Appendix A

Well Construction Plans and Schematics
Terminal Island Facility
SFI # 1
Section 8 - T5S - R13W
Slurry Injector
Vertical Well

Lat: (NAD83) 33.74391 N
Long: (NAD83) -118.26486 W
KB (above sea level) 31
GL (above sea level) 10

20" 65#, H Conductor Pipe
@80' in 26" hole

3 1/2" 9.2# L-80 Ultra FJ Injection
tubing end @5149.71'

13 3/8" 61#, K-55 Surface Casing
@1499' in 17 1/2" hole
w/1227 sacks of cement
cement return to surface

Base of USDW sequence ~ 2200'

Two stage Cementing Tool
DV tool @2927'

Turn around sub/Fiber optics 5117'

Retrievable injection packer w/re-entry guide
@5140', set in 30K compression

8 5/8" 44#, L80 Injection Casing
@5545' in 12 1/4" hole
w/924 sacks of cement for top
w/1227 sacks of cement for bottom
both cement return to surface

TD 5550'
PBT 5326'
Float Collar @5455'

1st Perf:5186' - 5206'.433" dia 6sfi 1/9/08
2nd Perf: 5176' - 5196'.32" dia 6sfi 1/20/09
well bottomed @5211' per Schlumberger 1/20/09
Terminal Island Facility
SFI # 1
Section 8 - T5S - R13W
Slurry Injector

Well Data:
- Lat: (NAD83) 33.74391 N
- Long: (NAD83) -118.26486 W
- KB (above sea level) 31
- GL (above sea level) 10

**20" 65#, H Conductor Pipe**
- @80' in 26" hole

**3 1/2" 9.2# L-80 Ultra FJ Injection tubing end @5149.71'**
- Take out 2 3/8" tubing for tiltmeter
- Install stabbed in BHP/BHT sensor in annulus

**13 3/8" 61#, K-55 Surface Casing**
- @1499' in 17 1/2" hole
- w/1227 sacks of cement
cement return to surface

**Two stage Cementing Tool**
- DV tool @2927'
- Base of USDW sequence ~ 2200'

**Turn around sub/FIBO@5117'**

**Retrievable injection packer w/re-entry guide**
- @5140', set in 30K compression
- Re-entry guide @5150'

**8 5/8" 44#, L80 Injection Casing**
- @5545' in 12 1/4" hole
- w/924 sacks of cement for top
- w/1227 sacks of cement for bottom
- both cement return to surface

**BHP/BHT@~ 5074' to be stabbed into packer**
- Xn (2.81") nipple /2.7"xID
- TD 5550'
- PBTD 5326'
- Float Collar @5455'
- Vertical Well

**1st Perf:** 5186' - 5206' .433" dia 6spf 1/9/08
- 2nd Perf: 5176' - 5196' .32" dia 6spf 1/20/09
- well bottomed @5211' per Schlumberger 1/20/09
Section 8 - T5S - R13W

Monitoring Well

**Surface:**
- Lat: (NAD83) 33.7438942 N
- Long: (NAD83) -118.26491 W
- KB (above sea level) 31
- GL (above sea level) 10

**Bottom:**
- Lat: 33.7452833 N
- Long: -118.26413 W

**MD** | **TVD (from deviation survey)**
---|---
1500 | 1499.8
1939 | 1938.5
2607 | 2597.5
3147 | 3129.7
3625 | 3600.9
4005 | 3976
4482 | 4446.5
4767 | 4726.8
4927 | 4884
5118 | 5071.3
5300 | 5250.3

**Kick Off @1600ft, max build angle 10 degree @ 1degree/100ft**

**20” 65#, H Conductor Pipe**
- @80’ ft 26” hole

**2 3/8” 4.7# J-55 EUE tubing**
- end @ approx. 1000’

**10 3/4” 40.5#, J-55 Surface Casing**
- @1533’ in 14 3/4” hole
- w/920 sacks of cement
- cement return to surface

**Two stage Cementing Tool**
- DV tool @2922’

**BHP/BHT @ - 4720’**
- Perf:4730’ to 4750’.49” dia 6spf 11/23/09
- Perf:4755’ to 4775’.49” dia 6spf 11/23/09
- Perf:4982’ to 5002’.49” dia 6spf 11/23/09

**7” 29#, L80 Injection Casing**
- @5431’ in 9 7/8” hole
- w/575 sacks of cement for top TD 5431’
- w/700 sacks of cement for bottom PBDT 5334’
- cement return to surface Float Collar 5334’

**Base of USDW sequence ~ 2200’**

**BH Location:** 504.84’N & 238.66’E
Terminal Island Facility
SFI # 3

Section 8 - T5S - R13W

Slurry Injector

Deviated Well
Surface:
Lat: (NAD83) 33.7440075 N
Long: (NAD83) -118.2646628 W

Bottom:
Lat: (NAD83) 33.7440631 N
Long: (NAD83) -118.262808 W

KB (above sea level) 30ft
GL (above sea level) 10ft

20" 65#, H Conductor Pipe
@80' in 26" hole

13 3/8" 61#, K-55 BTC surface casing
at 1485ft in 17 1/2" hole

3.5" 9.3# J55 EUE tubing

Turnaround sub/FIBO @4816ft

Re-entry guide @4905ft

9 5/8" 47#, L80 Buttress Injection Casing
at 5423ft in 13" hole

TVD 5382ft
MD 5432ft
PBTD 5345ft

KOP 1600ft, build angle 1degree/100ft

Base of USDW sequence ~ 2200'

two stage cementing tool at 2896ft

BHP/BHT @4829ft stabbed into packer

mechanical packer @4895ft

double shoot perf @ 5086'-5106'
5spf 72deg, 42.6" penetration, X0.46" hole
Terminal Island Facility
SFI#4 (aka DOE#2)
Section 8 - T5S - R13W
Monitoring Well

Kick Off @3107ft

Surface:
Lat: (NAD83) 33.744032 N
Long: (NAD83) -118.26467 W

Bottom:
Lat: N
Long: W

KB (above sea level)
GL (above sea level)

16” 65#, H Conductor Pipe
in 22” hole, cmt to surface

10 3/4” 40.5#, K-55 Surface Casing
in 13 3/4” hole, cmt to surface

1500’

Two stage Cementing Tool
DV tool @****

2 3/8” tubing to strap microseismic tool

KOP 3107ft

Microseismic tool hang @ 4000’ to 5000’

7” 29#, L-80 Injection Casing
@7500’ in 7 7/8” hole, cmt to surface

MD 7643’
TVD 7500’

Base of USDW sequence ~ 2200’
Terminal Island Facility
SFI # 1
Section 8 - T5S - R13W
Vertical Well
Slurry Injector
Lat: (NAD83) 33.74391 N
Long: (NAD83) -118.26486 W

20" 65#, H Conductor Pipe
@80' in 26" hole

3 1/2" 9.2# L-80 Ultra FJ Injection tubing, end depth to be determined

13 3/8" 61#, K-55 Surface Casing
@1499' in 17 1/2" hole
w/1227 sacks of cement
cement return to surface

Two stage Cementing Tool
DV tool @2927'

Turn around sub/FIBO@5117'

old perforations will be isolated

8 5/8" 44#, L80 Injection Casing
@5545' in 12 1/4" hole
w/924 sacks of cement for top
w/1227 sacks of cement for bottom
both cement return to surface

Turn around sub/FIBO depth to be determined

Retrievable injection packer
w/re-entry guide
depth to be determined

8 5/8" casing @ 7500' in 8 5/8" hole,
w/approx 1250 sacks cmt
enough cmt to return to surface

BHP/BHT to be stabbed into packer,
depth to be determined

TVD 7500' Vertical Well
Terminal Island Facility  
SFI # 2  
Section 8 - T5S - R13W  
Monitoring Well

20" 65#, H Conductor Pipe  
@80' ft 26" hole

10 3/4" 40.5#, J-55 Surface Casing  
@1533' in 14 3/4" hole  
w/920 sacks of cement  
cement return to surface

Two stage Cementing Tool  
DV tool @2922'

7" 29#, L80 Injection Casing  
@5431' in 9 7/8" hole  
w/575 sacks of cement for top  
w/700 sacks of cement for bottom  
cement return to surface

Base of USDW sequence ~ 2200'

BHP/BHT to be hung @ inj interval  
Depth to be determined

New perforations to be determined

TVD 7500'  
Deviated Well
Terminal Island Facility

SFI # 3

Section 8 - T5S - R13W

Slurry Injector

Surface:
Lat: (NAD83) 33.7440075 N  To be determined
Long: (NAD83) -118.264663 W  To be determined

20" 65#, H Conductor Pipe  @80' in 26" hole

13 3/8"  61#, K-55 BTC surface casing  at 1485ft in 17 1/2" hole

3.5" 9.3# J55 EUE tubing  end depth to be determined

turnaround sub/FIBO @4816ft

9 5/8"  47#, L80 Buttress Injection Casing  at 5423ft in 13" hole

Base of USDW sequence ~ 2200'

two stage cementing tool at 2896ft

old perforations will be isolated

new perforations to be determined

BHP/BHT to be stabbed into packer, depth to be determined

7" casing @7500' in 9 5/8" hole w/approx. 1350 sacks of cmt, enough cmt to return to surface

Retrievable injection packer w/re-entry guide  depth to be determined

TVD 7500'  Deviated Well

Turn around sub/FIBO  depth to be determined
Appendix B

Sample- Weekly Progress Summary Report
May 27, 2013 Operations Summary for TIRE Project

The past week May 20 through May 26, GeoEnvironment Technologies (GET) injected at varying rates from 124,338 to 245,930gpd total volumes. We present in Table 1 a summary of the injection operations for the month of May to-date. In Figure 1, the weekly plot of wellhead pressure (WHP), calculated bottom-hole pressure (BHPcalc), casing pressure (Pcas) and injection rate data for the past week is shown. Also, Figure 2 provides a comparison of the bottom-hole pressure at SFI#3 in relation to the SFI#1 well-head pressure - please note the bottom-hole pressure gage in SFI#2 is tentatively scheduled for re-deployment in late May or early June depending on the manufacturers repair turnaround.

The key events for this period are:

1. Geologic formation injectivity and bottom-hole pressure response remain consistent.
2. Last week, the TIRE Site’s average daily digested sludge received (from TIWRP) was 181,979gallons per day – excluding flows received on Friday due to the SRT.
3. Wet cake loads from HTP were scheduled Monday through Thursday – 4 loads per day; no loads are scheduled for Friday. All scheduled loads were delivered and taken. Last week’s average daily HTP biosolids injected was 100tons per day over the 4 days loads were delivered, excluding Friday due to the SRT.
4. Last week the injection equipment operated without interruption.
5. On Thursday, a contractor was on site to install a temporary BHP/BHT sensor in SFI#1 in anticipation of Friday’s SRT.
6. On Friday, the monthly Step-Rate Test was performed.

TIRE Site objectives for the near future are:

- Continue injection of TITP digested sludge daily Monday thru Friday – GET anticipates taking TIWRP digested sludge in the range of 175,000 to 195,000 gallons per day Monday thru Thursday and 130,000 to 150,000 gallons on Friday.
- Continue HTP wet cake deliveries – GET plans on taking 4 truckloads per day Monday thru Thursday.
- A City maintenance training session will be held this Friday, 5/31, for training on injection pump repair/maintenance.
### Table 1 - Injection Summary for May 2013

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**Injection Summary Legend:**

- Total Vol Pumped (gallons) = Total number of pump strokes * stroke volume
- Total Vol Pumped (lbsis) = Total Vol pumped (gallons) / 42
- Daily Total HPE (gallons) = Number of pump strokes when HPE is running * stroke volume
- Daily Total Brine (gallons) = weekly CLA data
- Daily digested Sludge (gallons) = weekly CLA data
- Sludge ton equivalent (USTons) = daily digested sludge (gallons) * 26.8 (USTons) / 100000 (gallons)
- WetCake delivered (USTons) = sum of wetcake loads delivered
- Daily Total Slurry* (gallons) = Number of pump strokes when Slurry is injected * stroke volume (includes daily digested sludge, brine flush and wet cake material)
- Weight % Wetcake of Total Slurry (%) = wetcake (USTons) * 2000 (lb/USTon) / (8.3 (lb/gallon) * Slurry (gallons))
- Calculated Volume % Dry Solids of Total Slurry (%) = [28% * wetcake (USTons) * 2000 (lb/USTon) / 8.3 (lb/gallon) + 2% * Digested Sludge (gallons)] / Total Slurry (gallons)
- Measured Volume % Dry Solids of TIRE Slurry (%) = weekly CLA data – lab results from mix tank sampling
Figure 1 – WHP, BHPest, and Casing Pressure Data for Week of May 19 thru May 26, 2013
Figure 2 – SFI#2 and SFI#3 Bottom-Hole Pressure Data for Week of May 19 thru May 26, 2013
Appendix C

Injection Operations Data (July 2008 through December 2012)
In November 2006, the City of Los Angeles received an U.S. EPA Underground Injection Control (UIC) demonstration permit for the Terminal Island Renewable Energy Project. The demonstration project the first of its kind in the United States places biosolids into depleted subsurface geological formations where the earth’s high temperature would biodegrade the organic compounds to generate methane gas that can ultimately be used to produce an environmentally safe renewable energy. The demonstration project site consists of one injection well SFI#1, one monitoring well (SFI#2), and (2) 500 hP pumps that were placed in operation July 2008. During the start-up phase brine and high pressure effluent was tested and injected into the deep subsurface. The first injection of bio-slurry material occurred in September 2008.

In June 2010, the construction of well SFI#3 was completed and the project changed to current operations: 1 injection well, 2 monitoring wells and 2 pumps injecting an average of 150 tons per day of bio-slurry material. Standard operating inject is approximately 12 hours per day, 5 days a week with 2 days of shut-in over the weekend. As of December 2012 the project has injected more than 220 million gallons of slurry diverting more than 97,000 tons of biosolids from land application, eliminating approximately 540,000 miles of heavy truck traffic, and consequently, a reduction of 12 tons of Nitrogen Oxide (NO\textsubscript{X}) and 11.2 tons of Carbon Monoxide (CO). The project has also sequestered more than 15,000 metric tons of Carbon Dioxide (CO\textsubscript{2}) thus reducing greenhouse emissions. Gas samples taken periodically have shown an increase in methane production, but not sufficient amount available to extract for use a renewable energy. The tables below summarize the injection operations from July 2008 to December 2012.

### 2008 Injection Data

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<thead>
<tr>
<th>Date</th>
<th>Daily Injection Duration (hrs:min)</th>
<th>Max Pump WHP (psi)</th>
<th>Avg. Flowrate (gpm)</th>
<th>Total Vol Pumped (gallons)</th>
<th>HPE (gallons)</th>
<th>Brine (gallons)</th>
<th>Digested Sludge (USTons)</th>
<th>Biosolids (USTons)</th>
<th>Total Bio-Slurry (gallons)</th>
<th>Volume of Bio-Slurry (%)</th>
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<td>1,450</td>
<td>1,646</td>
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N/R = Not Reported  
Brine - water that has a quantity of salt, especially sodium chloride, dissolved in it and is the discharge from the advanced water treatment system  
HPE - High Pressure Effluent, is tertiary treated effluent used for in-house treatment plant usage such as tank wash outs, cooling water, etc.  
Digested Sludge - anaerobically digested solids that have gone through treatment process  
Biosolids - nutrient-rich organic materials resulting from the treatment and processing of wastewater residuals. When treated and processed, these residuals can be recycled and applied as fertilizer to improve and maintain productive soils and stimulate plant growth.  
Thickened Waste Activated Sludge - thickened solids recovered from secondary activated sludge system of a wastewater treatment process  
Bio-slurry - mixture of wastewater treatment fluids and residuals including brine, high pressure effluent, digested sludge, thickened waste active sludge, and biosolids
### 2009 Injection Data

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**N/R** = Not Reported

**Brine** - water that has a quantity of salt, especially sodium chloride, dissolved in it and is the discharge from the advanced water treatment system

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**2010 Injection Data**

<table>
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<th>Date</th>
<th>Daily Injection Duration (hrs:min)</th>
<th>Max Pump WHP (psi)</th>
<th>Avg. Flowrate (gpm)</th>
<th>Total Vol Pumped (gallons)</th>
<th>HPE (gallons)</th>
<th>Brine (gallons)</th>
<th>Digested Sludge (USTons)</th>
<th>Biosolids (USTons)</th>
<th>Total Bio-Slurry (gallons)</th>
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| 2010 Totals | 60,079,162 | 4,074,116 | 800,192 | 11,270 | 21,388 | 55,908,041 |

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## 2011 Injection Data

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**2011 Totals**

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N/R = Not Reported

**Brine** - water that has a quantity of salt, especially sodium chloride, dissolved in it and is the discharge from the advanced water treatment system

**HPE** - High Pressure Effluent, is tertiary treated effluent used for in-house treatment plant usage such as tank wash outs, cooling water, etc.

**Digested Sludge** - anaerobically digested solids that have gone through treatment process

**Biosolids** - nutrient-rich organic materials resulting from the treatment and processing of wastewater residuals. When treated and processed, these residuals can be recycled and applied as fertilizer to improve and maintain productive soils and stimulate plant growth.

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**Bio-slurry** - mixture of wastewater treatment fluids and residuals including brine, high pressure effluent, digested sludge, thickened waste active sludge, and biosolids
## 2012 Injection Data

<table>
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<th>Date</th>
<th>Daily Injection Duration (hrs:min)</th>
<th>Max Pump WHP (psi)</th>
<th>Avg. Flowrate (gpm)</th>
<th>Total Vol Pumped (gallons)</th>
<th>HPE (gallons)</th>
<th>Brine (gallons)</th>
<th>Digested Sludge (USTons)</th>
<th>Biosolids (USTons)</th>
<th>Total Bio-Slurry (gallons)</th>
<th>Volume of Bio-Slurry (%)</th>
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Appendix D

Operation Scenarios for Field Experiment
OPERATIONAL SCENARIOS FOR FIELD EXPERIMENT

EPA will grant authorization to alternately inject into Wells SFI-1 and SFI-3 after the requirements of Part II, Section C.6. of this permit have been met and Well SFI-4 has been drilled and constructed.

This permit allows for converting SFI-3 from a monitoring well to an injection well following drilling, construction and evaluation of SFI-4.

This permit allows for injecting in both Wells SFI-1 and SFI-3, but solely on an alternating basis, i.e. one well injecting and one well monitoring at any given time. Injection into SFI-3 will be authorized when specific operational scenarios and triggers are met.

Scenario A: Inject into SFI-3
1. SFI-4 has been drilled and approved for monitoring operations. Conduct a Step Rate Test (SRT) in Well SFI-3 to determine if approved permitted injection zone contains suitable injectivity characteristics.
2. If the SRT performed on SFI-3 yields good results (good injectivity characteristics at approved permitted zone), commence injections operations in well SFI-3 and cease injection operations in SFI-1.
   a. If item 2 above occurs the relaxation period for SFI-1 will commence for a period of approximately six months.
   b. If item 2 above does not occur based on the SRT results indicating unfavorable injectivity characteristics at the approved permitted injection zone, recomplete SFI-3 into suitable higher sand. Conduct a SRT after recompletion of SFI-3 to determine if the new higher sand is suitable for injection.
3. SFI-1 pressure will be monitored for 6 months during this time the bottom-hole fall-off pressure will be charted to ensure the Bottom-Hole Pressure (BHP) falls to less than 3200psi. (See attached daily fall-off well head pressure plot for SFI-1)
4. Install a BHP/BHT sensor similar in SFI-1 similar to configuration in SFI-3.

Scenario B. Alternating well injection: SFI-1 and SFI-3
1. Begin alternating well injection into SFI-1 and SFI-3 based on the following:
   a. SFI-4 has been drilled and approved for monitoring operations. Evaluate data from drilling SFI-4 to determine suitable injection zone location (higher or lower)
   b. SFI-1 relaxation criteria has been achieved and BHP/BHT sensor has been installed
APPENDIX E    REPORTING FORMS

Forms can also be obtained on the web at
http://water.epa.gov/type/groundwater/uic/reportingforms.cfm

The forms that need to be obtained are:
   7520-6
   7520-7
   7520-8
   7520-9
   7520-11
   7520-12
   7520-14
   7520-16
Appendix F

Plugging and Abandonment Plan
WELL PLUGGING AND ABANDONMENT SCHEMATIC

Steel plate with well name & date of abandonment

Cement plug 0-50'

20" 65#, H Conductor Pipe in 26" hole cemented to surface

Cement plug 2300-2400'
BFW 2200'

13 3/8" 61#, K-55 Surface Casing in 17 1/2" hole cemented to surface

Two stage Cementing Tool

Cement plug extend 100’ above highest perforation and 200’ below lowest perforation

Perforation Interval about 100ft

7" 29#, L80 Injection Casing

All cement plugs shall meet EPA and DOGGR P&A standards, cement plugs shall have max liquid permeability of 0.1md and attain compressive strength of >=1000lb psi within 24 hours. All cement test data will be submitted to EPA and DOGGR and conducted according to DOGGR guidelines. Space between cement plugs will be filled with drilling mud with corrosion inhibitor added, consistent with DOGGR requirements and field practices.