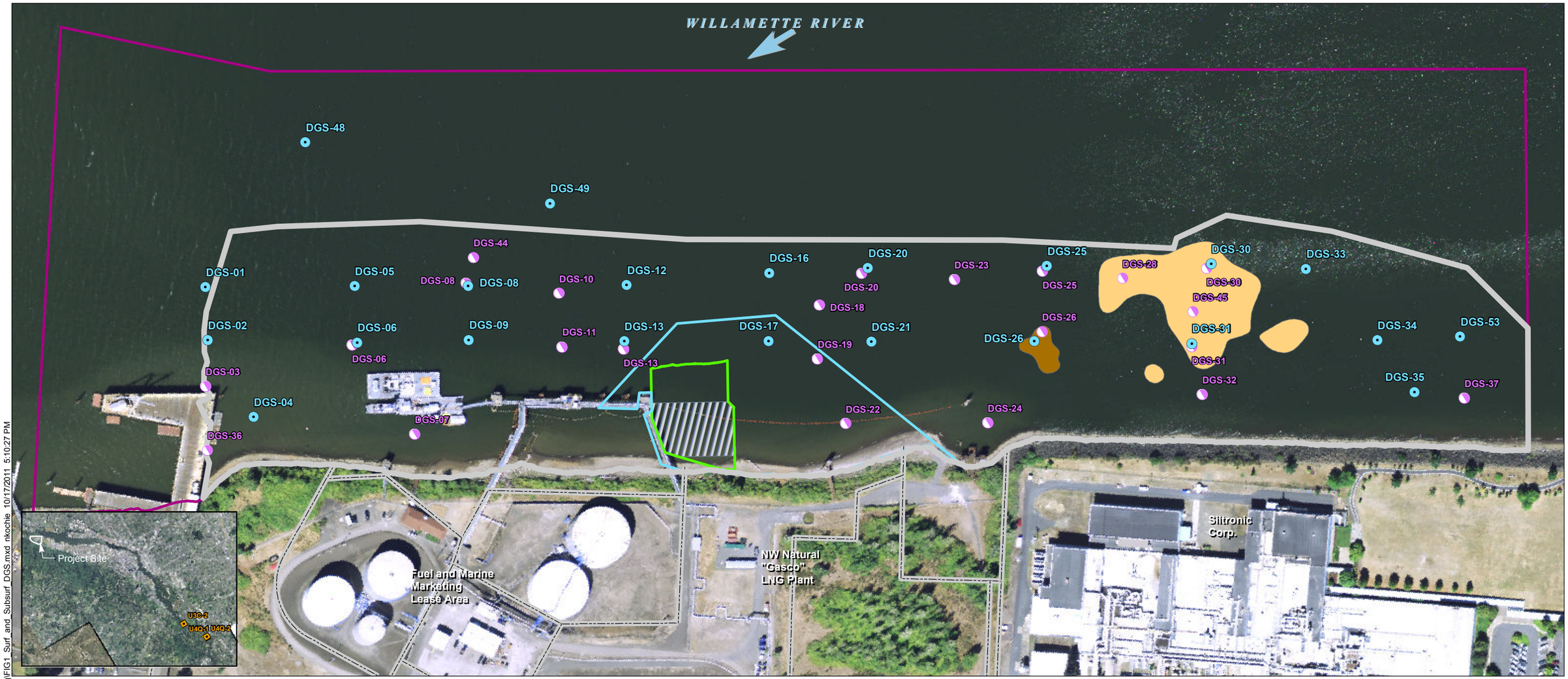


Retest Surface Sediment Grab Location (April 2011)

Surface Sediment Reference Location

Subsurface Sediment Core Location

Gasco Sediment Site Area of Interest (Final Work Plan [Anchor QEA 2009])

Initial Project Area

Tar Body Removal Action Area (RAPP [Anchor 2005])

Area 1 - CVOCs in TZW

Area 2 - CVOCs in TZW and 1 Subsurface Sediment Location

Tar Body Removal Action 6-inch Fringe Cover Placement

Tar Body Removal Action Pilot Cap

NOTES:
1. Area 1 zone of impact provided by MFA via e-mail on October 17, 2011.
2. Area 2 zone of impact is as shown in Figure 1 of the Statement of Work.
3. Arrow indicates direction of flow of river.
4. Horizontal datum is NAD83 HARN Oregon State Plane North, Intl. Feet.
5. Vertical datum is NAVD88.
6. Aerial imagery from July 2007.
7. Surface sediment chemistry and bioassay retesting was completed per the rationale procedures identified in the memorandum "Scope of Work for Benthic Toxicity Testing", dated April 12, 2011.

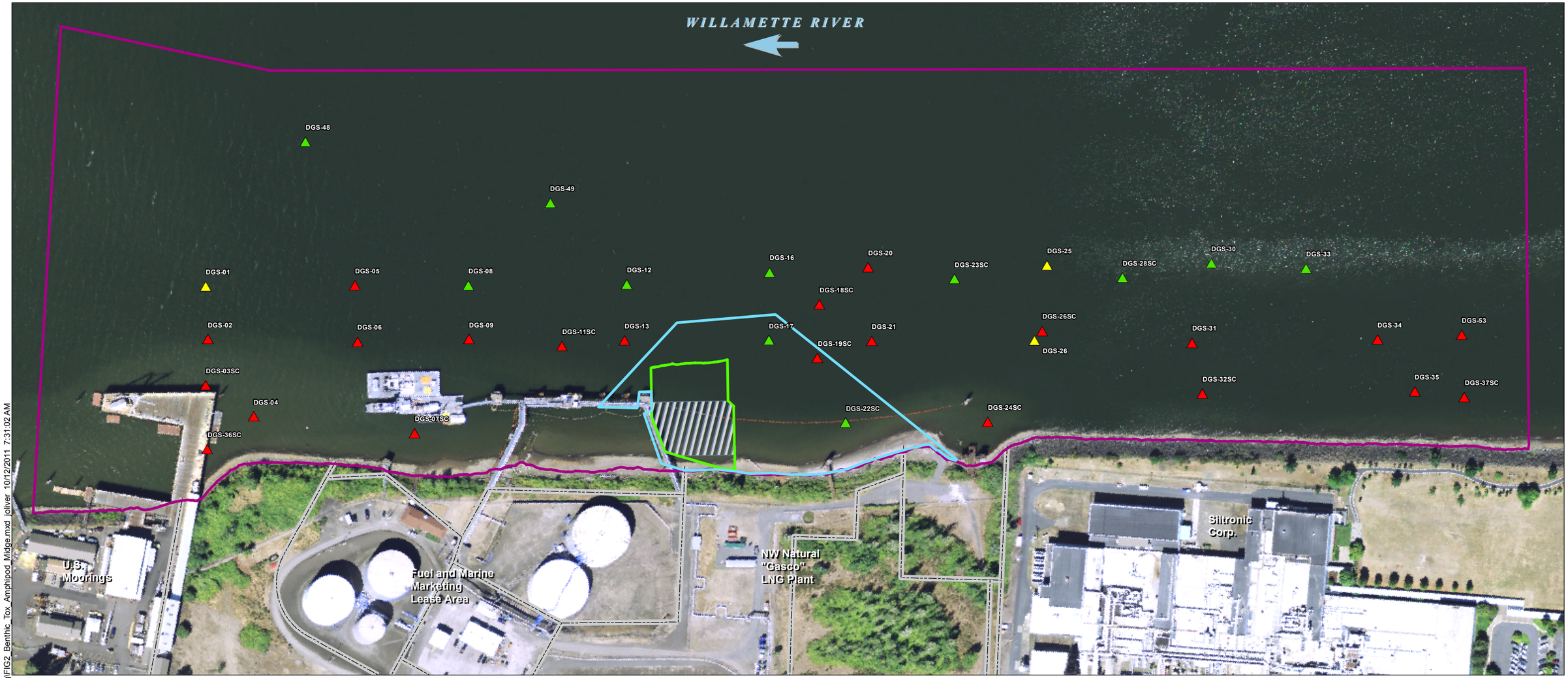
Feet
0 100 200 300 400

Q:\Jobs\000029-02_Gasco\Maps\2011_09\EPA_Meeting\FIG1_Surf_and_Subsurf_DGS.mxd nkochie 10/17/2011 5:10:27 PM

ANCHOR QEA

DRAFT – PRELIMINARY AND SUBJECT TO CHANGE

Figure 1
Data Gaps Surface and Subsurface Sample Locations
Gasco EE/CA Technical Briefing - October 19, 2011
Gasco Sediments Cleanup Action



Hit; models agree or only one model available

Models disagree

No hit; models agree or only one model available

Gasco Sediment Site Area of Interest (Final Work Plan [Anchor QEA 2009])

Tar Body Removal Action Area (RAPP [Anchor 2005])

Tar Body Removal Action 6-inch Fringe Cover Placement

Tar Body Removal Action Pilot Cap

NOTES:
1. Arrow indicates direction of flow of river.
2. Horizontal datum is NAD83 HARN Oregon State Plane North, Intl. Feet.
3. Vertical datum is NAVD88.
4. Aerial imagery from July 2007.

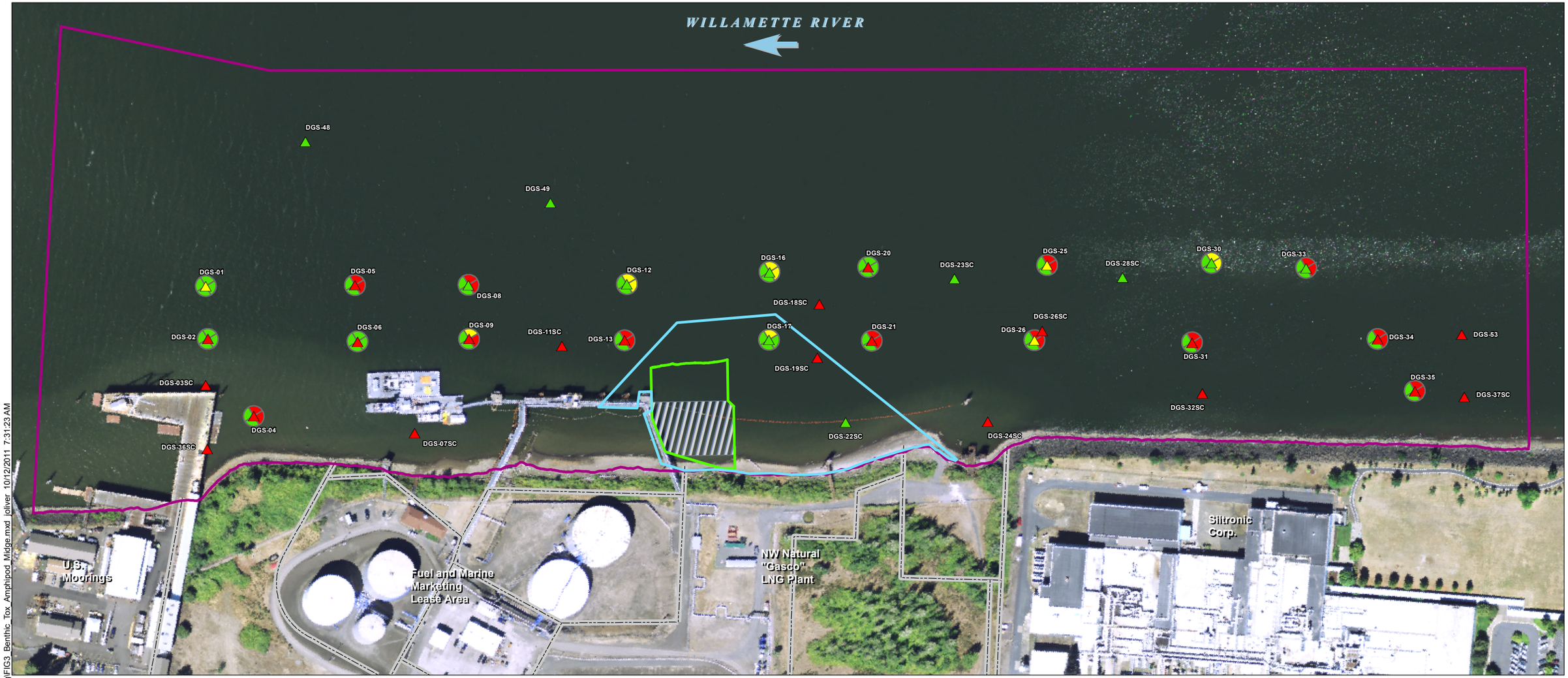
Feet
0 100 200 300 400

Q:\Jobs\000029-02_GascoIMaps\2011_09\EPA_Meeting\FIG2_Benthic_Tox_Amphipod_Midge.mxd jolivier 10/12/2011 7:31:02 AM

ANCHOR QEA

DRAFT – PRELIMINARY AND SUBJECT TO CHANGE

Figure 2
Gasco Data Gaps Sampling Predictive Toxicity LOE Results
Gasco EE/CA Technical Briefing - October 19, 2011
Gasco Sediments Cleanup Action



Hit; models agree or only one model available

Models disagree

No hit; models agree or only one model available

Gasco Sediment Site Area of Interest (Final Work Plan [Anchor QEA 2009])

Tar Body Removal Action Area (RAPP [Anchor 2005])

Tar Body Removal Action 6-inch Fringe Cover Placement

Tar Body Removal Action Pilot Cap

Amphipod Survival

Midge Survival

Amphipod Growth

Midge Growth

REA Level 0

REA Level 1

REA Level 2

REA Level 3

NOTES:
1. Arrow indicates direction of flow of river.
2. Horizontal datum is NAD83 HARN Oregon State Plane North, Intl. Feet.
3. Vertical datum is NAVD88.
4. Aerial imagery from July 2007.

Feet

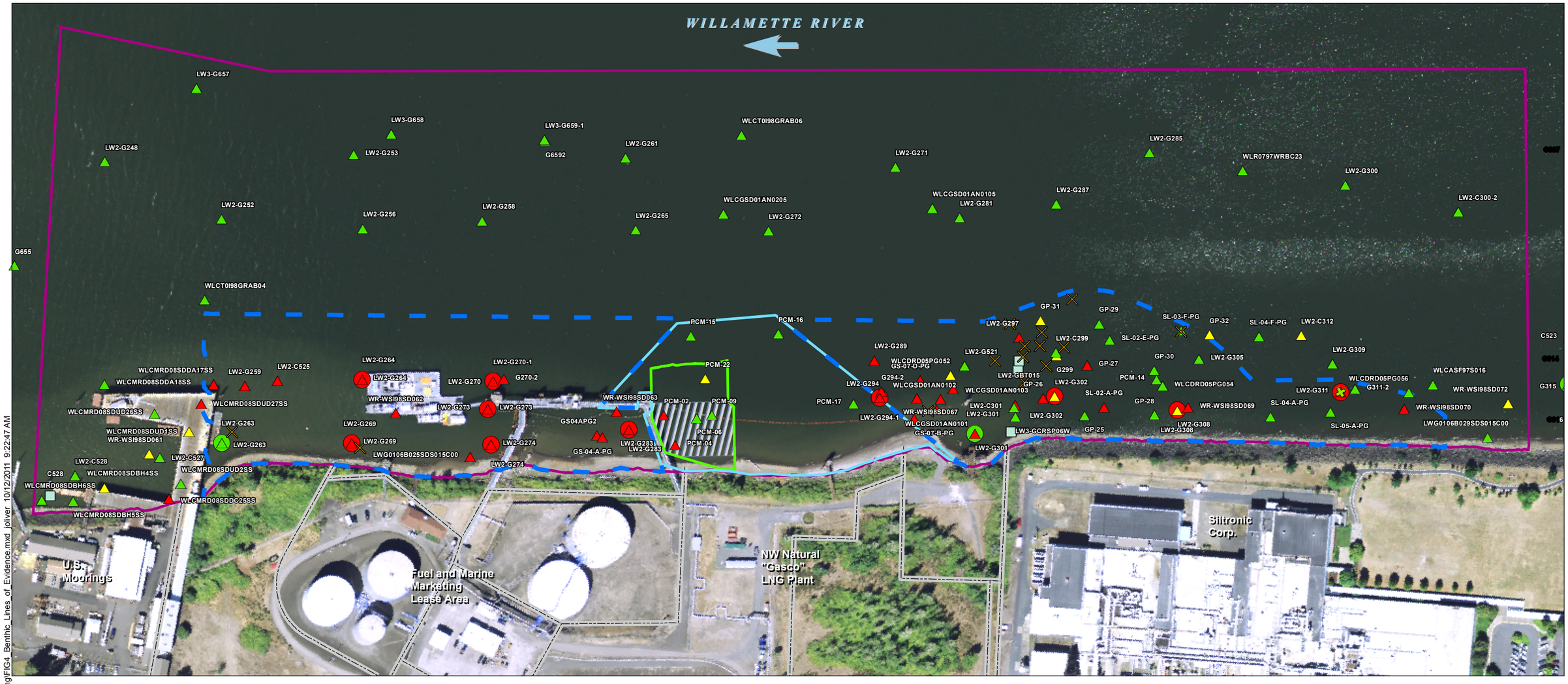
0 100 200 300 400

Q:\Jobs\000029-02_Gasco\Maps\2011_09\EPA_Meeting\FIG3_Benthic_Tox_Amphipod_Midge.mxd jolliver 10/12/2011 7:31:23 AM

ANCHOR QEA

DRAFT – PRELIMINARY AND SUBJECT TO CHANGE

Figure 3
Gasco Data Gaps Sampling Benthic Toxicity Results – Amphipod and Midge Performance
Gasco EE/CA Technical Briefing - October 19, 2011
Gasco Sediments Cleanup Action



Predicted Bioaccumulation

- TBT HQ ≥ 1
- Hybrid PCBs

Benthic Tissue HQ gt 1 empirical

- BEHP HQ ≥ 1
- Tributyltin ion HQ ≥ 1
- Total DDx HQ ≥ 1
- Total PCBs HQ ≥ 1
- Metal HQ ≥ 1

- TZW HQ ≥ 100
- Total DDxs HQ ≥ 1
- Hit; models agree or only one model available
- Models disagree
- No hit; models agree or only one model available

Pooled Bioassay Result

- Hit
- No hit

- PH FS Comprehensive Benthic Risk Boundary – July 2011
- Gasco Sediment Site Area of Interest (Final Work Plan [Anchor QEA 2009])
- Tar Body Removal Action Area (RAPP [Anchor 2005])
- Tar Body Removal Action 6-inch Fringe Cover Placement
- Tar Body Removal Action Pilot Cap

NOTES:
1. Arrow indicates direction of flow of river.
2. Horizontal datum is NAD83 HARN Oregon State Plane North, Intl. Feet.
5. Vertical datum is NAVD88.
6. Aerial imagery from July 2007.

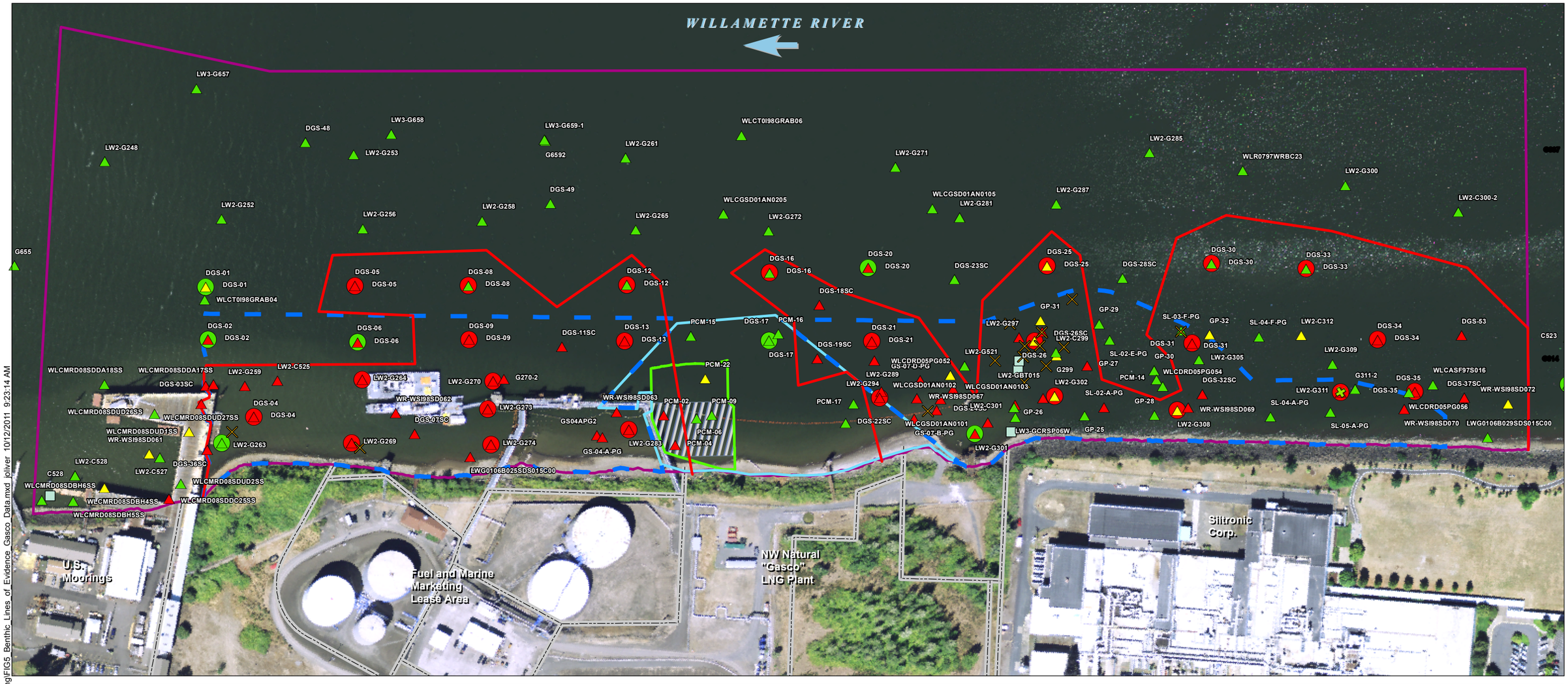
Feet
0 100 200 300 400

Q:\Jobs\000029-02_Gasco\Maps\2011_09\EPA_Meeting\FIG4_Benthic_Lines_of_Evidence.mxd jolivier 10/12/2011 9:22:47 AM

ANCHOR QEA

DRAFT – PRELIMINARY AND SUBJECT TO CHANGE

Figure 4
Benthic LOE's Used in PH FS – July 2011
Gasco EE/CA Technical Briefing - October 19, 2011
Gasco Sediments Cleanup Action



Predicted Bioaccumulation

- TBT HQ ≥ 1
- Hybrid PCBs

Benthic Tissue HQ gt 1 empirical

- BEHP HQ ≥ 1
- Tributyltin ion HQ ≥ 1
- Total DDx HQ ≥ 1
- Total PCBs HQ ≥ 1
- Metal HQ ≥ 1

- TZW HQ ≥ 100
- Total DDxs HQ ≥ 1
- Hit; models agree or only one model available
- Models disagree
- No hit; models agree or only one model available

Pooled Bioassay Result

- Hit
- No hit

- PH FS Comprehensive Benthic Risk Boundary – July 2011
- Revised Comprehensive Benthic Risk Area (September 2011)
- Gasco Sediment Site Area of Interest (Final Work Plan [Anchor QEA 2009])
- Tar Body Removal Action Area (RAPP [Anchor 2005])
- Tar Body Removal Action 6-inch Fringe Cover Placement
- Tar Body Removal Action Pilot Cap

NOTES:
1. Arrow indicates direction of flow of river.
2. Horizontal datum is NAD83 HARN Oregon State Plane North, Intl. Feet.
3. Vertical datum is NAVD88.
4. Aerial imagery from July 2007.

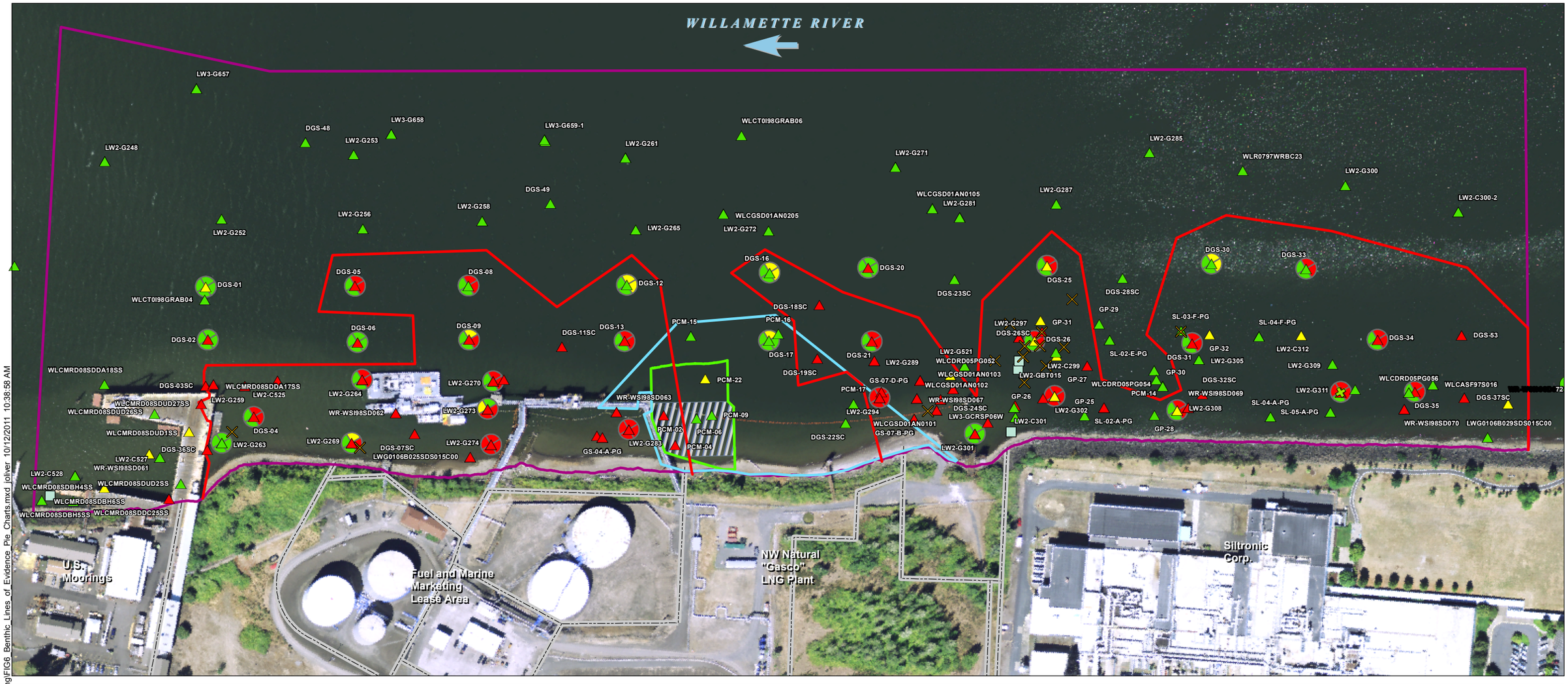
Feet
0 100 200 300 400

Q:\Jobs\000029-02_GascoIMaps\2011_09\EPA_Meeting\FIG5_Benthic_Lines_of_Evidence_Gasco_Data.mxd jolliver 10/12/2011 9:23:14 AM

ANCHOR QEA

DRAFT – PRELIMINARY AND SUBJECT TO CHANGE

Figure 5
Comparison of PH FS and Gasco Data Gaps Benthic LOEs
Gasco EE/CA Technical Briefing - October 19, 2011
Gasco Sediments Cleanup Action



Predicted Bioaccumulation

- TBT HQ ≥ 1
- Hybrid PCBs

Benthic Tissue HQ gt 1 empirical

- BEHP HQ ≥ 1
- Tributyltin ion HQ ≥ 1
- Total DDx HQ ≥ 1
- Total PCBs HQ ≥ 1
- Metal HQ ≥ 1

- TZW HQ ≥ 100
- Total DDxs HQ ≥ 1
- Hit; models agree or only one model available
- Models disagree
- No hit; models agree or only one model available

Pooled Bioassay Result

- Hit
- No hit

- Revised Comprehensive Benthic Risk Area (October 2011)
- Gasco Sediment Site Area of Interest (Final Work Plan [Anchor QEA 2009])
- Tar Body Removal Action Area (RAPP [Anchor 2005])
- Tar Body Removal Action 6-inch Fringe Cover Placement
- Tar Body Removal Action Pilot Cap

Amphipod Survival
Midge Survival
Amphipod Growth
Midge Growth

- REA Level 0
- REA Level 1
- REA Level 2
- REA Level 3

NOTES:
1. Arrow indicates direction of flow of river.
2. Horizontal datum is NAD83 HARN Oregon State Plane North, Intl. Feet.
3. Vertical datum is NAVD88.
4. Aerial imagery from July 2007.

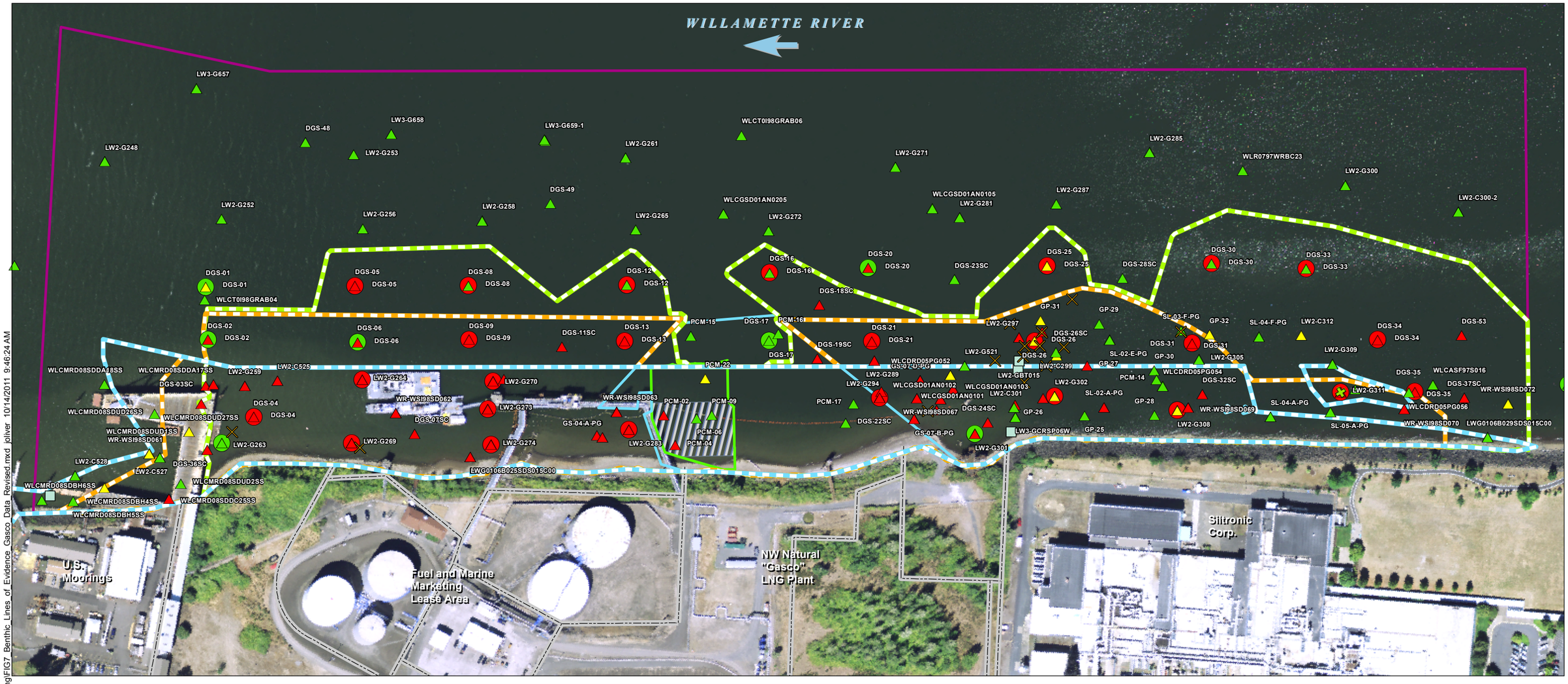
Feet
0 100 200 300 400

Q:\Jobs\000029-02_GascoMaps\2011_09\EPA_Meeting\FIG6_Benthic_Lines_of_Evidence_Pie_Charts.mxd joliver 10/12/2011 10:38:58 AM

ANCHOR QEA

DRAFT – PRELIMINARY AND SUBJECT TO CHANGE

Figure 6
Gasco Data Gaps Benthic LOEs Relative to Bioassay Performance
Gasco EE/CA Technical Briefing - October 19, 2011
Gasco Sediments Cleanup Action



Predicted Bioaccumulation

- TBT HQ ≥ 1
- Hybrid PCBs

Benthic Tissue HQ gt 1 empirical

- BEHP HQ ≥ 1
- Tributyltin ion HQ ≥ 1
- Total DDx HQ ≥ 1
- Total PCBs HQ ≥ 1
- Metal HQ ≥ 1

- TZW HQ ≥ 100
- Total DDxs HQ ≥ 1
- Hit; models agree or only one model available
- Models disagree
- No hit; models agree or only one model available

Pooled Bioassay Result

- Hit
- No hit

- BapEq RAL (1,500 ug/kg)
- FS Alternative D Active Cleanup Area – September 2011
- Gasco Data Gaps BapEq RAL Exceedances and Benthic Risk Boundary
- Gasco Sediment Site Area of Interest (Final Work Plan [Anchor QEA 2009])
- Tar Body Removal Action Area (RAPP [Anchor 2005])
- Tar Body Removal Action 6-inch Fringe Cover Placement
- Tar Body Removal Action Pilot Cap

NOTES:
1. Arrow indicates direction of flow of river.
2. Horizontal datum is NAD83 HARN Oregon State Plane North, Intl. Feet.
3. Vertical datum is NAVD88.
4. Aerial imagery from July 2007.

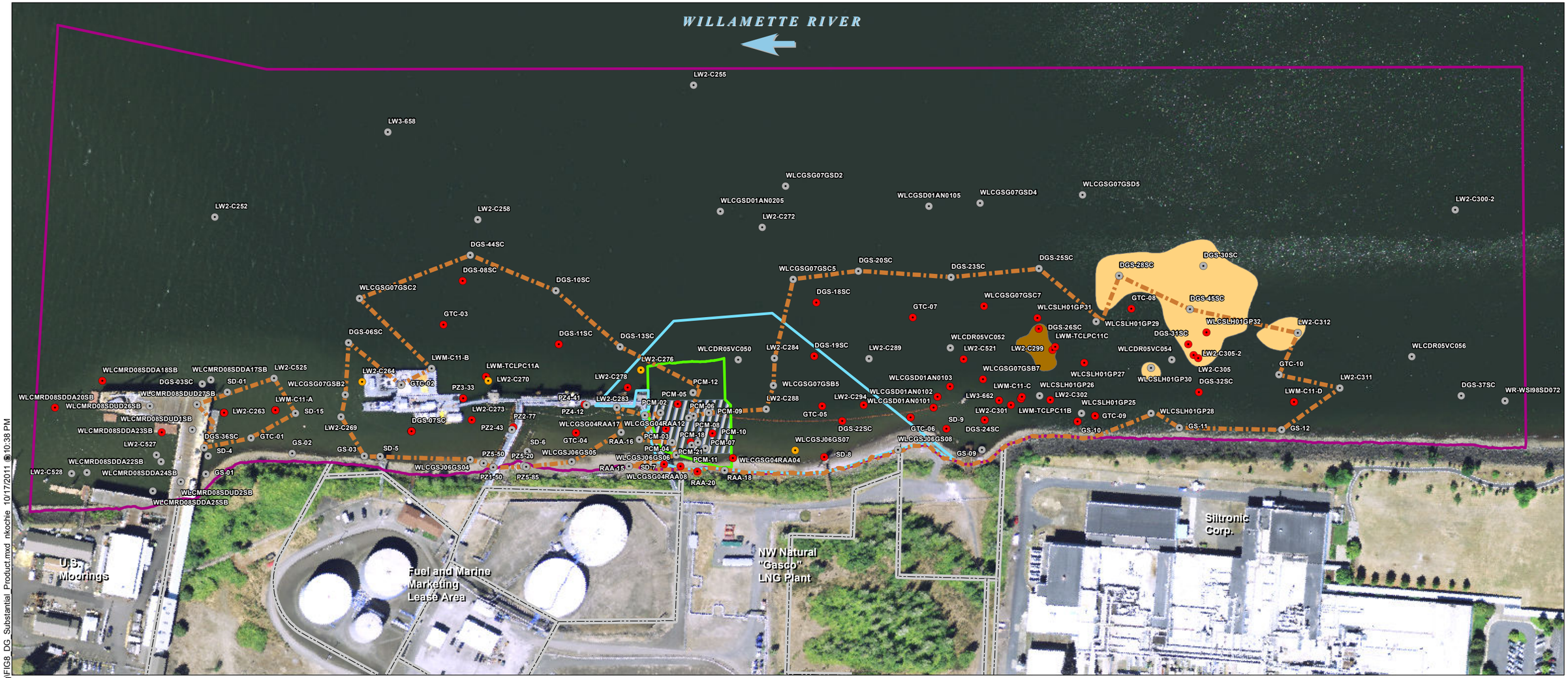
Feet
0 100 200 300 400

Q:\Jobs\000029-02_GascoMaps\2011_09\EPA_Meeting\FIG7_Benthic_Lines_of_Evidence_Gasco_Data_Revised.mxd jolivier 10/14/2011 9:46:24 AM

ANCHOR QEA

DRAFT – PRELIMINARY AND SUBJECT TO CHANGE

Figure 7
Comparison of Gasco Data Gaps and PH FS Cleanup Boundaries – BapEq RALs and Benthic LOEs
Gasco EE/CA Technical Briefing - October 19, 2011
Gasco Sediments Cleanup Action



Substantial Product
No Substantial Product
Inconclusive Substantial Product
Gasco Sediment Site Area of Interest (Final Work Plan [Anchor QEA 2009])
Substantial Product Area
Tar Body Removal Action Area (RAPP [Anchor 2005])
Area 1 - CVOCs in TZW
Area 2 - CVOCs in TZW and 1 Subsurface Sediment Location
Tar Body Removal Action 6-inch Fringe Cover Placement
Tar Body Removal Action Pilot Cap

NOTES:
1. Area 1 zone of impact provided by MFA via e-mail on October 17, 2011.
2. Area 2 zone of impact is as shown in Figure 1 of the Statement of Work.
3. Arrow indicates direction of flow of river.
4. Horizontal datum is NAD83 HARN Oregon State Plane North, Intl. Feet.
5. Vertical datum is NAVD88.
6. Aerial imagery from July 2007.
7. Presence of substantial product and shown substantial product area boundary determined based on definitions identified in the Statement of Work .

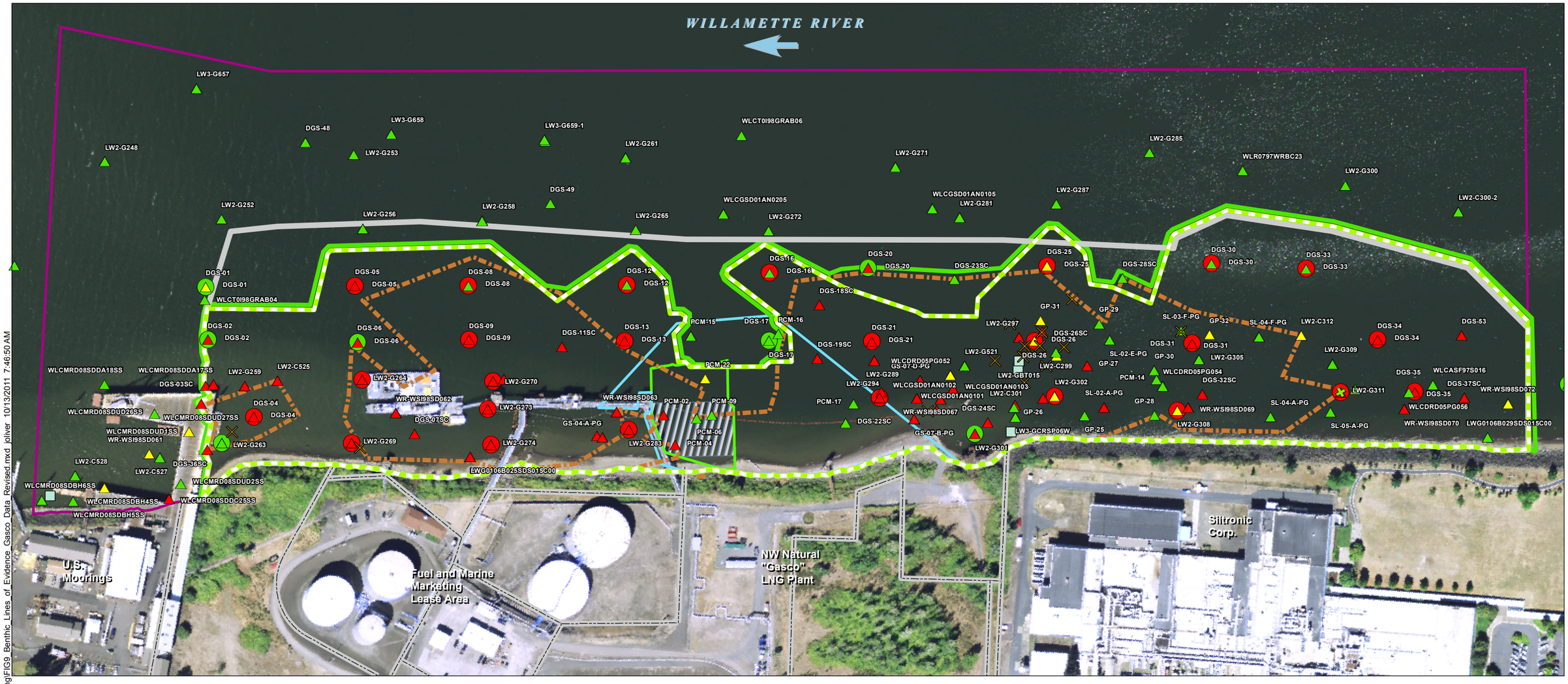
Feet
0 100 200 300 400

Q:\Jobs\000029-02_GascoMaps\2011_09\EPA_Meeting\FIG8_DG_Substantial_Product.mxd nkochie 10/17/2011 @ 10:38 PM

ANCHOR QEA

DRAFT – PRELIMINARY AND SUBJECT TO CHANGE

Figure 8
Summary of Presence of Substantial Product
Gasco EE/CA Technical Briefing - October 19, 2011
Gasco Sediments Cleanup Action



Predicted Bioaccumulation

- TBT HQ ≥ 1
- Hybrid PCBs

Benthic Tissue HQ gt 1 empirical

- BEHP HQ ≥ 1
- Tributyltin ion HQ ≥ 1
- Total DDx HQ ≥ 1
- Total PCBs HQ ≥ 1
- Metal HQ ≥ 1

- TZW HQ ≥ 100
- Total DDxs HQ ≥ 1
- Hit; models agree or only one model available
- Models disagree
- No hit; models agree or only one model available

Pooled Bioassay Result

- Hit
- No hit

- Gasco Data Gaps RAL Exceedances and Benthic Risk Boundary
- Expanded EE/CA Remedial Footprint (October 2011; see Note 5)
- Gasco Sediment Site Area of Interest (Final Work Plan [Anchor QEA 2009])
- Initial Project Area
- Substantial Product Area
- Tar Body Removal Action Area (RAPP [Anchor 2005])

- Tar Body Removal Action 6-inch Fringe Cover Placement
- Tar Body Removal Action Pilot Cap

NOTES:
1. Arrow indicates direction of flow of river.
2. Horizontal datum is NAD83 HARN Oregon State Plane North, Intl. Feet.
3. Vertical datum is NAVD88.
4. Aerial imagery from July 2007.
5. Expanded EE/CA remedial footprint developed based on perimeter of comprehensive benthic risk area, BapEq RAL exceedances, and outer boundary of cores containing no substantial product.

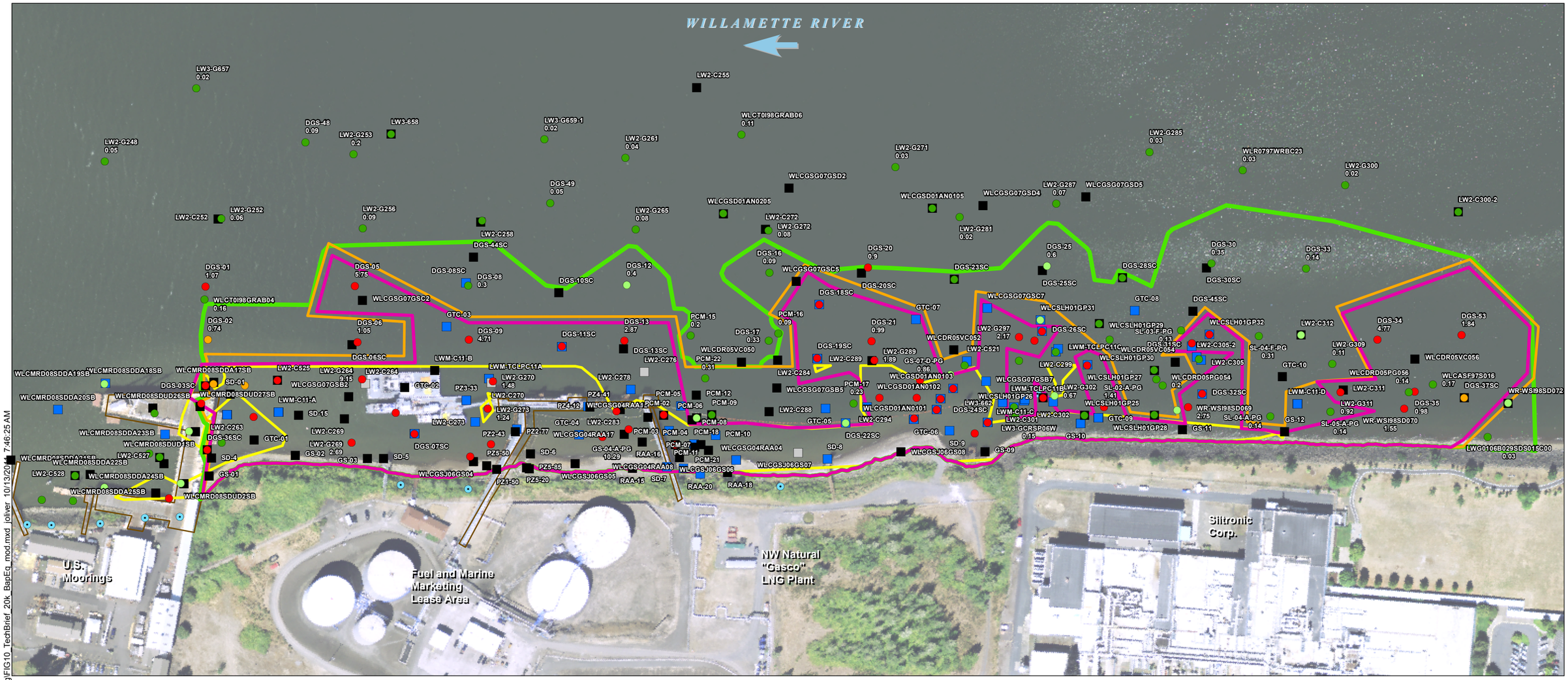
Feet
0 100 200 300 400

Q:\Jobs\000029-02_GascoIMaps\2011_09\EPA_Meeting\FIG9_Benthic_Lines_of_Evidence_Gasco_Data_Revised.mxd jolivier 10/13/2011 7:46:50 AM

ANCHOR QEA

Figure 9
Summary of LOEs Used for EE/CA Alternatives Development – Expanded Remedial Footprint
Gasco EE/CA Technical Briefing - October 19, 2011
Gasco Sediments Cleanup Action

DRAFT – PRELIMINARY AND SUBJECT TO CHANGE



Mean Quotient Result
- < 0.35
- 0.35 - 0.7
- 0.7 - 0.85
- > 0.85
- Substantial Product
- No Substantial Product
- Inconclusive Substantial Product
- Active Outfall

- Expanded Comprehensive Benthic Risk Area Reduced to Exclude MQ<0.7 (October 2011)
- Reduced Comprehensive Benthic Risk Area (Excludes MQ<0.7 and Includes Mobile Substantial Product) (See Note 6)
- Expanded EE/CA Remedial Footprint (October 2011; see Note 5)
- Structures
- BapEq 20,000

NOTES:
1. Arrow indicates direction of flow of river.
2. Horizontal datum is NAD83 HARN Oregon State Plane North, Intl. Feet.
3. Vertical datum is NAVD88.
4. Aerial imagery from July 2007.
5. Consistent with the LWG FS methods, the Reduced Comprehensive Benthic Risk Area was developed by reducing the Comprehensive Benthic Risk Area to exclude mean quotient (MQ) results less than 0.7.
6. Reduced EE/CA remedial footprint developed based on perimeter of reduced comprehensive benthic risk area, BapEq RAL exceedances and outer boundary of cores containing mobile substantial product.
7. Sheetpile wall rigid containment barrier shown along outer most constructible elevation contour (20 ft NAVD88).

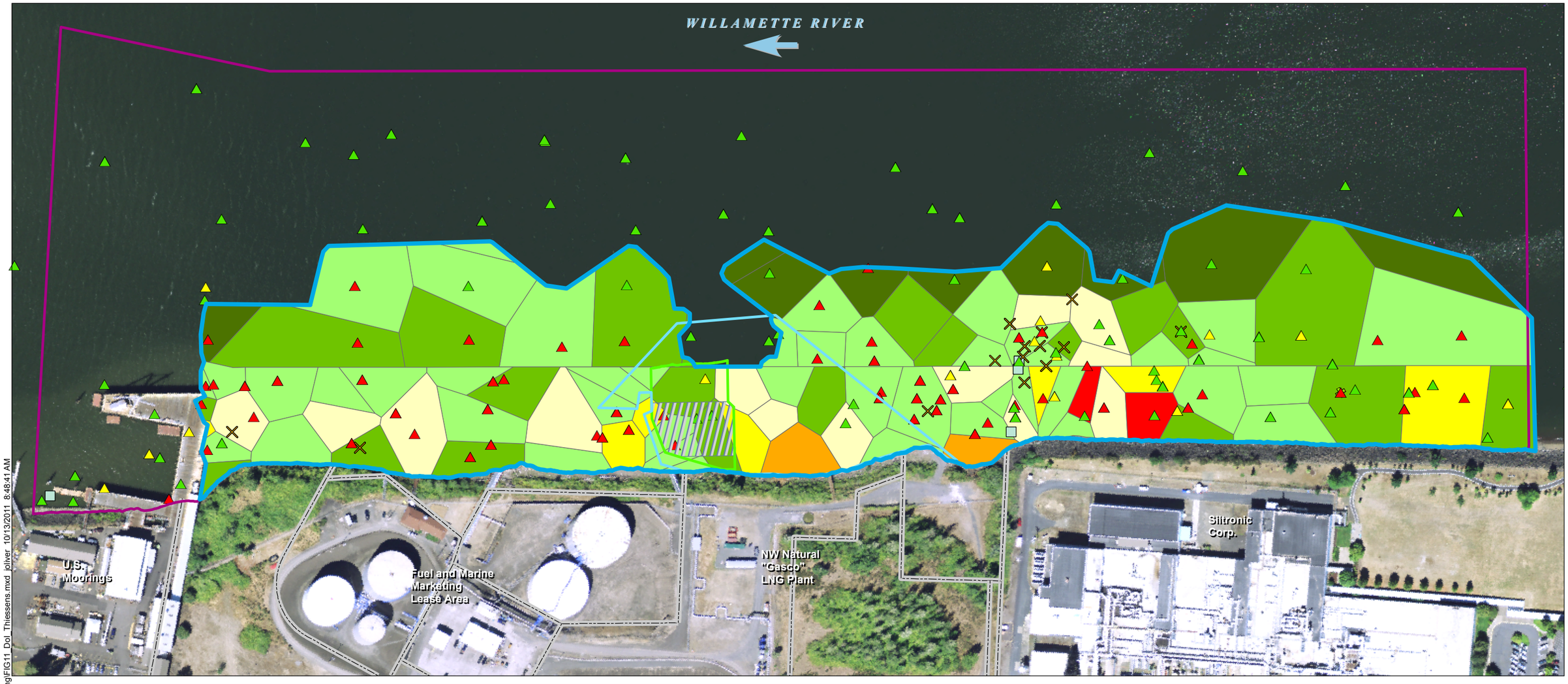
Feet
0 100 200 300 400

Q:\Jobs\000029-02_GascoMaps\2011_09\EPA_Meeting\FIG10_TechBrief_20k_BapEq_mod.mxd jolliver 10/13/2011 7:46:25 AM

ANCHOR QEA

DRAFT – PRELIMINARY AND SUBJECT TO CHANGE

Figure 10
Summary of LOEs Used for EE/CA Alternatives Development – Reduced Remedial Footprint
Gasco EE/CA Technical Briefing - October 19, 2011
Gasco Sediments Cleanup Action



Depth of Impact (feet)
- DoI = 0
- < 6
- 6 - 12
- 12 - 18
- 18 - 24
- 24 - 30
- > 30

Predicted Bioaccumulation
- TBT HQ ≥ 1
- Hybrid PCBs

Benthic Tissue HQ gt 1 empirical
- BEHP HQ ≥ 1
- Tributyltin ion HQ ≥ 1
- Total DDx HQ ≥ 1
- Total PCBs HQ ≥ 1
- Metal HQ ≥ 1

- TZW HQ ≥ 100
- Total DDxs HQ ≥ 1
- Hit; models agree or only one model available
- Models disagree
- No hit; models agree or only one model available

- Gasco Sediment Site Area of Interest (Final Work Plan [Anchor QEA 2009])
- Tar Body Removal Action Area (RAPP [Anchor 2005])
- Tar Body Removal Action 6-inch Fringe Cover Placement
- Tar Body Removal Action Pilot Cap
- Expanded EE/CA Remedial Footprint (October 2011; see Note 5)

NOTES:
1. Arrow indicates direction of flow of river.
2. Horizontal datum is NAD83 HARN Oregon State Plane North, Intl. Feet.
3. Vertical datum is NAVD88.
4. Aerial imagery from July 2007.
5. Expanded EE/CA remedial footprint developed based on perimeter of comprehensive benthic risk area, BapEq RAL exceedances, and outer boundary of cores containing no substantial product.

Feet
0 100 200 300 400

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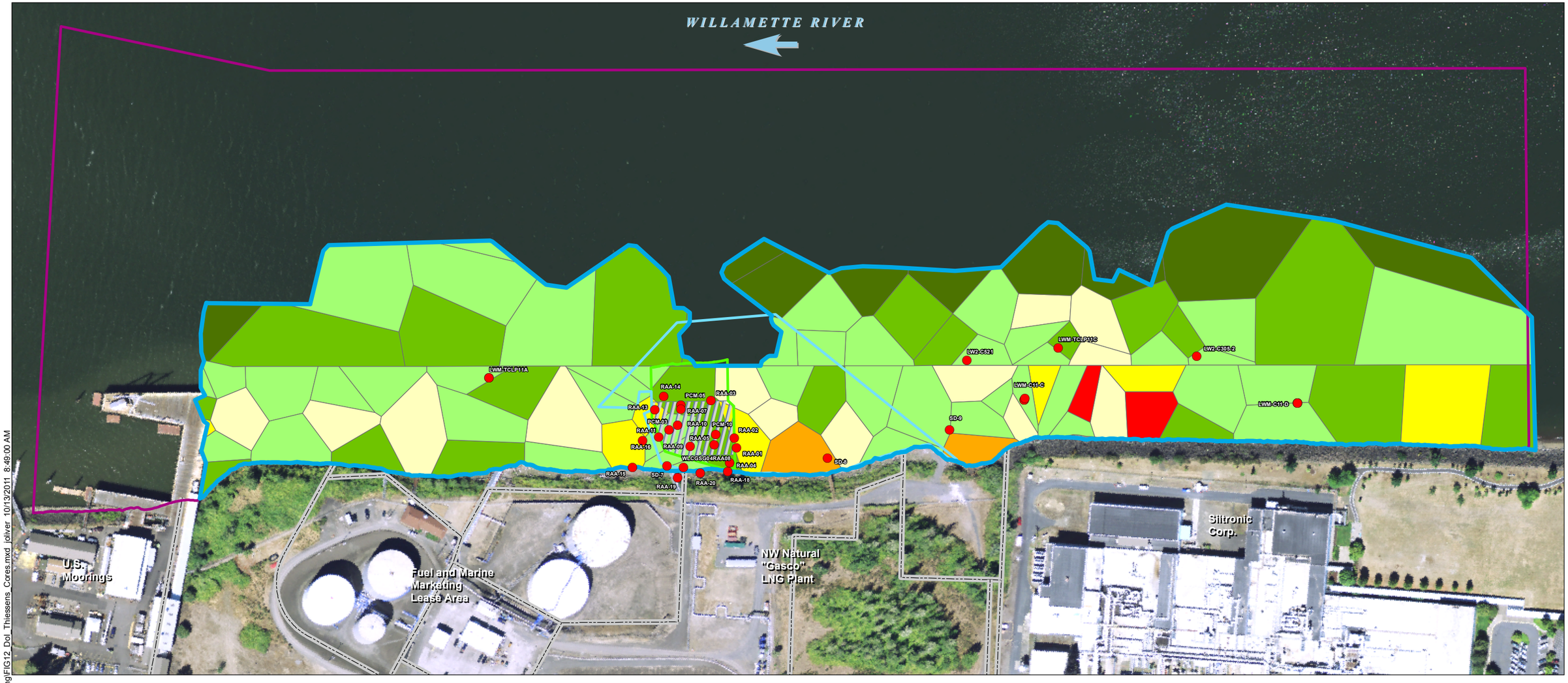
ANCHOR QEA

DRAFT – PRELIMINARY AND SUBJECT TO CHANGE

Figure 11
PH RAL Depth of Impact Exceedances
Gasco EE/CA Technical Briefing - October 19, 2011
Gasco Sediments Cleanup Action



Q:\Jobs\000029-02_Gasco\Maps\2011_09\EPA_Meeting\FIG12_DoI_Thiessens_Cores.mxd jolivier 10/13/2011 8:49:00 AM

- Substantial Product DOI Deeper than RAL DOI

Depth of Impact (feet)

- DoI = 0
- < 6
- 6 - 12
- 12 - 18
- 18 - 24
- 24 - 30
- > 30

- Gasco Sediment Site Area of Interest (Final Work Plan [Anchor QEA 2009])
- Tar Body Removal Action Area (RAPP [Anchor 2005])
- Tar Body Removal Action 6-inch Fringe Cover Placement
- Tar Body Removal Action Pilot Cap
- Expanded EE/CA Remedial Footprint (October 2011; see Note 5)

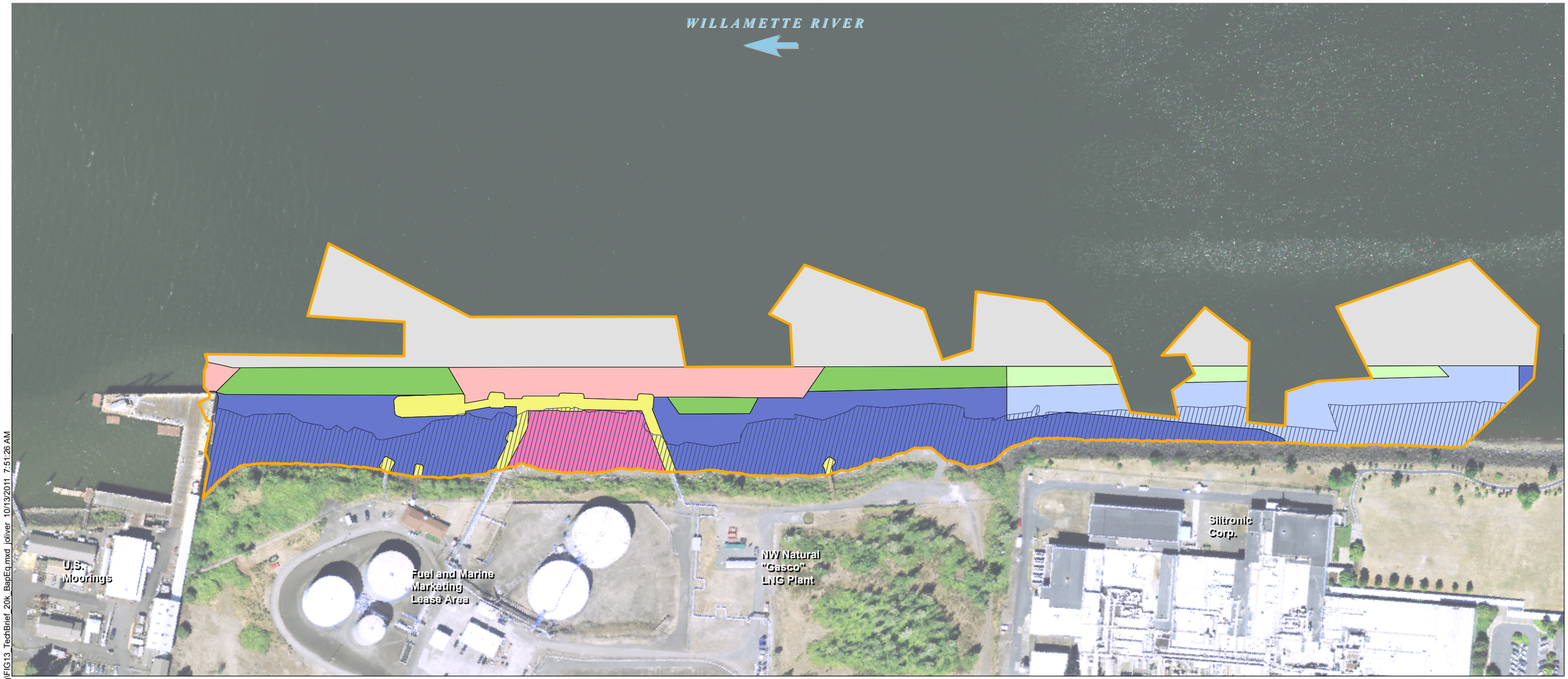
NOTES:
1. Arrow indicates direction of flow of river.
2. Horizontal datum is NAD83 HARN Oregon State Plane North, Intl. Feet.
3. Vertical datum is NAVD88.
4. Aerial imagery from July 2007.
5. Expanded EE/CA remedial footprint developed based on perimeter of comprehensive benthic risk area, BapEq RAL exceedances, and outer boundary of cores containing no substantial product.

Feet
0 100 200 300 400

ANCHOR QEA

DRAFT – PRELIMINARY AND SUBJECT TO CHANGE

Figure 12
Comparison of PH RAL and Substantial Product Depth of Impact Exceedances
Gasco EE/CA Technical Briefing - October 19, 2011
Gasco Sediments Cleanup Action



- Potential Future Maintenance Dredge (FMD)
- Navigation Channel (NC)
- Open Water (OW)
- Structure - Limited Access (SL)
- Structure - Under (SS)
- Wave Zone (-WZ)
- Navigation Channel to Sheetpile Wall (-NCSW)
- Navigation Channel to Sheetpile Wall Low Chemical Concentration (NSLC)
- Open Water Low Chemical Concentration (OWLC)
- Reduced EE/CA Remedial Footprint (See Note 6)

NOTES:
1. Arrow indicates direction of flow of river.
2. Horizontal datum is NAD83 HARN Oregon State Plane North, Intl. Feet.
3. Vertical datum is NAVD88.
4. Aerial imagery from July 2007.
5. Consistent with the LWG FS methods, the Reduced Comprehensive Benthic Risk Area was developed by reducing the Comprehensive Benthic Risk Area to exclude mean quotient (MQ) results less than 0.7.
6. Reduced EE/CA remedial footprint developed based on perimeter of reduced comprehensive benthic risk area, BapEq RAL exceedances and outer boundary of cores containing mobile substantial product.
7. Sheetpile wall rigid containment barrier shown along outer most constructible elevation contour (20 ft NAVD88).

Feet
0 100 200 300 400

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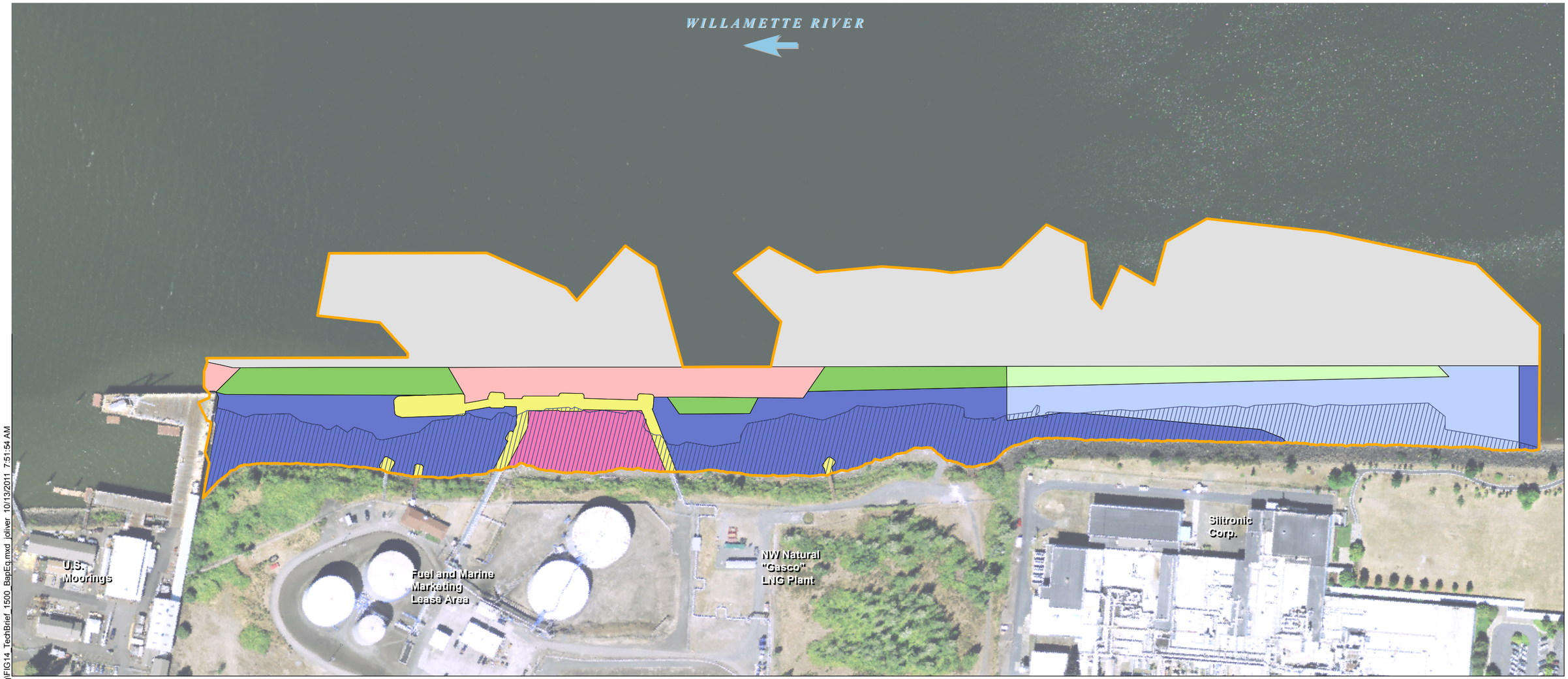
ANCHOR QEA

DRAFT – PRELIMINARY AND SUBJECT TO CHANGE

Figure 13
Reduced EE/CA Remedial Footprint SubSMA Designations
Gasco EE/CA Technical Briefing - October 19, 2011
Gasco Sediments Cleanup Action



- Potential Future Maintenance Dredge (FMD)
- Navigation Channel (NC)
- Open Water (OW)
- Structure - Limited Access (SL)
- Structure - Under (SS)
- Wave Zone (-WZ)
- Navigation Channel to Sheetpile Wall (-NCSW)
- Navigation Channel to Sheetpile Wall Low Chemical Concentration (NSLC)
- Open Water Low Chemical Concentration (OWLC)
- Expanded EE/CA Remedial Footprint (see Note 6)

NOTES:
1. Arrow indicates direction of flow of river.
2. Horizontal datum is NAD83 HARN Oregon State Plane North, Intl. Feet.
3. Vertical datum is NAVD88.
4. Aerial imagery from July 2007.
5. Consistent with the LWG FS methods, the Reduced Comprehensive Benthic Risk Area was developed by reducing the Comprehensive Benthic Risk Area to exclude mean quotient (MQ) results less than 0.7.
6. Expanded EE/CA remedial footprint developed based on perimeter of comprehensive benthic risk area, BapEq RAL exceedances, and outer boundary of cores containing no substantial product.
7. Sheetpile wall rigid containment barrier shown along outer most constructible elevation contour (20 ft NAVD88).

Feet
0 100 200 300 400

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ANCHOR QEA

DRAFT – PRELIMINARY AND SUBJECT TO CHANGE

Figure 14
Expanded EE/CA Remedial Footprint SubSMA Designations
Gasco EE/CA Technical Briefing - October 19, 2011
Gasco Sediments Cleanup Action