

**Technical Report for**

**Olsson Associates**

**Johnson 5-05 Produced Water Sample**

**Accutest Job Number: D54551**

**Sampling Date: 01/22/14**

**Report to:**

**Olsson Associates**

**shall@oaconsulting.com**

**ATTN: Stuart Hall**

**Total number of pages in report: 20**



Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Program and/or state specific certification programs as applicable.

A handwritten signature in black ink, appearing to read "Scott Heideman".

**Scott Heideman**  
**Laboratory Director**

**Client Service contact: Renea Jackson 303-425-6021**

Certifications: CO (CO00049), ID, NE (CO00049), ND (R-027), NJ (CO 0007), OK (D9942), UT (NELAP CO00049), TX (T104704511)

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Test results relate only to samples analyzed.

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## Sample Summary

**Olsson Associates**

**Job No: D54551**

**Johnson 5-05 Produced Water Sample**

| Sample Number | Collected |          | Received | Matrix |       | Client Sample ID |
|---------------|-----------|----------|----------|--------|-------|------------------|
|               | Date      | Time By  |          | Code   | Type  |                  |
| D54551-1      | 01/22/14  | 12:10 KB | 01/23/14 | AQ     | Water | JOHNSON 5-05 PW  |
| D54551-1F     | 01/22/14  | 12:10 KB | 01/23/14 | AQ     | Water | JOHNSON 5-05 PW  |



## CASE NARRATIVE / CONFORMANCE SUMMARY

**Client:** Olsson Associates

**Job No** D54551

**Site:** Johnson 5-05 Produced Water Sample

**Report Date** 1/28/2014 3:43:43 PM

On 01/23/2014, 1 sample(s), 0 Trip Blank(s), and 0 Field Blank(s) were received at Accutest Mountain States (AMS) at a temperature of 1.7 °C. The samples were intact and properly preserved, unless noted below. An AMS Job Number of D54551 was assigned to the project. The lab sample ID, client sample ID, and date of sample collection are detailed in the report's Results Summary.

Specified quality control criteria were achieved for this job except as noted below. For more information, please refer to the analytical results and QC summary pages.

### Volatiles by GCMS By Method SW846 8260B

|                  |                          |
|------------------|--------------------------|
| <b>Matrix</b> AQ | <b>Batch ID:</b> V6V1299 |
|------------------|--------------------------|

- All samples were analyzed within the recommended method holding time.
- Sample(s) D54519-10DUP, D54523-6MS were used as the QC samples indicated.
- All method blanks for this batch meet method specific criteria.
- The matrix spike (MS) recovery(s) of Ethylbenzene are outside control limits. Outside control limits due to possible matrix interference.
- D54523-6MS: The pH of the sample aliquot for VOA analysis was >2 at time of analysis.
- D54523-6MS: The pH of the sample aliquot for VOA analysis was >2 at time of analysis.
- D54519-10DUP: The pH of the sample aliquot for VOA analysis was >2 at time of analysis.

|                  |                          |
|------------------|--------------------------|
| <b>Matrix</b> AQ | <b>Batch ID:</b> V6V1301 |
|------------------|--------------------------|

- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) D54549-8MS, D54551-1DUP were used as the QC samples indicated.

### Extractables by GCMS By Method SW846 8270C

|                  |                         |
|------------------|-------------------------|
| <b>Matrix</b> AQ | <b>Batch ID:</b> OP9296 |
|------------------|-------------------------|

- All samples were extracted within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- Sample(s) D54519-12MS, D54519-12MSD were used as the QC samples indicated.
- All method blanks for this batch meet method specific criteria.
- The matrix spike (MS) recovery(s) of Benzoic Acid are outside control limits. Outside control limits due to possible matrix interference.
- The matrix spike duplicate (MSD) recovery(s) of Benzoic Acid are outside control limits. Probable cause due to matrix interference.
- Sample(s) D54551-1 have surrogates outside control limits. Outside control limits due to dilution.
- D54551-1: Elevated reporting limits due to sample matrix, dilution required during sample prep. Additional dilution during analysis due to high concentrations of non-target analytes.

## Volatiles by GC By Method SW846 8015B

|                  |                          |
|------------------|--------------------------|
| <b>Matrix</b> AQ | <b>Batch ID:</b> GGA1175 |
|------------------|--------------------------|

- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) D54495-1MS, D54495-1MSD were used as the QC samples indicated.
- D54551-1: Sample results indicate possible sample nonhomogeneity(multiple phases).

## Extractables by GC By Method SW846-8015B

|                  |                         |
|------------------|-------------------------|
| <b>Matrix</b> AQ | <b>Batch ID:</b> OP9285 |
|------------------|-------------------------|

- All samples were extracted within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- Sample(s) D54519-8MS, D54519-8MSD were used as the QC samples indicated.
- All method blanks for this batch meet method specific criteria.

## Metals By Method EPA 200.7

|                  |                          |
|------------------|--------------------------|
| <b>Matrix</b> AQ | <b>Batch ID:</b> MP12194 |
|------------------|--------------------------|

- All samples were digested within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) D54532-1MS, D54532-1MSD were used as the QC samples for the metals analysis.
- The matrix spike (MS) recovery(s) of Sodium are outside control limits. Spike amount low relative to the sample amount. Refer to lab control or spike blank for recovery information.

## Metals By Method EPA 200.8

|                  |                          |
|------------------|--------------------------|
| <b>Matrix</b> AQ | <b>Batch ID:</b> MP12193 |
|------------------|--------------------------|

- All samples were digested within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) D54560-1MS, D54560-1MSD were used as the QC samples for the metals analysis.
- D54551-1F for Selenium: Elevated detection limit due to dilution required for possible matrix interference.

## Wet Chemistry By Method EPA 300.0/SW846 9056

|                  |                          |
|------------------|--------------------------|
| <b>Matrix</b> AQ | <b>Batch ID:</b> GP11830 |
|------------------|--------------------------|

- All samples were prepared within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) D54525-1MS, D54525-1MSD were used as the QC samples for the Bromide, Chloride, Nitrogen, Nitrate, Nitrogen, Nitrite, Phosphate, Ortho, Sulfate, Bromide analysis.
- D54551-1 for Nitrogen, Nitrate: Elevated detection limit due to matrix interference.
- D54551-1 for Nitrogen, Nitrite: Elevated detection limit due to matrix interference.
- D54551-1 for Phosphate, Ortho: Elevated detection limit due to matrix interference.

### Wet Chemistry By Method SM 2320B-2011

**Matrix** AQ **Batch ID:** GN23460

- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) D54556-1DUP, D54556-1MS, D54556-1MSD were used as the QC samples for the Alkalinity, Total as CaCO<sub>3</sub> analysis.

### Wet Chemistry By Method SM 2510B-2011

**Matrix** AQ **Batch ID:** GP11844

- Sample(s) D54521-1DUP were used as the QC samples for the Specific Conductivity analysis.

### Wet Chemistry By Method SM 2540C-2011

**Matrix** AQ **Batch ID:** GN23457

- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) D54510-1DUP were used as the QC samples for the Solids, Total Dissolved analysis.

### Wet Chemistry By Method SM4500HB+-2011/9040C

**Matrix** AQ **Batch ID:** GN23463

- The following samples were run outside of holding time for method SM4500HB+-2011/9040C: D54551-1 Analysis performed past the required 15 minutes from collection time/holding time.

AMS certifies that data reported for samples received, listed on the associated custody chain or analytical task order, were produced to specifications meeting AMS's Quality System precision, accuracy and completeness objectives except as noted.

Estimated non-standard method measurement uncertainty data is available on request, based on quality control bias and implicit for standard methods. Acceptable uncertainty requires tested parameter quality control data to meet method criteria.

AMS is not responsible for data quality assumptions if partial reports are used and recommends that this report be used in its entirety. This report is authorized by AMS indicated via signature on the report cover.

## Summary of Hits

Job Number: D54551  
 Account: Olsson Associates  
 Project: Johnson 5-05 Produced Water Sample  
 Collected: 01/22/14



| Lab Sample ID | Client Sample ID | Result/<br>Qual | RL | MDL | Units | Method |
|---------------|------------------|-----------------|----|-----|-------|--------|
|---------------|------------------|-----------------|----|-----|-------|--------|

**D54551-1 JOHNSON 5-05 PW**

|  |  |        |      |      |          |                       |
|--|--|--------|------|------|----------|-----------------------|
| Benzene                                |  | 36600  | 200  | 50   | ug/l     | SW846 8260B           |
| Ethylbenzene                           |  | 25600  | 400  | 50   | ug/l     | SW846 8260B           |
| Toluene                                |  | 321000 | 5000 | 2500 | ug/l     | SW846 8260B           |
| Xylene (total)                         |  | 437000 | 7500 | 5000 | ug/l     | SW846 8260B           |
| Dibenzofuran <sup>a</sup>              |  | 766 J  | 3800 | 380  | ug/l     | SW846 8270C           |
| Fluorene <sup>a</sup>                  |  | 2010 J | 3800 | 380  | ug/l     | SW846 8270C           |
| 2-Methylnaphthalene <sup>a</sup>       |  | 56800  | 3800 | 380  | ug/l     | SW846 8270C           |
| Naphthalene <sup>a</sup>               |  | 18800  | 3800 | 380  | ug/l     | SW846 8270C           |
| Phenanthrene <sup>a</sup>              |  | 1730 J | 3800 | 380  | ug/l     | SW846 8270C           |
| TPH-GRO (C6-C10) <sup>b</sup>          |  | 180    | 40   | 10   | mg/l     | SW846 8015B           |
| TPH-DRO (C10-C28)                      |  | 5810   | 60   | 54   | mg/l     | SW846-8015B           |
| Alkalinity, Total as CaCO <sub>3</sub> |  | 1080   | 5.0  |      | mg/l     | SM 2320B-2011         |
| Bromide                                |  | 34.9   | 1.0  |      | mg/l     | EPA 300.0/SW846 9056  |
| Chloride                               |  | 5730   | 130  |      | mg/l     | EPA 300.0/SW846 9056  |
| Solids, Total Dissolved                |  | 10700  | 10   |      | mg/l     | SM 2540C-2011         |
| Specific Conductivity                  |  | 15500  | 1.0  |      | umhos/cm | SM 2510B-2011         |
| Sulfate                                |  | 10.9   | 10   |      | mg/l     | EPA 300.0/SW846 9056  |
| pH <sup>c</sup>                        |  | 7.57   |      |      | su       | SM4500HB+ -2011/9040C |

**D54551-1F JOHNSON 5-05 PW**

|           |  |         |      |  |      |           |
|-----------|--|---------|------|--|------|-----------|
| Calcium   |  | 195000  | 400  |  | ug/l | EPA 200.7 |
| Iron      |  | 87.0    | 10   |  | ug/l | EPA 200.7 |
| Magnesium |  | 6760    | 200  |  | ug/l | EPA 200.7 |
| Manganese |  | 269     | 5.0  |  | ug/l | EPA 200.7 |
| Potassium |  | 39500   | 1000 |  | ug/l | EPA 200.7 |
| Sodium    |  | 3350000 | 8000 |  | ug/l | EPA 200.7 |

- (a) Elevated reporting limits due to sample matrix, dilution required during sample prep. Additional dilution during analysis due to high concentrations of non-target analytes.
- (b) Sample results indicate possible sample nonhomogeneity(multiple phases).
- (c) Analysis performed past the required 15 minutes from collection time/holding time.

**Sample Results**

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**Report of Analysis**

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## Report of Analysis

|                   |                                    |                 |          |
|-------------------|------------------------------------|-----------------|----------|
| Client Sample ID: | JOHNSON 5-05 PW                    | Date Sampled:   | 01/22/14 |
| Lab Sample ID:    | D54551-1                           | Date Received:  | 01/23/14 |
| Matrix:           | AQ - Water                         | Percent Solids: | n/a      |
| Method:           | SW846 8260B                        |                 |          |
| Project:          | Johnson 5-05 Produced Water Sample |                 |          |

| Run #  | File ID   | DF   | Analyzed | By | Prep Date | Prep Batch | Analytical Batch |
|--------|-----------|------|----------|----|-----------|------------|------------------|
| Run #1 | 6V23139.D | 200  | 01/23/14 | BR | n/a       | n/a        | V6V1299          |
| Run #2 | 6V23178.D | 2500 | 01/24/14 | BR | n/a       | n/a        | V6V1301          |

| Run #  | Purge Volume |
|--------|--------------|
| Run #1 | 5.0 ml       |
| Run #2 | 5.0 ml       |

## VOA HSL List

| CAS No.    | Compound                   | Result | RL   | MDL  | Units | Q |
|------------|----------------------------|--------|------|------|-------|---|
| 67-64-1    | Acetone                    | ND     | 4000 | 1400 | ug/l  |   |
| 71-43-2    | Benzene                    | 36600  | 200  | 50   | ug/l  |   |
| 75-27-4    | Bromodichloromethane       | ND     | 400  | 50   | ug/l  |   |
| 75-25-2    | Bromoform                  | ND     | 400  | 86   | ug/l  |   |
| 75-15-0    | Carbon disulfide           | ND     | 400  | 150  | ug/l  |   |
| 56-23-5    | Carbon tetrachloride       | ND     | 400  | 50   | ug/l  |   |
| 108-90-7   | Chlorobenzene              | ND     | 400  | 50   | ug/l  |   |
| 75-00-3    | Chloroethane               | ND     | 400  | 110  | ug/l  |   |
| 110-75-8   | 2-Chloroethyl vinyl ether  | ND     | 400  | 54   | ug/l  |   |
| 67-66-3    | Chloroform                 | ND     | 400  | 50   | ug/l  |   |
| 124-48-1   | Dibromochloromethane       | ND     | 400  | 50   | ug/l  |   |
| 95-50-1    | o-Dichlorobenzene          | ND     | 400  | 50   | ug/l  |   |
| 541-73-1   | m-Dichlorobenzene          | ND     | 400  | 50   | ug/l  |   |
| 106-46-7   | p-Dichlorobenzene          | ND     | 400  | 50   | ug/l  |   |
| 75-34-3    | 1,1-Dichloroethane         | ND     | 400  | 84   | ug/l  |   |
| 107-06-2   | 1,2-Dichloroethane         | ND     | 400  | 60   | ug/l  |   |
| 75-35-4    | 1,1-Dichloroethylene       | ND     | 400  | 190  | ug/l  |   |
| 156-59-2   | cis-1,2-Dichloroethylene   | ND     | 200  | 60   | ug/l  |   |
| 156-60-5   | trans-1,2-Dichloroethylene | ND     | 400  | 170  | ug/l  |   |
| 78-87-5    | 1,2-Dichloropropane        | ND     | 400  | 68   | ug/l  |   |
| 10061-01-5 | cis-1,3-Dichloropropene    | ND     | 400  | 50   | ug/l  |   |
| 10061-02-6 | trans-1,3-Dichloropropene  | ND     | 400  | 50   | ug/l  |   |
| 100-41-4   | Ethylbenzene               | 25600  | 400  | 50   | ug/l  |   |
| 591-78-6   | 2-Hexanone                 | ND     | 400  | 150  | ug/l  |   |
| 74-83-9    | Methyl bromide             | ND     | 1000 | 460  | ug/l  |   |
| 74-87-3    | Methyl chloride            | ND     | 400  | 100  | ug/l  |   |
| 75-09-2    | Methylene chloride         | ND     | 800  | 500  | ug/l  |   |
| 108-10-1   | 4-Methyl-2-pentanone       | ND     | 2000 | 1000 | ug/l  |   |
| 78-93-3    | Methyl ethyl ketone        | ND     | 2000 | 640  | ug/l  |   |
| 100-42-5   | Styrene                    | ND     | 400  | 50   | ug/l  |   |
| 79-34-5    | 1,1,2,2-Tetrachloroethane  | ND     | 400  | 50   | ug/l  |   |
| 127-18-4   | Tetrachloroethylene        | ND     | 400  | 56   | ug/l  |   |

ND = Not detected MDL - Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

## Report of Analysis

|  |                                |
|--|--------------------------------|
| <b>Client Sample ID:</b> JOHNSON 5-05 PW           | <b>Date Sampled:</b> 01/22/14  |
| <b>Lab Sample ID:</b> D54551-1                     | <b>Date Received:</b> 01/23/14 |
| <b>Matrix:</b> AQ - Water                          | <b>Percent Solids:</b> n/a     |
| <b>Method:</b> SW846 8260B                         |                                |
| <b>Project:</b> Johnson 5-05 Produced Water Sample |                                |

**VOA HSL List**

| CAS No.   | Compound              | Result              | RL   | MDL  | Units | Q |
|-----------|-----------------------|---------------------|------|------|-------|---|
| 108-88-3  | Toluene               | 321000 <sup>a</sup> | 5000 | 2500 | ug/l  |   |
| 71-55-6   | 1,1,1-Trichloroethane | ND                  | 400  | 58   | ug/l  |   |
| 79-00-5   | 1,1,2-Trichloroethane | ND                  | 400  | 62   | ug/l  |   |
| 79-01-6   | Trichloroethylene     | ND                  | 400  | 50   | ug/l  |   |
| 108-05-4  | Vinyl Acetate         | ND                  | 2000 | 520  | ug/l  |   |
| 75-01-4   | Vinyl chloride        | ND                  | 400  | 98   | ug/l  |   |
| 1330-20-7 | Xylene (total)        | 437000 <sup>a</sup> | 7500 | 5000 | ug/l  |   |

| CAS No.    | Surrogate Recoveries  | Run# 1 | Run# 2 | Limits  |
|------------|-----------------------|--------|--------|---------|
| 17060-07-0 | 1,2-Dichloroethane-D4 | 86%    | 94%    | 62-130% |
| 2037-26-5  | Toluene-D8            | 119%   | 109%   | 70-130% |
| 460-00-4   | 4-Bromofluorobenzene  | 108%   | 103%   | 69-130% |

(a) Result is from Run# 2

ND = Not detected      MDL - Method Detection Limit  
 RL = Reporting Limit  
 E = Indicates value exceeds calibration range

J = Indicates an estimated value  
 B = Indicates analyte found in associated method blank  
 N = Indicates presumptive evidence of a compound

4.1  
4

## Report of Analysis

|                   |                                    |                 |          |
|-------------------|------------------------------------|-----------------|----------|
| Client Sample ID: | JOHNSON 5-05 PW                    | Date Sampled:   | 01/22/14 |
| Lab Sample ID:    | D54551-1                           | Date Received:  | 01/23/14 |
| Matrix:           | AQ - Water                         | Percent Solids: | n/a      |
| Method:           | SW846 8270C SW846 3510C            |                 |          |
| Project:          | Johnson 5-05 Produced Water Sample |                 |          |

| Run #               | File ID   | DF | Analyzed | By | Prep Date | Prep Batch | Analytical Batch |
|---------------------|-----------|----|----------|----|-----------|------------|------------------|
| Run #1 <sup>a</sup> | 3G17841.D | 10 | 01/27/14 | DC | 01/27/14  | OP9296     | E3G888           |
| Run #2              |           |    |          |    |           |            |                  |

| Run #  | Initial Volume | Final Volume |
|--------|----------------|--------------|
| Run #1 | 1060 ml        | 80.0 ml      |
| Run #2 |                |              |

## ABN HSL List

| CAS No.   | Compound                    | Result | RL   | MDL  | Units | Q |
|-----------|-----------------------------|--------|------|------|-------|---|
| 65-85-0   | Benzoic Acid                | ND     | 7600 | 7600 | ug/l  |   |
| 59-50-7   | 4-Chloro-3-methyl phenol    | ND     | 3800 | 480  | ug/l  |   |
| 95-57-8   | 2-Chlorophenol              | ND     | 3800 | 420  | ug/l  |   |
| 120-83-2  | 2,4-Dichlorophenol          | ND     | 3800 | 460  | ug/l  |   |
| 105-67-9  | 2,4-Dimethylphenol          | ND     | 3800 | 400  | ug/l  |   |
| 534-52-1  | 4,6-Dinitro-o-cresol        | ND     | 3800 | 380  | ug/l  |   |
| 51-28-5   | 2,4-Dinitrophenol           | ND     | 3800 | 3000 | ug/l  |   |
| 95-48-7   | 2-Methylphenol              | ND     | 3800 | 380  | ug/l  |   |
| 106-44-5  | 4-Methylphenol              | ND     | 3800 | 380  | ug/l  |   |
| 88-75-5   | 2-Nitrophenol               | ND     | 3800 | 380  | ug/l  |   |
| 100-02-7  | 4-Nitrophenol               | ND     | 3800 | 380  | ug/l  |   |
| 87-86-5   | Pentachlorophenol           | ND     | 3800 | 380  | ug/l  |   |
| 108-95-2  | Phenol                      | ND     | 3800 | 380  | ug/l  |   |
| 95-95-4   | 2,4,5-Trichlorophenol       | ND     | 3800 | 410  | ug/l  |   |
| 88-06-2   | 2,4,6-Trichlorophenol       | ND     | 3800 | 390  | ug/l  |   |
| 83-32-9   | Acenaphthene                | ND     | 3800 | 390  | ug/l  |   |
| 208-96-8  | Acenaphthylene              | ND     | 3800 | 380  | ug/l  |   |
| 120-12-7  | Anthracene                  | ND     | 3800 | 380  | ug/l  |   |
| 56-55-3   | Benzo(a)anthracene          | ND     | 3800 | 380  | ug/l  |   |
| 205-99-2  | Benzo(b)fluoranthene        | ND     | 3800 | 380  | ug/l  |   |
| 207-08-9  | Benzo(k)fluoranthene        | ND     | 3800 | 380  | ug/l  |   |
| 191-24-2  | Benzo(g,h,i)perylene        | ND     | 3800 | 380  | ug/l  |   |
| 50-32-8   | Benzo(a)pyrene              | ND     | 3800 | 380  | ug/l  |   |
| 100-51-6  | Benzyl Alcohol              | ND     | 3800 | 490  | ug/l  |   |
| 101-55-3  | 4-Bromophenyl phenyl ether  | ND     | 3800 | 380  | ug/l  |   |
| 85-68-7   | Butyl benzyl phthalate      | ND     | 3800 | 380  | ug/l  |   |
| 106-47-8  | 4-Chloroaniline             | ND     | 3800 | 490  | ug/l  |   |
| 111-91-1  | bis(2-Chloroethoxy)methane  | ND     | 3800 | 380  | ug/l  |   |
| 111-44-4  | bis(2-Chloroethyl)ether     | ND     | 3800 | 380  | ug/l  |   |
| 108-60-1  | bis(2-Chloroisopropyl)ether | ND     | 3800 | 420  | ug/l  |   |
| 91-58-7   | 2-Chloronaphthalene         | ND     | 3800 | 380  | ug/l  |   |
| 7005-72-3 | 4-Chlorophenyl phenyl ether | ND     | 3800 | 380  | ug/l  |   |

ND = Not detected MDL - Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

## Report of Analysis

|                   |                                    |                 |          |
|-------------------|------------------------------------|-----------------|----------|
| Client Sample ID: | JOHNSON 5-05 PW                    | Date Sampled:   | 01/22/14 |
| Lab Sample ID:    | D54551-1                           | Date Received:  | 01/23/14 |
| Matrix:           | AQ - Water                         | Percent Solids: | n/a      |
| Method:           | SW846 8270C SW846 3510C            |                 |          |
| Project:          | Johnson 5-05 Produced Water Sample |                 |          |

## ABN HSL List

| CAS No.  | Compound                   | Result | RL   | MDL  | Units | Q |
|----------|----------------------------|--------|------|------|-------|---|
| 218-01-9 | Chrysene                   | ND     | 3800 | 380  | ug/l  |   |
| 53-70-3  | Dibenzo(a,h)anthracene     | ND     | 3800 | 380  | ug/l  |   |
| 132-64-9 | Dibenzofuran               | 766    | 3800 | 380  | ug/l  | J |
| 84-74-2  | Di-n-butyl phthalate       | ND     | 3800 | 520  | ug/l  |   |
| 95-50-1  | 1,2-Dichlorobenzene        | ND     | 3800 | 420  | ug/l  |   |
| 541-73-1 | 1,3-Dichlorobenzene        | ND     | 3800 | 460  | ug/l  |   |
| 106-46-7 | 1,4-Dichlorobenzene        | ND     | 3800 | 450  | ug/l  |   |
| 91-94-1  | 3,3'-Dichlorobenzidine     | ND     | 3800 | 380  | ug/l  |   |
| 84-66-2  | Diethyl phthalate          | ND     | 3800 | 380  | ug/l  |   |
| 131-11-3 | Dimethyl phthalate         | ND     | 3800 | 380  | ug/l  |   |
| 121-14-2 | 2,4-Dinitrotoluene         | ND     | 3800 | 380  | ug/l  |   |
| 606-20-2 | 2,6-Dinitrotoluene         | ND     | 3800 | 420  | ug/l  |   |
| 117-84-0 | Di-n-octyl phthalate       | ND     | 3800 | 380  | ug/l  |   |
| 117-81-7 | bis(2-Ethylhexyl)phthalate | ND     | 3800 | 830  | ug/l  |   |
| 206-44-0 | Fluoranthene               | ND     | 3800 | 380  | ug/l  |   |
| 86-73-7  | Fluorene                   | 2010   | 3800 | 380  | ug/l  | J |
| 118-74-1 | Hexachlorobenzene          | ND     | 3800 | 380  | ug/l  |   |
| 87-68-3  | Hexachlorobutadiene        | ND     | 3800 | 380  | ug/l  |   |
| 77-47-4  | Hexachlorocyclopentadiene  | ND     | 3800 | 3000 | ug/l  |   |
| 67-72-1  | Hexachloroethane           | ND     | 3800 | 430  | ug/l  |   |
| 193-39-5 | Indeno(1,2,3-cd)pyrene     | ND     | 3800 | 430  | ug/l  |   |
| 78-59-1  | Isophorone                 | ND     | 3800 | 380  | ug/l  |   |
| 91-57-6  | 2-Methylnaphthalene        | 56800  | 3800 | 380  | ug/l  |   |
| 91-20-3  | Naphthalene                | 18800  | 3800 | 380  | ug/l  |   |
| 88-74-4  | 2-Nitroaniline             | ND     | 3800 | 440  | ug/l  |   |
| 99-09-2  | 3-Nitroaniline             | ND     | 3800 | 700  | ug/l  |   |
| 100-01-6 | 4-Nitroaniline             | ND     | 3800 | 390  | ug/l  |   |
| 98-95-3  | Nitrobenzene               | ND     | 3800 | 380  | ug/l  |   |
| 86-30-6  | N-Nitrosodiphenylamine     | ND     | 3800 | 380  | ug/l  |   |
| 621-64-7 | N-Nitroso-di-n-propylamine | ND     | 3800 | 550  | ug/l  |   |
| 85-01-8  | Phenanthrene               | 1730   | 3800 | 380  | ug/l  | J |
| 129-00-0 | Pyrene                     | ND     | 3800 | 380  | ug/l  |   |
| 120-82-1 | 1,2,4-Trichlorobenzene     | ND     | 3800 | 380  | ug/l  |   |

| CAS No.   | Surrogate Recoveries | Run# 1          | Run# 2 | Limits  |
|-----------|----------------------|-----------------|--------|---------|
| 367-12-4  | 2-Fluorophenol       | 0% <sup>b</sup> |        | 10-130% |
| 4165-62-2 | Phenol-d5            | 0% <sup>b</sup> |        | 10-130% |
| 118-79-6  | 2,4,6-Tribromophenol | 0% <sup>b</sup> |        | 16-130% |
| 4165-60-0 | Nitrobenzene-d5      | 0% <sup>b</sup> |        | 14-130% |

ND = Not detected MDL - Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

## Report of Analysis

|   |   |
|---|---|
| <b>Client Sample ID:</b> JOHNSON 5-05 PW<br><b>Lab Sample ID:</b> D54551-1<br><b>Matrix:</b> AQ - Water<br><b>Method:</b> SW846 8270C SW846 3510C<br><b>Project:</b> Johnson 5-05 Produced Water Sample | <b>Date Sampled:</b> 01/22/14<br><b>Date Received:</b> 01/23/14<br><b>Percent Solids:</b> n/a |
|---|---|

**ABN HSL List**

| CAS No.   | Surrogate Recoveries | Run# 1          | Run# 2 | Limits  |
|-----------|----------------------|-----------------|--------|---------|
| 321-60-8  | 2-Fluorobiphenyl     | 0% <sup>b</sup> |        | 16-130% |
| 1718-51-0 | Terphenyl-d14        | 123%            |        | 10-145% |

- (a) Elevated reporting limits due to sample matrix, dilution required during sample prep. Additional dilution during analysis due to high concentrations of non-target analytes.  
 (b) Outside control limits due to dilution.

---

|   |                              |  |
|---|------------------------------|--|
| ND = Not detected                             | MDL - Method Detection Limit | J = Indicates an estimated value                       |
| RL = Reporting Limit                          |                              | B = Indicates analyte found in associated method blank |
| E = Indicates value exceeds calibration range |                              | N = Indicates presumptive evidence of a compound       |

4.1  
4

## Report of Analysis

|   |   |
|---|---|
| <b>Client Sample ID:</b> JOHNSON 5-05 PW<br><b>Lab Sample ID:</b> D54551-1<br><b>Matrix:</b> AQ - Water<br><b>Method:</b> SW846 8015B<br><b>Project:</b> Johnson 5-05 Produced Water Sample | <b>Date Sampled:</b> 01/22/14<br><b>Date Received:</b> 01/23/14<br><b>Percent Solids:</b> n/a |
|---|---|

| Run #               | File ID   | DF  | Analyzed | By | Prep Date | Prep Batch | Analytical Batch |
|---------------------|-----------|-----|----------|----|-----------|------------|------------------|
| Run #1 <sup>a</sup> | GA20861.D | 200 | 01/24/14 | EV | n/a       | n/a        | GGA1175          |
| Run #2              |           |     |          |    |           |            |                  |

| Run #  | Purge Volume |
|--------|--------------|
| Run #1 | 5.0 ml       |
| Run #2 |              |

| CAS No.  | Compound               | Result | RL     | MDL     | Units | Q |
|----------|------------------------|--------|--------|---------|-------|---|
|          | TPH-GRO (C6-C10)       | 180    | 40     | 10      | mg/l  |   |
| CAS No.  | Surrogate Recoveries   | Run# 1 | Run# 2 | Limits  |       |   |
| 120-82-1 | 1,2,4-Trichlorobenzene | 92%    |        | 60-140% |       |   |

(a) Sample results indicate possible sample nonhomogeneity(multiple phases).

ND = Not detected      MDL - Method Detection Limit  
 RL = Reporting Limit  
 E = Indicates value exceeds calibration range

J = Indicates an estimated value  
 B = Indicates analyte found in associated method blank  
 N = Indicates presumptive evidence of a compound

4.1  
4

## Report of Analysis

|   |   |
|---|---|
| <b>Client Sample ID:</b> JOHNSON 5-05 PW<br><b>Lab Sample ID:</b> D54551-1<br><b>Matrix:</b> AQ - Water<br><b>Method:</b> SW846-8015B SW846 3510C<br><b>Project:</b> Johnson 5-05 Produced Water Sample | <b>Date Sampled:</b> 01/22/14<br><b>Date Received:</b> 01/23/14<br><b>Percent Solids:</b> n/a |
|---|---|

|        | File ID    | DF | Analyzed | By | Prep Date | Prep Batch | Analytical Batch |
|--------|------------|----|----------|----|-----------|------------|------------------|
| Run #1 | FH017633.D | 20 | 01/27/14 | JJ | 01/24/14  | OP9285     | GFH872           |
| Run #2 |            |    |          |    |           |            |                  |

|        | Initial Volume | Final Volume |
|--------|----------------|--------------|
| Run #1 | 1000 ml        | 15.0 ml      |
| Run #2 |                |              |

| CAS No. | Compound             | Result | RL     | MDL     | Units | Q |
|---------|----------------------|--------|--------|---------|-------|---|
|         | TPH-DRO (C10-C28)    | 5810   | 60     | 54      | mg/l  |   |
| CAS No. | Surrogate Recoveries | Run# 1 | Run# 2 | Limits  |       |   |
| 84-15-1 | o-Terphenyl          | 97%    |        | 10-130% |       |   |

ND = Not detected      MDL - Method Detection Limit  
 RL = Reporting Limit  
 E = Indicates value exceeds calibration range

J = Indicates an estimated value  
 B = Indicates analyte found in associated method blank  
 N = Indicates presumptive evidence of a compound

4.1  
4

## Report of Analysis

|                   |                                    |                 |          |
|-------------------|------------------------------------|-----------------|----------|
| Client Sample ID: | JOHNSON 5-05 PW                    | Date Sampled:   | 01/22/14 |
| Lab Sample ID:    | D54551-1                           | Date Received:  | 01/23/14 |
| Matrix:           | AQ - Water                         | Percent Solids: | n/a      |
| Project:          | Johnson 5-05 Produced Water Sample |                 |          |

## General Chemistry

| Analyte                                | Result  | RL    | Units    | DF  | Analyzed       | By | Method                |
|--|---------|-------|----------|-----|----------------|----|-----------------------|
| Alkalinity, Total as CaCO <sub>3</sub> | 1080    | 5.0   | mg/l     | 1   | 01/27/14       | KB | SM 2320B-2011         |
| Bromide                                | 34.9    | 1.0   | mg/l     | 20  | 01/23/14 13:54 | SK | EPA 300.0/SW846 9056  |
| Chloride                               | 5730    | 130   | mg/l     | 250 | 01/23/14 15:43 | SK | EPA 300.0/SW846 9056  |
| Nitrogen, Nitrate <sup>a</sup>         | < 0.20  | 0.20  | mg/l     | 20  | 01/23/14 13:54 | SK | EPA 300.0/SW846 9056  |
| Nitrogen, Nitrite <sup>a</sup>         | < 0.080 | 0.080 | mg/l     | 20  | 01/23/14 13:54 | SK | EPA 300.0/SW846 9056  |
| Phosphate, Ortho <sup>a</sup>          | < 13    | 13    | mg/l     | 250 | 01/23/14 15:43 | SK | EPA 300.0/SW846 9056  |
| Solids, Total Dissolved                | 10700   | 10    | mg/l     | 1   | 01/27/14       | BF | SM 2540C-2011         |
| Specific Conductivity                  | 15500   | 1.0   | umhos/cm | 1   | 01/24/14       | KB | SM 2510B-2011         |
| Sulfate                                | 10.9    | 10    | mg/l     | 20  | 01/23/14 13:54 | SK | EPA 300.0/SW846 9056  |
| pH <sup>b</sup>                        | 7.57    |       | su       | 1   | 01/27/14 12:00 | KB | SM4500HB+ -2011/9040C |

(a) Elevated detection limit due to matrix interference.

(b) Analysis performed past the required 15 minutes from collection time/holding time.

RL = Reporting Limit

## Report of Analysis

|  |   |
|--|---|
| <b>Client Sample ID:</b> JOHNSON 5-05 PW<br><b>Lab Sample ID:</b> D54551-1F<br><b>Matrix:</b> AQ - Water<br><b>Project:</b> Johnson 5-05 Produced Water Sample | <b>Date Sampled:</b> 01/22/14<br><b>Date Received:</b> 01/23/14<br><b>Percent Solids:</b> n/a |
|--|---|

**Total Metals Analysis**

| Analyte               | Result  | RL   | Units | DF | Prep     | Analyzed By | Method                 | Prep Method            |
|-----------------------|---------|------|-------|----|----------|-------------|------------------------|------------------------|
| Arsenic               | < 25    | 25   | ug/l  | 1  | 01/27/14 | 01/27/14 KV | EPA 200.7 <sup>1</sup> | EPA 200.7 <sup>4</sup> |
| Calcium               | 195000  | 400  | ug/l  | 1  | 01/27/14 | 01/27/14 KV | EPA 200.7 <sup>1</sup> | EPA 200.7 <sup>4</sup> |
| Iron                  | 87.0    | 10   | ug/l  | 1  | 01/27/14 | 01/27/14 KV | EPA 200.7 <sup>1</sup> | EPA 200.7 <sup>4</sup> |
| Magnesium             | 6760    | 200  | ug/l  | 1  | 01/27/14 | 01/27/14 KV | EPA 200.7 <sup>1</sup> | EPA 200.7 <sup>4</sup> |
| Manganese             | 269     | 5.0  | ug/l  | 1  | 01/27/14 | 01/27/14 KV | EPA 200.7 <sup>1</sup> | EPA 200.7 <sup>4</sup> |
| Potassium             | 39500   | 1000 | ug/l  | 1  | 01/27/14 | 01/27/14 KV | EPA 200.7 <sup>1</sup> | EPA 200.7 <sup>4</sup> |
| Selenium <sup>a</sup> | < 2.0   | 2.0  | ug/l  | 5  | 01/27/14 | 01/28/14 JB | EPA 200.8 <sup>2</sup> | EPA 200.8 <sup>3</sup> |
| Sodium                | 3350000 | 8000 | ug/l  | 20 | 01/27/14 | 01/28/14 KV | EPA 200.7 <sup>1</sup> | EPA 200.7 <sup>4</sup> |

- (1) Instrument QC Batch: MA4406
- (2) Instrument QC Batch: MA4408
- (3) Prep QC Batch: MP12193
- (4) Prep QC Batch: MP12194

(a) Elevated detection limit due to dilution required for possible matrix interference.

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RL = Reporting Limit

4.2  
4

## Misc. Forms

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### Custody Documents and Other Forms

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**Includes the following where applicable:**

- Chain of Custody

FED-EX Tracking # \_\_\_\_\_  
 Accutest Quote # \_\_\_\_\_  
 Bottle Order Control # **D54551**  
 Accutest Job # \_\_\_\_\_

| Client / Reporting Information                                  |                                | Project Information   |         |      |            | Requested Analytes (Use TEST CODE sheet)   |              |    |     |     |    |        |    |      |     |     |     | Matrix Codes  |     |    |     |    |      |       |     |       |     |              |
|---|--------------------------------|---|---------|------|------------|--|--------------|----|-----|-----|----|--------|----|------|-----|-----|-----|---|-----|----|-----|----|------|-------|-----|-------|-----|--------------|
| Company Name<br><b>Olsson Associates</b>                        |                                | Project Name<br><b>Johnson 5-05 Produced Water Sample</b>         |         |      |            | AB8270HSL<br>ALK<br>B8015DRD<br>DISSMETALS<br>SO4.DPO4.ND3D.NO2.CH.BE<br>TDS.PH.SCON<br>V8015GRD<br>VB260HSL |              |    |     |     |    |        |    |      |     |     |     | DW - Drinking Water<br>GW - Ground Water<br>WW - Water<br>SW - Surface Water<br>SO - Soil<br>SL - Sludge<br>SED - Sediment<br>LIQ - Other Liquid<br>AIR - Air<br>SOL - Other Solid<br>WP - Wipes<br>FB - Field Blank<br>EB - Equipment Blank<br>RB - Rinse Blank<br>TB - Trip Blank |     |    |     |    |      |       |     |       |     |              |
| Street Address<br><b>760 Horizon Drive Suite 102</b>            |                                | Street<br><b>Grand Junction CO 81506</b>                          |         |      |            |  |              |    |     |     |    |        |    |      |     |     |     |   |     |    |     |    |      |       |     |       |     |              |
| City<br><b>Grand Junction CO 81506</b>                          |                                | Billing Information (If different from Report to)<br>Company Name |         |      |            |  |              |    |     |     |    |        |    |      |     |     |     |   |     |    |     |    |      |       |     |       |     |              |
| Project Contact<br><b>Shant Hall shall@olssonassociates.com</b> |                                | Project#  |         |      |            |  |              |    |     |     |    |        |    |      |     |     |     |   |     |    |     |    |      |       |     |       |     |              |
| Phone #<br><b>970-243-7800</b>                                  |                                | Client PO#  |         |      |            |  |              |    |     |     |    |        |    |      |     |     |     |   |     |    |     |    |      |       |     |       |     |              |
| Samples Name(s)<br><b>Kelsie Betz 719561240</b>                 |                                | Project Manager   |         |      |            | Matrix Codes<br>Attention: PO#   |              |    |     |     |    |        |    |      |     |     |     |   |     |    |     |    |      |       |     |       |     |              |
| Accutest Sample #   | Field ID / Point of Collection | MECH/ID/Vial #  | Date    | Time | Sampled by | Matrix   | # of bottles | FU | NO3 | NO2 | NO | AMONIA | PH | COND | SO4 | PO4 | NO3 | NO2   | CHL | BE | TDS | PH | SCON | V8015 | GRD | VB260 | HSL | LAB USE ONLY |
| 1   | Johnson 5-05 PW                |   | 1/22/14 | 1210 | KB         | WW   | 14           | 2  |     |     |    |        |    |      |     |     |     |   |     |    |     |    |      |       |     |       |     | 01           |
| 2   | FB Trip Blank                  |   |         |      |            | FB   | 3            |    |     |     |    |        |    |      |     |     |     |   |     |    |     |    |      |       |     |       |     | 02TB         |

Turnaround Time (Business days)  
 Std. 10 Business Days  
 Std. 5 Business Days (By Contract only)  
 5 Day R/SH  
 3 Day EMERGENCY  
 2 Day EMERGENCY  
 1 Day EMERGENCY

Approved By (Accutest PM) / Date: \_\_\_\_\_  
 \_\_\_\_\_

Commercial "A" (Level 1)  
 Commercial "B" (Level 2)  
 Commercial "B" + Narrative  
 FULLT1 (Level 3+4)

State Forms  
 EDD Format  
 PDF

Commercial "A" = Results Only  
 Commercial "B" = Results + QC Summary

Comments / Special Instructions  
**Lab filter Diss Met**

Emergency & Rush TIA data available VIA Lablink

Sample Custody must be documented below each time samples change possession, including courier delivery.

|  |                                    |                          |                            |                          |                              |
|--|------------------------------------|--------------------------|----------------------------|--------------------------|------------------------------|
| Relinquished by:<br><b>1 Kelsie Betz</b> | Date Time:<br><b>1/22/14, 1700</b> | Received By:<br><b>1</b> | Date Time:<br><b>12:57</b> | Received By:<br><b>2</b> | Date Time:<br><b>1-23-14</b> |
| Relinquished by:                         | Date Time:                         | Received By:             | Date Time:                 | Received By:             | Date Time:                   |
| Relinquished by:                         | Date Time:                         | Received By:             | Date Time:                 | Received By:             | Date Time:                   |
| Relinquished by:                         | Date Time:                         | Received By:             | Date Time:                 | Received By:             | Date Time:                   |

Custody Seal # **H9/60**  
 Intact  
 Not Intact  
 Preserved where applicable   
 On Ice  Cooler Temp. **1.7**

**D54551: Chain of Custody**

**Page 1 of 2**

5.1  
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# Accutest Laboratories Sample Receipt Summary

Accutest Job Number: D54551

Client: OLSSON ASSOCIATES

Immediate Client Services Action Required: No

Date / Time Received: 1/23/2014 12:57:00 PM

No. Coolers: 1

Client Service Action Required at Login: No

Project: JOHNSON 5-05 PRODUCED WATER SAMPL

Airbill #'s: hd/co

| <u>Cooler Security</u>    | <u>Y</u>                            | <u>or</u> | <u>N</u>                 |                       | <u>Y</u>                            | <u>or</u> | <u>N</u>                 |
|---------------------------|-------------------------------------|-----------|--------------------------|-----------------------|-------------------------------------|-----------|--------------------------|
| 1. Custody Seals Present: | <input checked="" type="checkbox"/> |           | <input type="checkbox"/> | 3. COC Present:       | <input checked="" type="checkbox"/> |           | <input type="checkbox"/> |
| 2. Custody Seals Intact:  | <input checked="" type="checkbox"/> |           | <input type="checkbox"/> | 4. SmpI Dates/Time OK | <input checked="" type="checkbox"/> |           | <input type="checkbox"/> |

| <u>Cooler Temperature</u>    | <u>Y</u>                            | <u>or</u> | <u>N</u>                 |
|------------------------------|-------------------------------------|-----------|--------------------------|
| 1. Temp criteria achieved:   | <input checked="" type="checkbox"/> |           | <input type="checkbox"/> |
| 2. Cooler temp verification: |                                     |           | Infrared gun             |
| 3. Cooler media:             |                                     |           | Ice (bag)                |

| <u>Quality Control Preservation</u> | <u>Y</u>                            | <u>or</u> | <u>N</u>                 | <u>N/A</u>                          |
|-------------------------------------|-------------------------------------|-----------|--------------------------|-------------------------------------|
| 1. Trip Blank present / cooler:     | <input type="checkbox"/>            |           | <input type="checkbox"/> |                                     |
| 2. Trip Blank listed on COC:        | <input type="checkbox"/>            |           | <input type="checkbox"/> |                                     |
| 3. Samples preserved properly:      | <input checked="" type="checkbox"/> |           | <input type="checkbox"/> |                                     |
| 4. VOCs headspace free:             | <input type="checkbox"/>            |           | <input type="checkbox"/> | <input checked="" type="checkbox"/> |

| <u>Sample Integrity - Documentation</u> | <u>Y</u>                            | <u>or</u> | <u>N</u>                 |
|---|-------------------------------------|-----------|--------------------------|
| 1. Sample labels present on bottles:    | <input checked="" type="checkbox"/> |           | <input type="checkbox"/> |
| 2. Container labeling complete:         | <input checked="" type="checkbox"/> |           | <input type="checkbox"/> |
| 3. Sample container label / COC agree:  | <input checked="" type="checkbox"/> |           | <input type="checkbox"/> |

| <u>Sample Integrity - Condition</u> | <u>Y</u>                            | <u>or</u> | <u>N</u>                 |
|-------------------------------------|-------------------------------------|-----------|--------------------------|
| 1. Sample recvd within HT:          | <input checked="" type="checkbox"/> |           | <input type="checkbox"/> |
| 2. All containers accounted for:    | <input checked="" type="checkbox"/> |           | <input type="checkbox"/> |
| 3. Condition of sample:             |                                     |           | Intact                   |

| <u>Sample Integrity - Instructions</u>    | <u>Y</u>                            | <u>or</u> | <u>N</u>                            | <u>N/A</u>                          |
|---|-------------------------------------|-----------|-------------------------------------|-------------------------------------|
| 1. Analysis requested is clear:           | <input checked="" type="checkbox"/> |           | <input type="checkbox"/>            |                                     |
| 2. Bottles received for unspecified tests | <input type="checkbox"/>            |           | <input checked="" type="checkbox"/> |                                     |
| 3. Sufficient volume rec'd for analysis:  | <input checked="" type="checkbox"/> |           | <input type="checkbox"/>            |                                     |
| 4. Compositing instructions clear:        | <input type="checkbox"/>            |           | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 5. Filtering instructions clear:          | <input type="checkbox"/>            |           | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |

Comments

Accutest Laboratories  
V:(303) 425-6021

4036 Youngfield Street  
F: (303) 425-6854

Wheat Ridge, CO  
www.accutest.com

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