GAC-Sand Amended Cap Pilot Scale Study

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Outline

- GAC and sand materials
- Bench testing
- Field monitoring results
- Recommendations
- Questions and discussion

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GAC and Sand Materials

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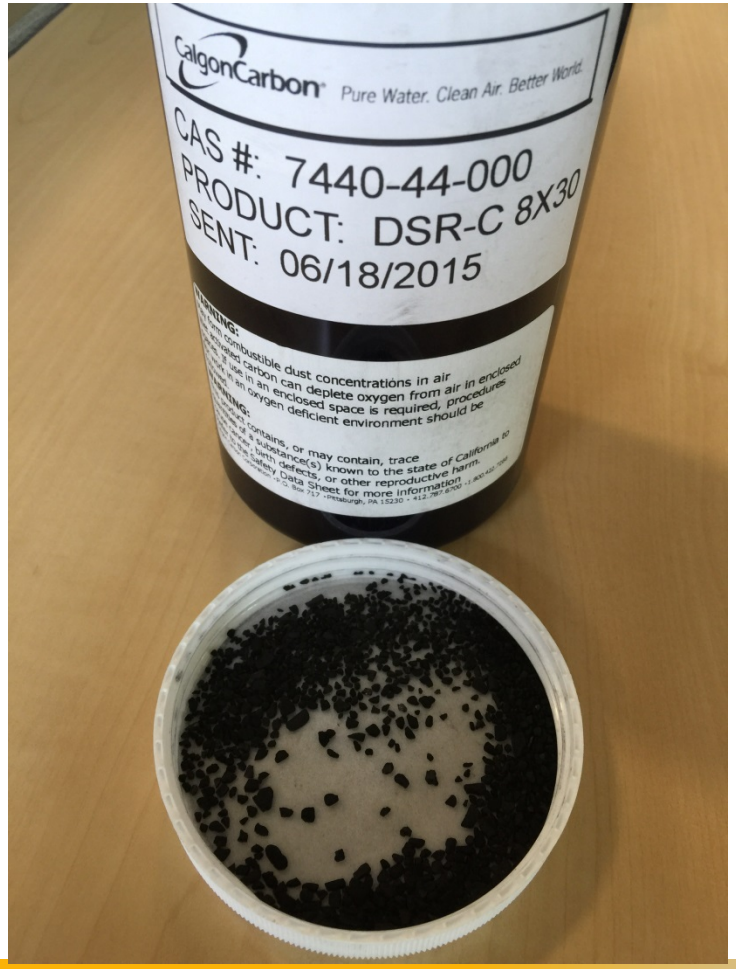
Activated Carbon



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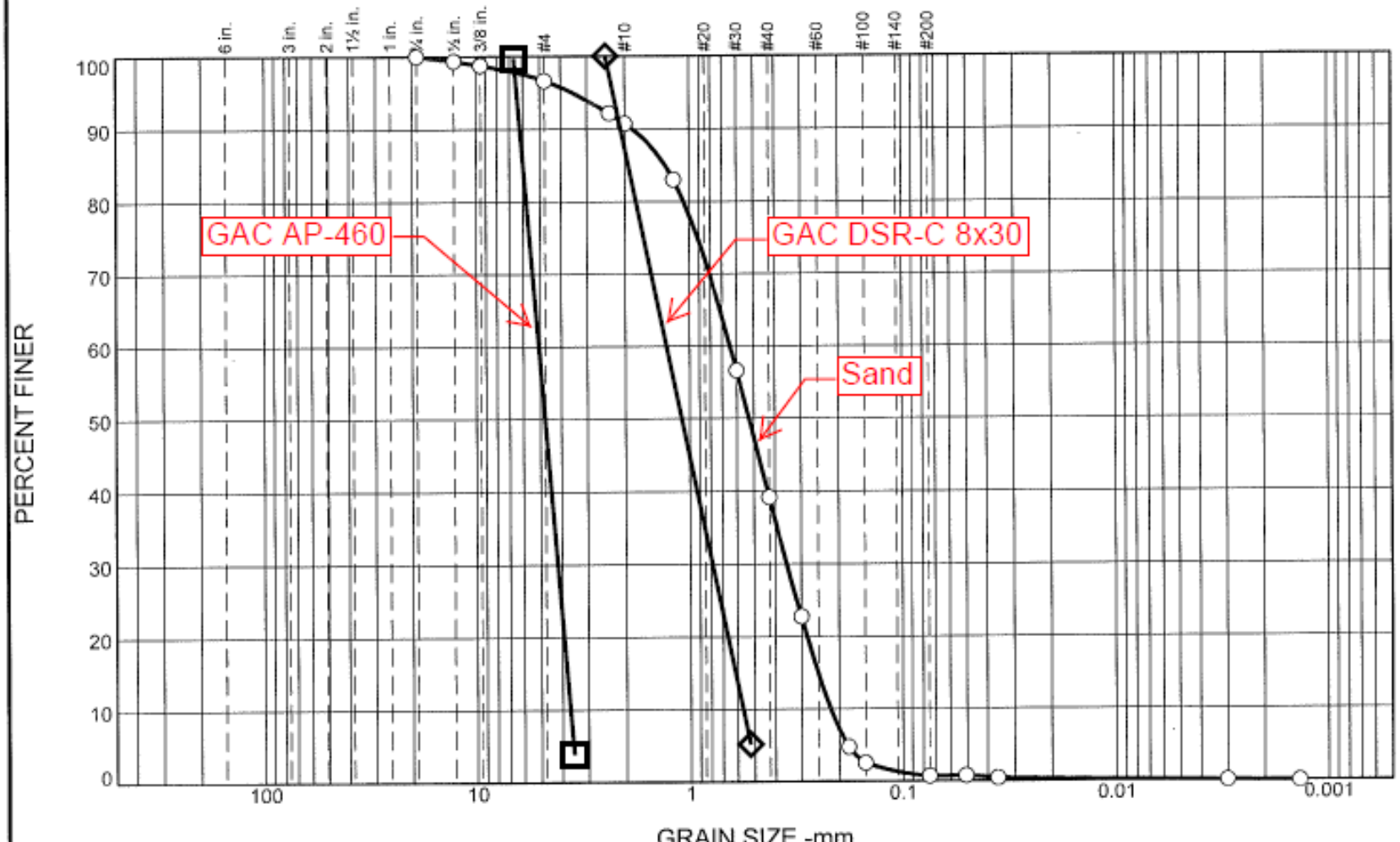
Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
Sand	0.0	0.0	3.3	6.0	51.5	38.5	0.6	0.1

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Organic Content by Loss-on-Ignition

Sand		GAC DSR-C		GAC AP-460	
Organic Content (%)	Ash Residue (%)	Organic Content (%)	Ash Residue (%)	Organic Content (%)	Ash Residue (%)
0.5	99.5	91.0	9.0	86.6	13.4
0.4	99.6	91.3	8.7	90.4	9.6
0.5	99.5	91.0	9.0	88.6	11.4
0.4	99.6	90.4	9.6	88.7	11.4
0.5	99.5	90.6	9.4	---	---
0.4	99.6	90.8	9.2	---	---
0.5	99.6	90.9	9.2	88.6	11.4
Averages					

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Bench Testing

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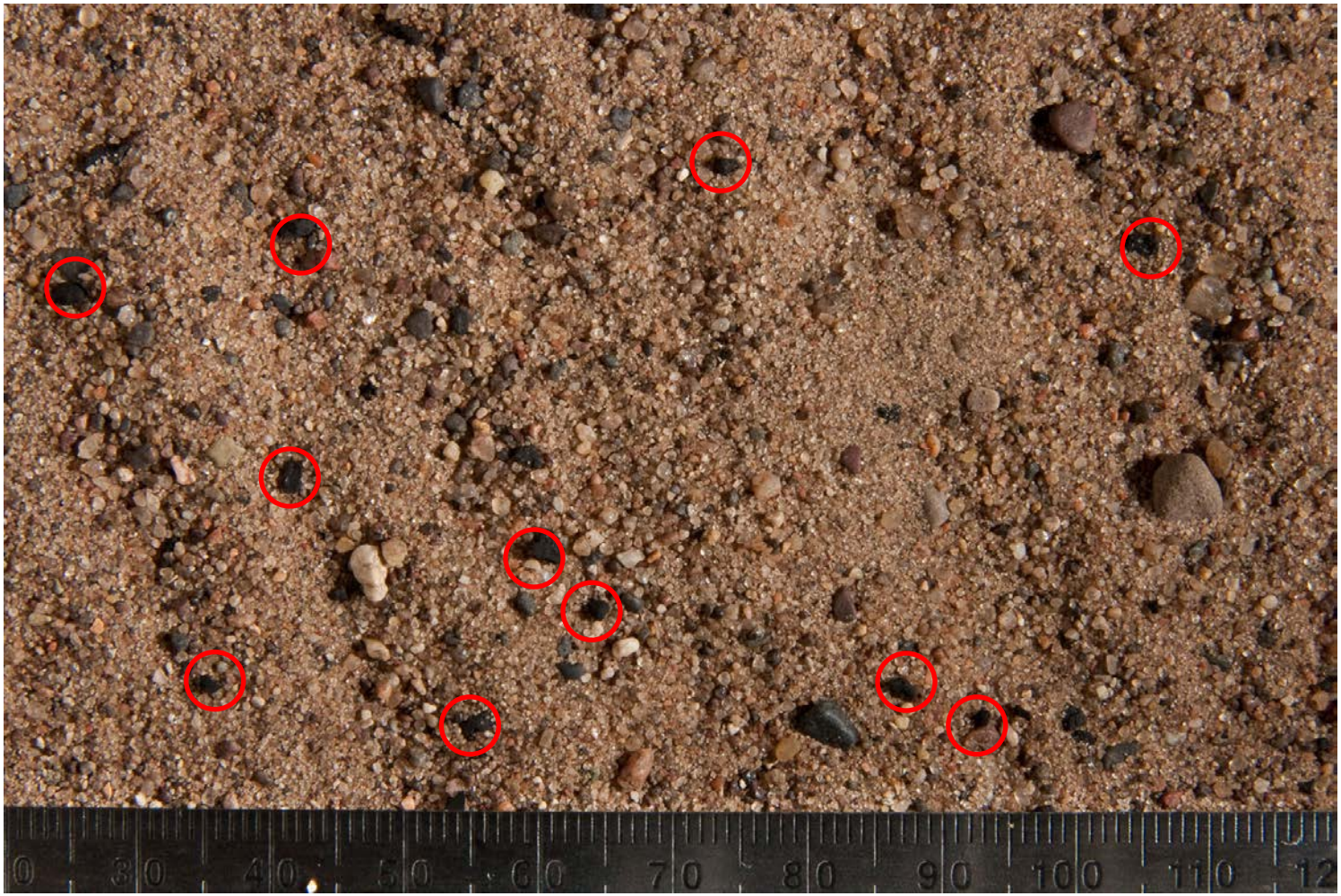
1% DSR-C GAC with Sand

(dry weight basis)



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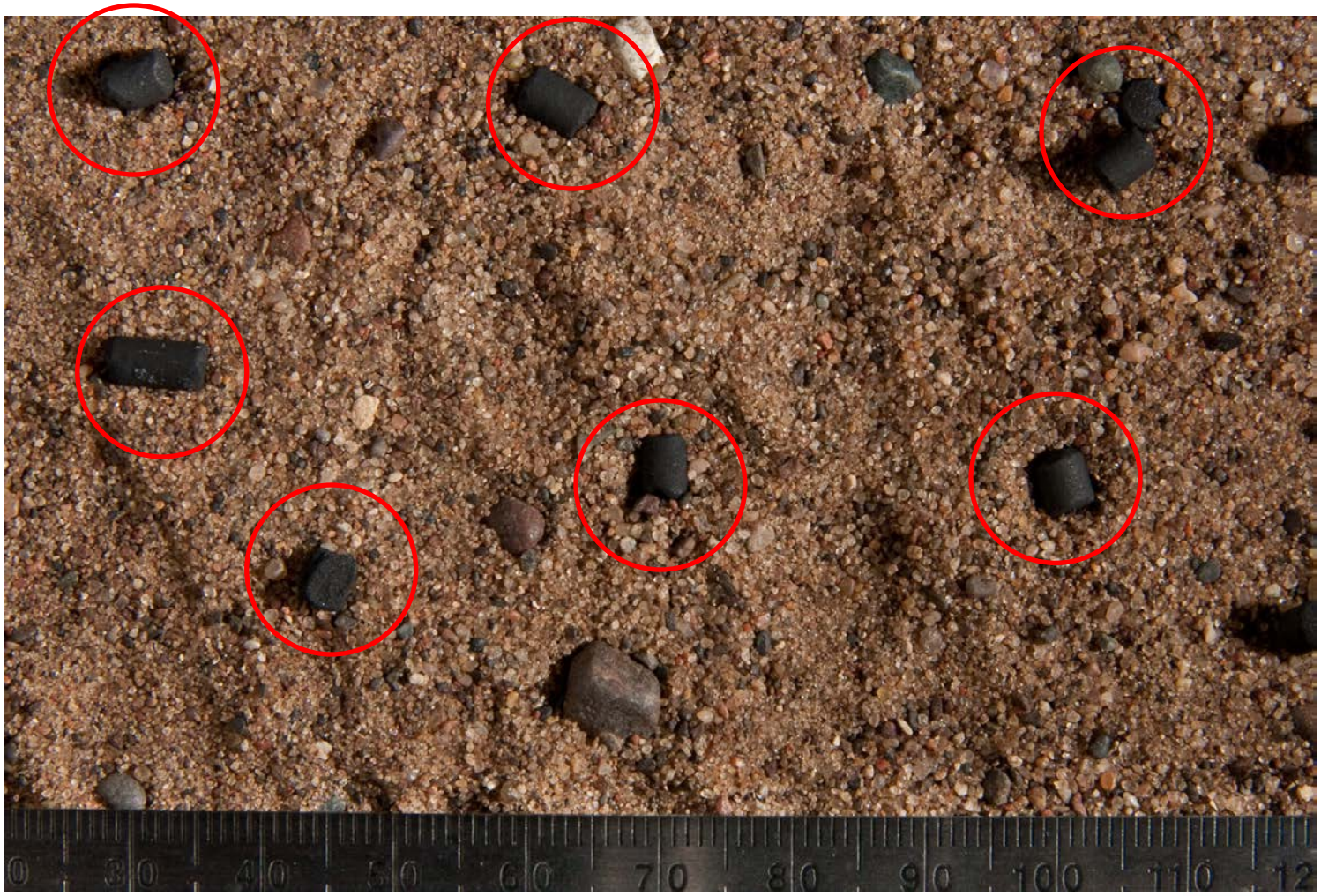
1% AP-460 GAC with Sand

(dry weight basis)



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Specific Gravity or Apparent Density

[Ratio of density of the material to the density of water]

Activated Carbon-Dry	0.6 +/-
Fresh Water	1.0
Activated Carbon-Saturated	1.4 +/-
Pure Carbon	2.2 +/-
Sand	2.6 +/-
Diluted Heavy Liquid	2.2 +/-

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Heavy Liquid Separation Testing
1% GAC with Sand

GAC	GAC Soaking Period (hr)	Heavy Liquid Separation Period (hr)	Computed GAC Content (%, dry weight)
AP-460	24	1	1.4
AP-460	24	4	0.9
DSR-C	24	4	1.0
AP-460	24	45	0.9
AP-460	24	0.25	1.6

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Heavy Liquid Separation

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Field Monitoring Results

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Qualitative QA/QC

Visual:

- Catch pans / buckets
- Post-placement cores
- Magnified photography – insitu or exsitu
- Tracer dye and UV light

Physical:

- Heavy liquid separation
- Sieving

Catch Pan / Bucket
5% DSR-C GAC

Catch Pan / Bucket
5% AP-460 GAC

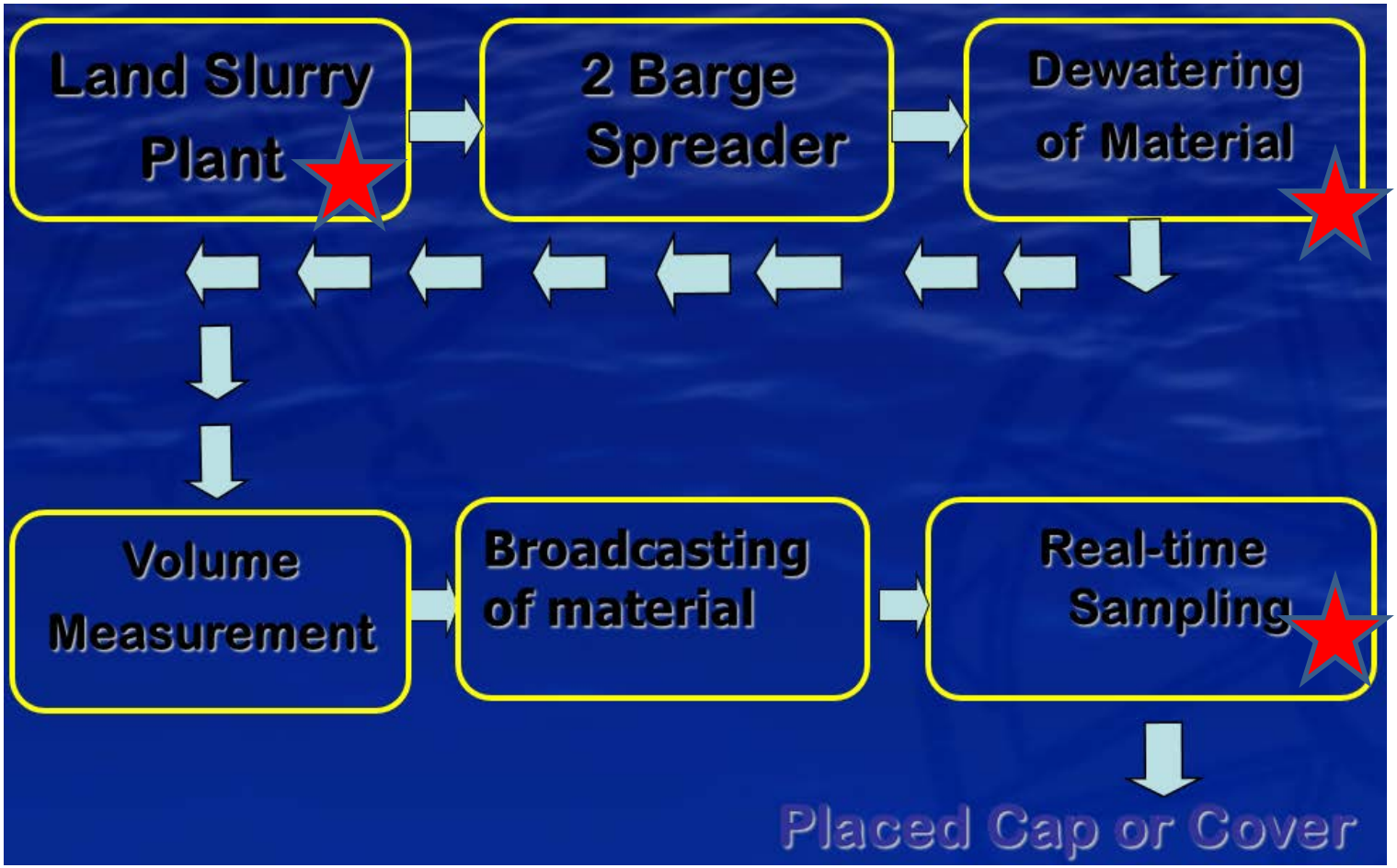
Quantitative QA/QC

- Mass balance
- Loss-on-ignition (LOI) testing
- Heavy liquid separation testing
- Computer analyses of magnified photography

Mass Balance

- % GAC = Dry GAC / (Dry GAC + Dry Sand)
- Moisture content testing of materials
  - Oven – ASTM D2216 (110^{o}C), or
  - Microwave – ASTM D4643
- Set feeder belt scales accordingly
- Record quantities used per day or per cap certification unit

Process Flow Diagram of Broadcast Capping System



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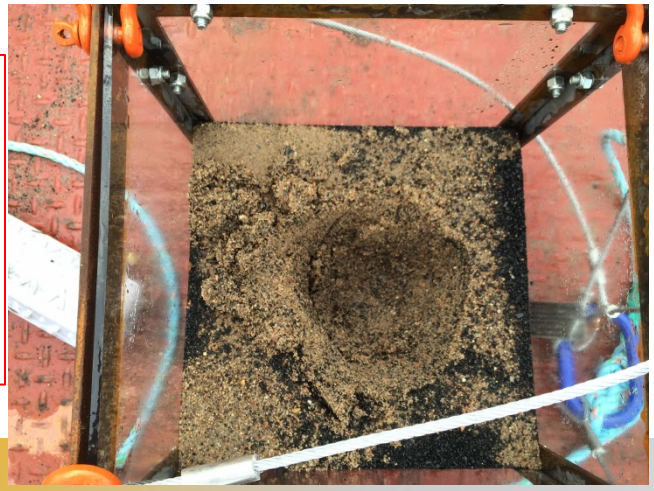
LOI Test Results for 5.2% DSR-C (mass balance)

6.4%
7.2%

5.7%
5.5%

6.3%
6.1%
6.8%
7.8%



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LOI Test Results – 5.3% AP-460 (mass balance)

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Recommendations

Monitoring Recommendations

- For qualitative documentation:
  - Primarily photographs of catch pans and/or cores
  - Heavy liquid separation if in doubt
- For quantitative documentation:
  - Rely upon mass balance – minimum daily
  - Loss-on-ignition testing at a reasonable frequency as a check and to assess variability

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Questions & Discussion

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