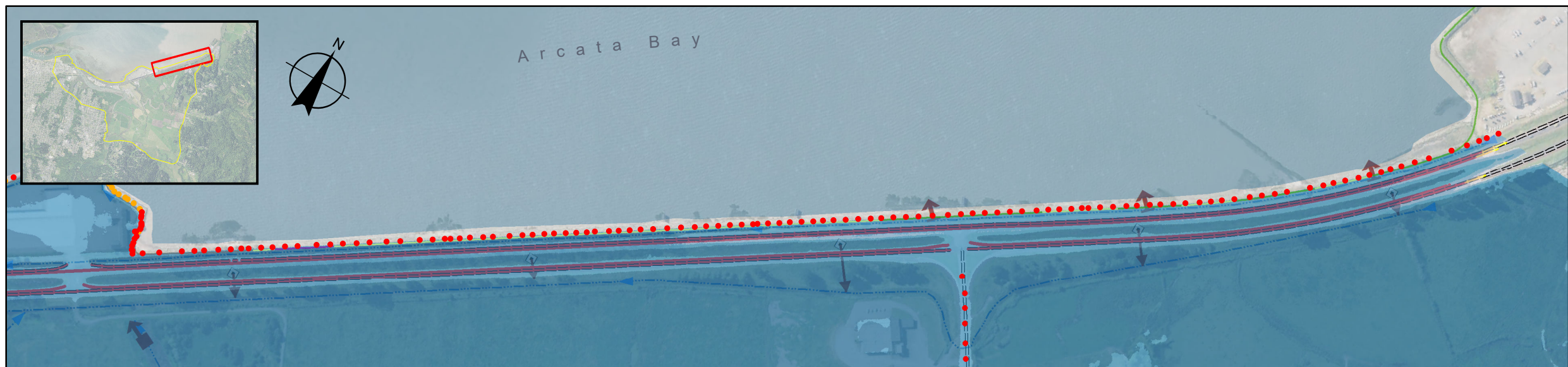
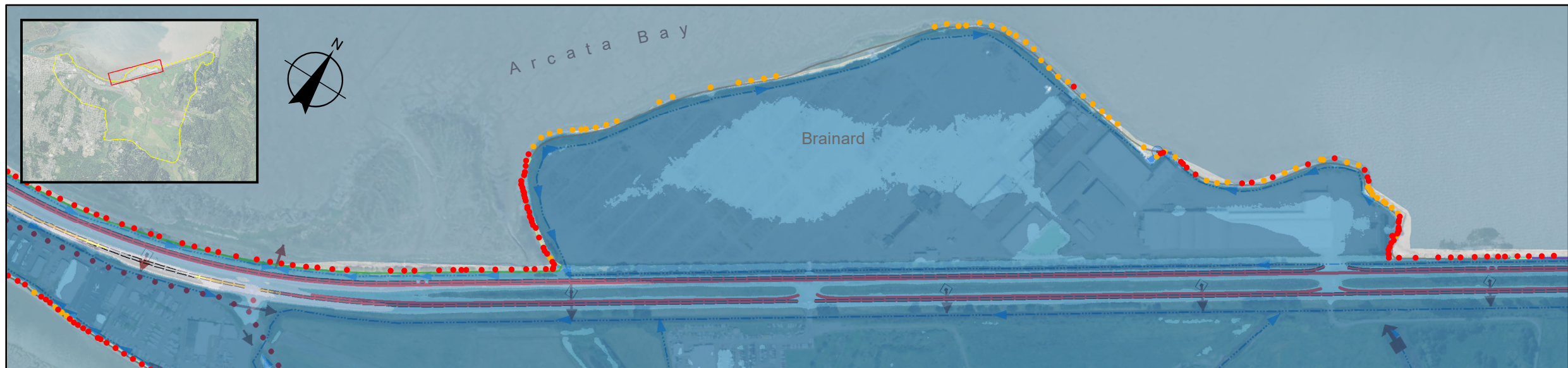
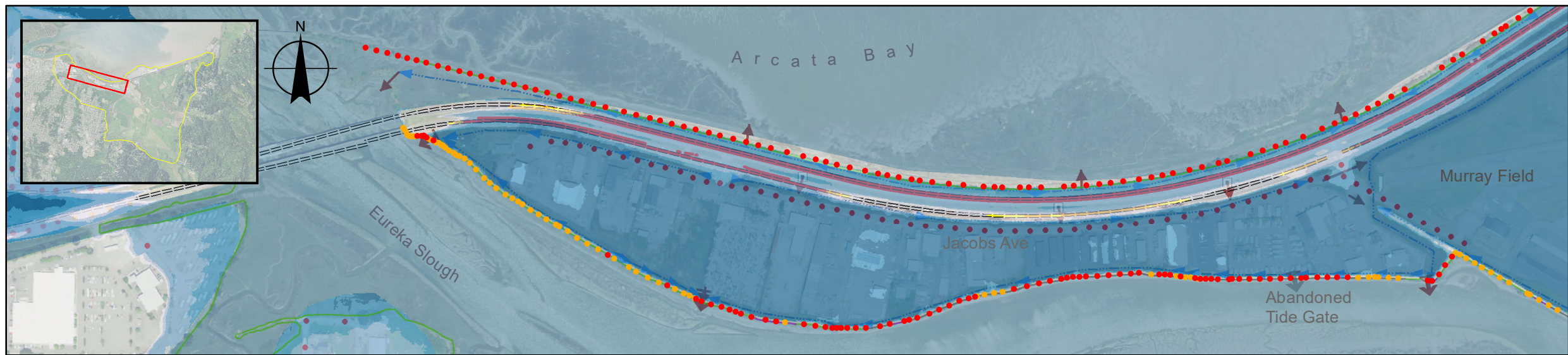
- > 12 inches | Hours | Damage
- 3-12 inches | Hours | Functional Disruption
- < 3 inches | Hours | Hazardous Conditions

#### Temporary Cell Flooding

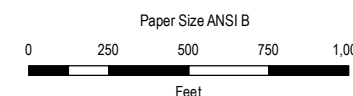
##### Approximate Flood Depth from Overtopping

- < 0.5 ft
- 1 - 3 ft
- > 6 ft
- 0.5 - 1 ft
- 3 - 6 ft

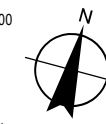
\*Not all Critical Resources Shown. See Critical Resource Response and Impact Evaluation Table in Case Hazard Scenario Case Study.



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Map Projection: Lambert Conformal Conic  
Horizontal Datum: North American 1983  
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet



County of Humboldt  
Humboldt Bay Sea Level Rise Adaptation Plan

Hazard Scenario 8  
Bay Shoreline

Project No. 11191743  
Revision No. -  
Date 4/22/2020

EXHIBIT HS 8-2