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Sent by Electronic Mail

January 29, 2019

Laura Malone, Director
Waste Programs Division
DEPARTMENT OF ENVIRONMENTAL QUALITY
1110 W. Washington Street
Phoenix, AZ 85007

Re: **Planned Roosevelt Irrigation District Replacement Well**
RID Well 114, Registration Number 55-607197
West Van Buren Area WQARF Registry Site

Dear Ms. Malone,

Synergy Environmental previously copied the Arizona Department of Environmental Quality (ADEQ) on a letter submitted to the Arizona Department of Water Resources (ADWR) on December 13, 2018 regarding Roosevelt Irrigation District's (RID's) plans to drill a replacement well for RID well 114 (ADWR registration number 55-607197), located on the southwest corner of 23rd Avenue and Van Buren Street in Phoenix, Arizona. The replacement well is required due to collapsed well casing in the existing well that occurred in 2017. We are providing this follow up letter to ADEQ to offer further detail regarding the planned replacement well since the subject well is a component of the ADEQ-approved RID groundwater remedial action implemented in the West Van Buren Area Water Quality Assurance Revolving Fund (WQARF) Site (the "WVBA Site").

BACKGROUND:

Well RID-114 is the easternmost of all RID wells that are impacted by volatile organic compounds (VOCs) within the Central Phoenix regional VOC groundwater contamination plume encompassing the WVBA Site. The existing RID-114 well was installed to a depth of 395 feet below ground surface (bgs) and completed as a 20-inch diameter, 10-gauge steel cased production well, following deepening of the original shallow well at this location in 1953. The existing RID-114 well is perforated across a screened interval from 205 to 380 feet bgs and has historically operated at a rate of around 2,500 gallons per minute (gpm) to meet RID water supply demands.

RID-114 has been and still remains one of the more highly contaminated RID wells within the WVBA Site. It is for this reason that RID-114 was considered an important well to address as RID entered into an Agreement to Conduct Work with ADEQ in October 2009 to develop and

implement groundwater response actions at the WVBA Site. RID-114 was designated for treatment as part of RID's proposed Early Response Action (ERA) Work Plan that was approved by ADEQ in June 2010 and later modified in a subsequent work plan authorized by ADEQ in February 2013. With ADEQ concurrence, RID installed liquid-phase granular activated carbon (GAC) treatment on RID-114 and initiated treatment at this well in March 2012. RID also prepared a Feasibility Study that evaluated remedial alternatives for a regional groundwater remedial action at the WVBA WQARF Site and included groundwater extraction and treatment at RID-114 as an essential remedial measure in every remedial alternative analyzed. ADEQ approved RID's Final Draft Feasibility Study Report, which included the proposed remedial action, in April 2015.[1] Also, as agreed to with ADEQ and to the extent that funds have been available, RID has operated the RID-114 GAC treatment system until the well was taken out of service in late 2017 due to operating problems that were subsequently found to relate to collapsed well casing.

GROUNDWATER CONTAMINATION IN RID-114 VICINITY:

RID-114 is located in the central core of the regional groundwater contaminant plume that encompasses the federal Motorola 52nd Street Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Site (the "M52 Site") to the east and the state WVBA Site. ADEQ previously and again more recently has documented that trichloroethene (TCE) releases at the former Motorola facility at 52nd Street and McDowell Road have migrated to the WVBA Site with the prevailing westerly flow of groundwater from the M52 Site.[2] Groundwater contamination from the M52 Site reportedly occurs within a subunit of the Upper Alluvial Unit (UAU) designated as the Salt River Gravels (SRGs), with higher TCE concentrations primarily found in the lower interval of SRGs at a depth of about 150 to 220 feet bgs at the western boundary of the M52 Site.[3]

As shown in **Figure 1**, RID-114 is located 1.5 miles west of the current boundary (generally 7th Avenue) between the M52 and WVBA sites, and throughout this area TCE is the primary contaminant of concern. Monitoring data indicate that TCE concentrations of over 100 micrograms per liter (µg/L) have impacted RID-114 in the past, while concentrations of tetrachloroethene (PCE) and other VOCs are generally below United States Environmental Protection Agency (EPA) Maximum Contaminant Levels (MCLs). Presently, TCE concentrations at RID-114 have declined to around 40 µg/L. This decline may be associated with onset of

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[1] As you are aware, RID reports, response to comments, and ADEQ approval letters associated with the ERA and Feasibility Study are included in the public record for the WVBA Site on the ADEQ web site.

[2] ADEQ, Remedial Investigation Report West Van Buren Area WQARF Registry Site, Phoenix, Arizona, August 2012, 4-7; Letter from M. Cabrera, ADEQ Director, to A. Strauss, Acting Regional Administrator, and E. Manzanilla, Superfund Director, of EPA Region 9, re: *Expansion of the Motorola 52nd Street Superfund Site Boundary*, April 24, 2018.

[3] *See* Section 5.4, Final OU3 Remedial Investigation Report, Motorola 52nd Street Superfund Site, Operable Unit 3, Phoenix, Arizona, prepared by ERM, October 2016.

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operations at the Operable Unit 2 groundwater treatment facility located at 20th and Washington Streets and/or changing groundwater flow conditions.

Water quality data shown in **Figure 1** indicate the core of the TCE plume within the WVBA Site appears to coincide with the following UAU2 monitoring wells[4] (with perforated interval noted in parentheses) that extend approximately 2.5 miles from 19th Avenue and Van Buren Street to the general vicinity of RID well 92 located at 43rd Avenue and Sherman Street:

TCE Concentrations (µg/L) in UAU2 Monitor Wells[5] Core Plume in East Central Region of WVBA Site			
AVB120-02 (240-250 feet bgs)	**AVB134-02** (224-244 feet bgs)	**AVB132-01** (195-225 feet bgs)	**AVB124-01** (200-233 feet bgs)
99.3	**147**	**189**	**112**
WEST <----------> **EAST**			
40th Avenue	31st Avenue	25th Avenue	19th Avenue

Several of these same well sites have multiple completions that help differentiate the vertical extent of observed TCE concentrations. For example, nested monitor wells in the core plume generally indicate that TCE concentrations decline substantially below a depth of 250 to 260 feet bgs, as shown in the following table, yet often are still in exceedance of applicable aquifer water quality standards:

TCE Concentrations (µg/L) in UAU Nested Monitor Wells								
Well ID	Screened Interval (feet bgs)	[TCE]	Well ID	Screened Interval (feet bgs)	[TCE]	Well ID	Screened Interval (feet bgs)	[TCE]
AVB120-01	70-150	**67.4**	AVB132-01	195-225	**252**	AVB124-01	200-230	**184**
AVB120-02	230-250	**99.3**	AVB132-02	272-292	**7.2**	AVB124-02	262-283	**<0.5**
AVB120-03	310-330	**18.7**	**3Q2013 Monitoring Event**			**3Q2013 Monitoring Event**		
1Q2015 Monitoring Event								

Well investigation work conducted at RID wells in the vicinity of RID-114 also provides useful information to characterize groundwater conditions and the contaminant distribution in the UAU. For example, spinner flow meter logging and depth discrete sampling conducted by RID confirms the bulk of fluid flow and the highest TCE contamination occurs in the upper UAU

[4] Note, different parties have installed monitor wells in the WVBA Site over different times, and their designation as either UAU1 or UAU2 hydrostratigraphic units appears to be somewhat arbitrary. For the purpose of this evaluation, the UAU1 and UAU2 monitored interval in the WVBA Site is thought to correlate to the Salt River Gravels subunit in the M52 Site, the thickness of which increases toward the west.

[5] Data compiled from ADEQ water quality monitoring conducted in the WVBA Site in 2013 to 2015 timeframe. More recent data to define current TCE concentrations in WVBA Site monitoring wells are not available.

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interval.[6] In fact, the well testing indicates an estimated 70 percent or more of the yield to RID wells in this area is from the UAU interval above a depth of 250 to 260 feet bgs.

RID-114 REPLACEMENT WELL DESIGN:

As requested by the RID Board of Directors, Synergy Environmental evaluated alternatives to replace the recent loss of use of RID-114, which included options in which the replacement well could optimize groundwater remediation in accordance with the ADEQ-approved RID remedial actions. RID has approved Synergy's recommendation to drill a replacement well (following abandonment of the existing well completion) that is specifically designed and intended to enhance its use for groundwater remediation purposes.

Consistent with the analysis of groundwater contaminant impacts discussed in the previous section, the RID-114 replacement well will be completed with perforated casing from a depth of 160 to 260 feet bgs. This completion interval will focus groundwater extraction from the most contaminated portion of the UAU aquifer in the core of the TCE plume. To comply with WQARF requirements,[7] the replacement well will be constructed with 24-inch diameter well casing to increase the available open area for groundwater production across the intentionally limited perforated interval. The well perforations will be louvered to help control potential sand production from the highly transmissive UAU completion interval, as was encountered in the installation of the RID-111 replacement well. Although the replacement well installation is intended to enhance groundwater remediation, this well also serves as a critical source of RID water supply. Therefore, as shown in the accompanying well construction diagram in **Figure 2**, the RID-114 replacement well will be drilled to the nominal depth of the existing well with blank casing below the perforated interval.[8] In the event the replacement well does not yield 2,500 gpm of water supply, the lower blank casing will be perforated in place using a down-hole perforating tool to meet RID water supply requirements, as required in ARS 49-282.06.B.4.b.

Although it is not possible to quantify the expected groundwater yield of this proposed well completion, Synergy believes production of as much as 2,500 gpm is possible. Large magnitude groundwater extraction at the RID-114 replacement well from the most contaminated

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[6] *See* letter report submitted to ADEQ re: *Roosevelt Irrigation District Well Investigations, West Van Buren Area WQARF Registry Site*, prepared by Synergy Environmental, March 5, 2014. The well investigations were conducted at RID-92, RID-95, and RID-111R.

[7] The WQARF Program requires that remedial measures implemented at wells that are affected by the release of hazardous substances shall not adversely impact the quantity and reliability of water supplies available to well owners and water providers [AAC R18-16-407(G)].

[8] The RID-114 replacement well will be drilled to 400 feet bgs, which based on an analysis that was presented to ADWR during the permitting of the RID-111 replacement well in January 2011, is entirely within the UAU. In this analysis, RID provided evidence to indicate the inferred depth of the UAU contact with the underlying Middle Alluvial Unit at the RID-111 well site was 425 feet bgs. RID-111 is located approximately two miles west of RID-114.

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UAU interval will significantly optimize hydraulic capture and TCE mass removal within the core of the TCE plume, including contaminated groundwater entering the WVBA Site from the upgradient Motorola 52nd Street Superfund Site.

RID has contracted with Hoover Drilling Company LLC (ADWR License Number 871; Registrar of Contractors License Number 315429) to abandon the existing well and install the RID-114 replacement well. Abandonment of the existing well was completed on January 21st and the surface conductor casing and sanitary seal for the new well installed on January 25th. Drilling of the replacement well will commence following driller mobilization this week. The replacement well will be drilled by cable tool rig to allow for staging of the work at the existing well site and avoid management of drilling fluids as potentially contaminated media that would otherwise occur with mud rotary drilling methods. Over the past two weeks RID has also changed-out spent GAC at three of the 20,000-pound treatment vessels at the RID-114 site to be prepared for future well operation.

Should you have any questions or comments regarding the planned RID replacement well, please contact the undersigned at 602-319-2977.

Sincerely,
Synergy Environmental LLC

Dennis H. Shirley, P.G.

Attachments:

Figure 1 – Groundwater Contamination in Vicinity of RID Well 114

Figure 2 –Well Schematic RID-114R Replacement Well

Cc: Misael Cabrera, ADEQ
Tina Le Page, ADEQ
Donovan Neese, RID
David Kimball, Gallagher & Kennedy

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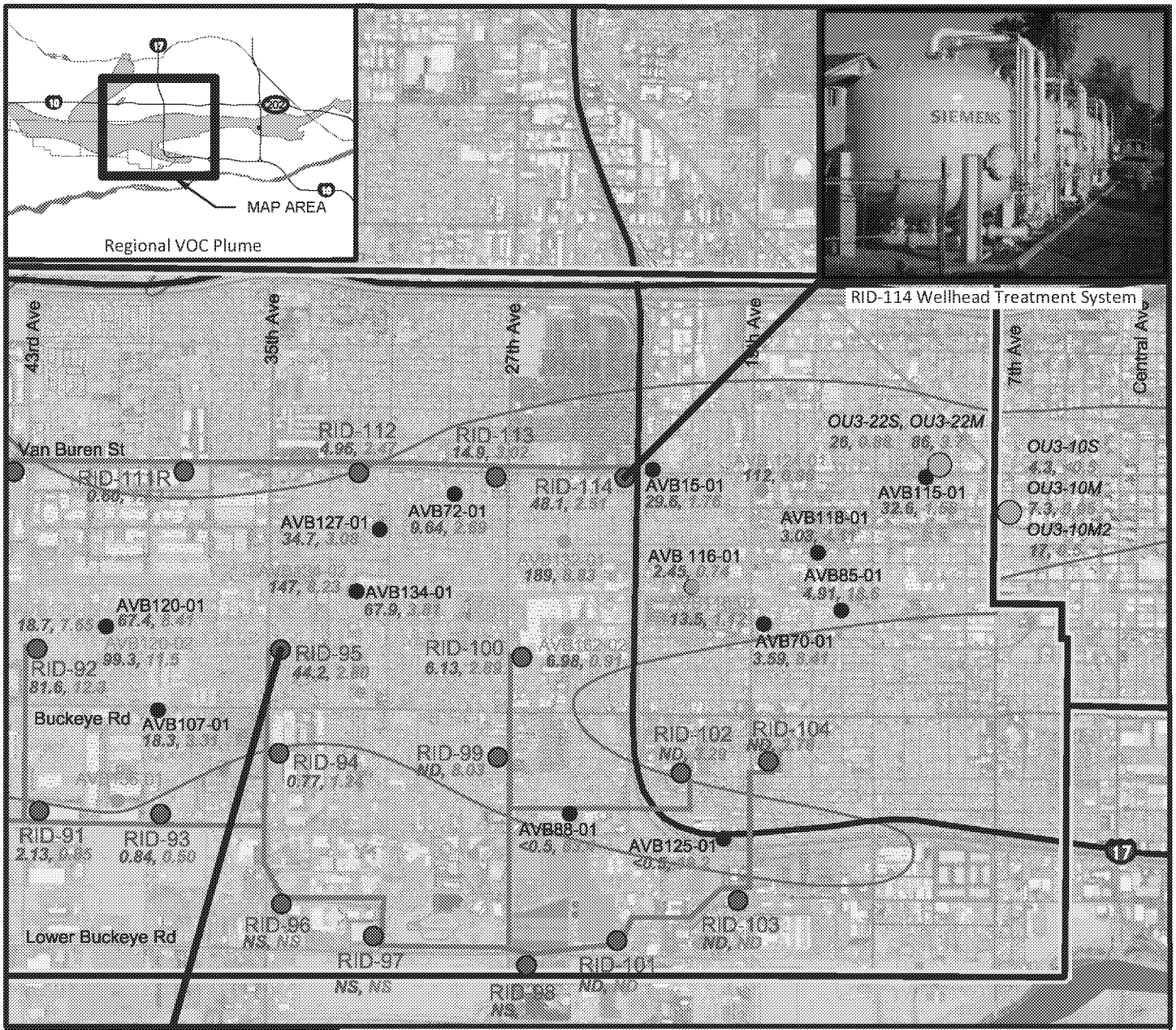
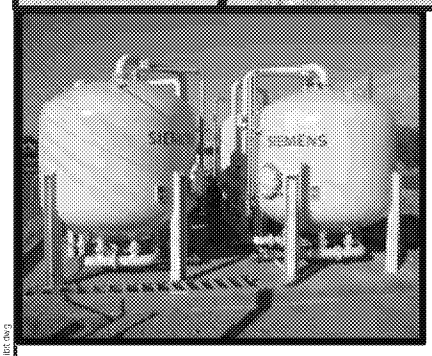
FIGURES





RID-95 Wellhead Treatment System

EXPLANATION

- RID-89 (NS, NS): Roosevelt Irrigation District Well Identifier
- Concentration of PCE, in µg/L
- Concentration of TCE, in µg/L
- AVB10-01: WVBA WQARF Site Monitor Well and Identifier Monitor Well and Identifier (Black=UAU1; Orange=UAU2; Green=MAU)
- Operable Unit 3 Monitor Wells
- Site Boundary
- Estimated Extent of PCE and/or TCE Contamination greater than 5µg/L in Central Phoenix Groundwater Contaminant Plume
- Existing Canal or Pipeline
- Interstates
- Local Streets

NOTE: Unless otherwise noted, water quality data for WVBA WQARF Site monitor wells and RID wells are from March/April 2015 and data for Operable Unit 3 monitor wells are from September 2016.

0 0.5 1.0

APPROX. SCALE IN MILES

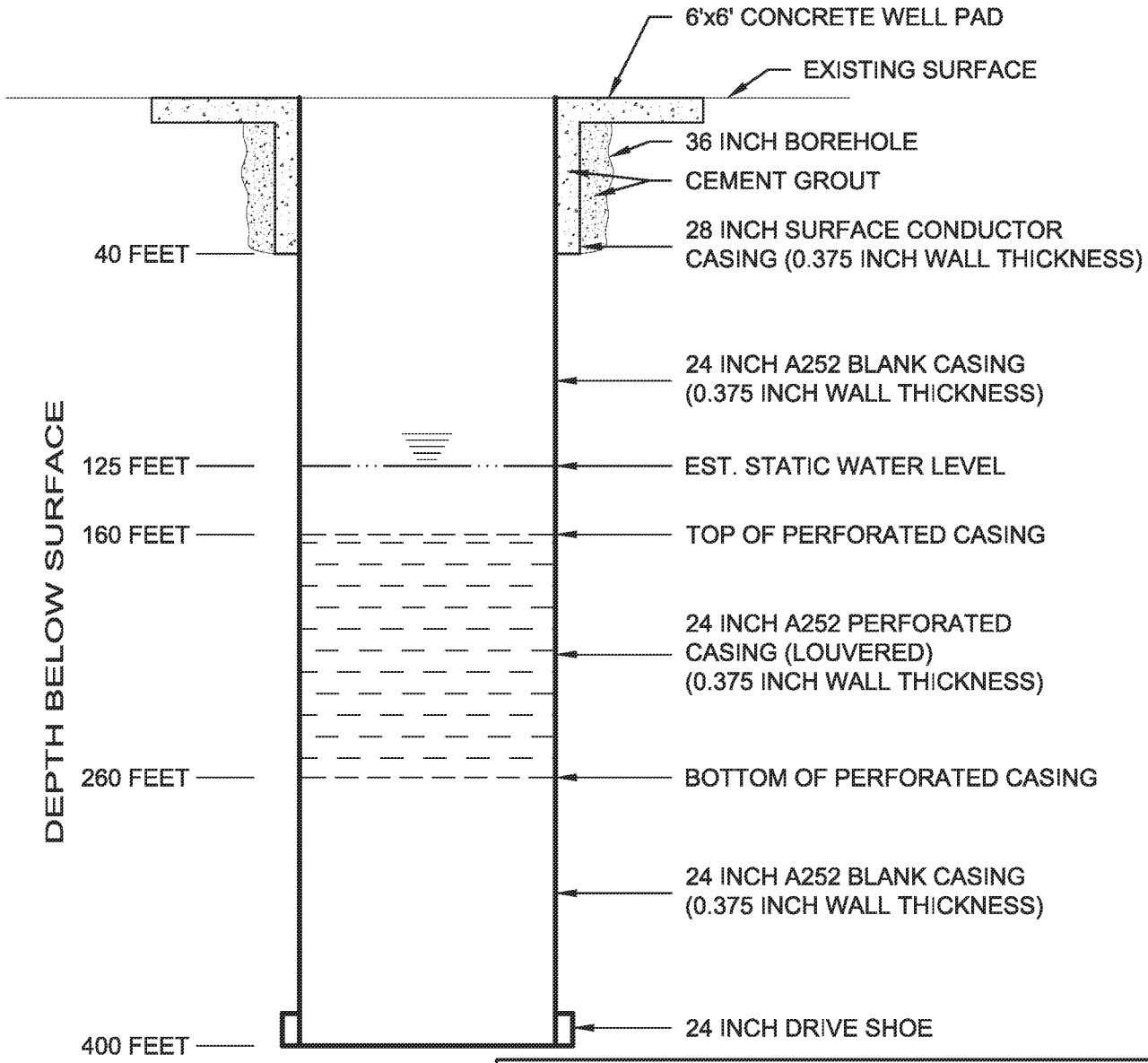
Groundwater Contamination in Vicinity of RID Well 114
Eastern Region of West Van Buren Area WQARF Site

Roosevelt Irrigation District
West Van Buren Area
WQARF Site

By: ld	Date: 05/21/18	Project No. 805.01
SYNERGY ENVIRONMENTAL, LLC		Figure 1

Plot Date: 05/21/18 - 2:00pm, Plotted by: Luke
Drawing Path: G:\Graphics\Figures\805.01\, Drawing name: Zoom Figure Exhibit.dwg

ROOSEVELT IRRIGATION DISTRICT
RID WELL 114 REPLACEMENT WELL
ADWR REGISTRATION NO. 55-607197
CADASTRAL LOCATION: A(1-2)baa
DRILLER: HOOVER DRILLING COMPANY, LLC
ROC# 315429, ADWR 871



Well Schematic
RID-114R Replacement Well

Roosevelt Irrigation District
West Van Buren Area
WQARF Site

By: ld	Date: 12/12/18	Project No. 805.01
SYNERGY ENVIRONMENTAL, LLC		Figure 2

Not to Scale

Plot Date: 12/12/18-1:23pm, Plotted by:Luke, Drawing Path: N:\Swap\AcPublish_11080\Drawing Name:114R Replacement Well exhibit.dwg