TECHNICAL SUPPORT DOCUMENT

TECHNICAL INFORMATION PRESENTED IN REVIEW OF AN APPLICATION FOR AN AUTHORITY TO CONSTRUCT PERMIT

APPLICATION SUBMITTED BY

CH2M Hill, Inc.
on behalf of:

Republic Dumpco, Inc.
770 East Sahara Avenue
Las Vegas, Nevada 89104

For

Apex Waste Management Center
13550 US Highway 93 North
Apex, Nevada 89124

Part 70 Operating Permit Number: 395
(ATC)

SIC Code – 1442: Construction Sand and Gravel
SIC Code - 4953: Refuse Systems

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Clark County
Department of Air Quality and Environmental Management
Permitting Section

11/15/2011

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Source Information

Preparer:	Beth Davis-Schaedler
Date:	May 27, 2011
Company:	Republic Dumpco, Inc.
Submitter:	CH2M Hill, Inc.: Catherine MacDougall
Source:	395
Action Requested:	February 1, 2011
Hydrographic Area:	216 & 217
Subject:	Apex Waste Management Center 13550 US Highway 93 North Apex, Nevada 89124 T18S, R64E, S10 &18 and T18S, R63E, S24

Source Description

Republic Dumpco, Inc. (Republic) is a municipal solid waste landfill and a producer of construction sand and gravel. The source operates under Standard Industrial Classification (SIC) Code 4953: Refuse Systems and SIC 1442: Construction Sand and Gravel and North American Industrial Classification System (NAICS) Code 562212: Solid Waste Landfill and NAICS 212321: Construction Sand and Gravel Mining. The source meets or exceeds the major source thresholds for PM_{10}, NO_x, CO, SO_x, HAP, and TCS (H_2S) and is a minor source for $PM_{2.5}$ and VOC in the Apex hydrographic basin.

Permitting Action

Republic Dumpco, Inc. applied for an AQR Section 12.4 Authority to Construct. The source has requested the installation of a John Zink 5,000 standard cubic feet per minute (scfm) enclosed combustion flare (flare) at the Municipal Solid Waste Landfill. The new flare will burn-off landfill gases and will be in compliance with 40 CFR 60 Subpart WWW. Republic will control the emission of SO_2 from the flare by having the landfill gas (LFG) go through a Paques THIOPAQ desulfurization system to remove H_2S from the LFG prior to the LFG going to the flare, which will reduce the SO_2 emissions from the flare stack. The 5,000 scfm flare will replace emission units G07, a 1,000 scfm Callidus enclosed LFG Flare, and G26, a 1,400 scfm John Zink LFG flare.

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Acronyms

Table 1: Acronyms

Acronym	Term
AQR	Clark County Air Quality Regulations
ATC	Authority to Construct
Btu	British Thermal Unit
°C	Degrees Celsius
CAAA	Clean Air Act, as amended
CFR	United States Code of Federal Regulations
CO	Carbon Monoxide
DAQEM	Clark County Department of Air Quality & Environmental Management
EPA	United States Environmental Protection Agency
EU	Emission Unit
°F	Degrees Fahrenheit
ft^3/yr	Cubic foot per year
GCCS	Gas Collection and Control System
HAP	Hazardous Air Pollutant
HP	Horse Power
H_2S	Hydrogen Sulfide
kW	kilowatt
LANDGem	Landfill Gas Emissions Model
LFG	Landfill Gas
m^3/yr	Cubic meter per year
Mg/yr	Megagram per year
MMBtu	Millions of British Thermal Units
MMscf	Million Standard Cubic Foot
M/N	Model Number
MSWL	Municipal Solid Waste Landfill
N/A	Not Applicable
NAICS	North American Industry Classification System
NMOC	Non-Methane Organic Compounds
NO_x	Nitrogen Oxides
NRS	Nevada Revised Statutes
OP	Operating Permit
PM_{10}	Particulate Matter less than 10 microns
ppm	Parts per Million
ppmvd	Parts per Million, Volumetric Dry
PSD	Prevention of Significant Deterioration
PTE	Potential to Emit
RBLC	EPA's RACT/BACT/LAER Clearinghouse database
RMP	Risk Management Plan
SCC	Source Classification Codes
scfm	Standard Cubic Feet per minute
SIC	Standard Industrial Classification
SIP	State Implementation Plan
S/N	Serial Number
SO_x	Sulfur Oxides
SSM	Startup, Shutdown, and Malfunction
TCS	Toxic Chemical Substance
TRS	Total Reduced Sulfur
VOC	Volatile Organic Compound

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Emission Units

Table 2: Summary of Emission Units

EU	Description	Model No.	Serial No.[1]	SCC
W11	John Zink Enclosed Combustion Flare, 5,000 scfm LFG Flow	Zule Zink Low Emission Flare	TBD	50100410

[1]TBD = To Be Determined.

Calculation of PTE and NEI

The NO_x and CO emission factors are supplied by the manufacturer of the flare.

- *Using Flare Flow Rate of 5,000 scfm (Maximum rated capacity for Flare)*

$$\boldsymbol{Manufacturer's\ Maximum\ Flare\ Rate\ = 136.605\ \frac{MMBtu}{hr}}$$

Note the flow rate capacity of the flare is limited by its rated Btu capacity. Therefore, the flare may not achieve the rated flow rate if the heat value of the landfill gas is too high. All calculations associated with emission potentials are based on the limiting factor (i.e. 136.605 MMBtu/hr).

- *Using requested Flare Flow Rate of 2,099,246,400 scf per year for basis for yearly calculations*

$$\boldsymbol{Requested\ Yearly\ Calculations\ } = (2{,}099{,}246{,}400\ cf/yr)/\left(\left(8{,}760\ \frac{hrs}{yr}\right)\left(60\ \frac{mins}{hr}\right)\right)$$
$$= \boldsymbol{3{,}994\ cfm}$$

$$\boldsymbol{Flare\ Flow\ Rate\ } = (3{,}994\ cfm)\left(525{,}600\frac{mins}{yr}\right)\left(0.0005\frac{MMBtu}{ft^3}\right)\left(\frac{1\ yr}{8{,}760\ hrs}\right)$$
$$= \boldsymbol{119.82\ \frac{MMBtu}{hr}}$$

<u>NO_x Calculations</u>:

- *Using Flare Flow Rate of 5,000 scfm (Maximum rated capacity for Flare)*

$$\boldsymbol{NO_x\ \frac{lbs}{hr}} = \left(NO_x\ EF\ \frac{lb}{MMBtu}\right)\left(Flare\ Flow\ Rate\ \frac{MMBtu}{hr}\right) =$$

$$NO_x\ \frac{lbs}{hr} = \left(0.025\ \frac{lbs}{MMBtu}\right)\left(136.605\ \frac{MMBtu}{hr}\right) = \boldsymbol{3.42\ \frac{lbs}{hr}}$$

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$$\boldsymbol{NO_x}\ \frac{\boldsymbol{tons}}{\boldsymbol{yr}} = \left(3.42\frac{lbs}{hr}\right)\left(\frac{8{,}760\ hrs}{yr}\right)\left(\frac{ton}{2{,}000\ lbs}\right) = \mathbf{14.98}\ \frac{\boldsymbol{tons}}{\boldsymbol{yr}}$$

- *Using requested Flare Flow Rate of 2,099,246,400 scf per year for basis for yearly calculations*

$$\boldsymbol{NO_x}\ \frac{\boldsymbol{lbs}}{\boldsymbol{hr}} = \left(NO_x\ EF\ \frac{lb}{MMBtu}\right)\left(Flare\ Flow\ Rate\ \frac{MMBtu}{hr}\right) =$$

$$NO_x\ \frac{lbs}{hr} = \left(0.025\ \frac{lbs}{MMBtu}\right)\left(119.82\ \frac{MMBtu}{hr}\right) = \mathbf{3.00}\ \frac{\boldsymbol{lbs}}{\boldsymbol{hr}}$$

$$\boldsymbol{NO_x}\ \frac{\boldsymbol{tons}}{\boldsymbol{yr}} = \left(2.9955\frac{lbs}{hr}\right)\left(\frac{8{,}760\ hrs}{yr}\right)\left(\frac{ton}{2{,}000\ lbs}\right) = \mathbf{13.12}\ \frac{\boldsymbol{tons}}{\boldsymbol{yr}}$$

CO Calculations:

- *Using Flare Flow Rate of 5,000 scfm (Maximum rated capacity for Flare)*

$$CO\ \frac{lbs}{hr} = \left(CO\ EF\ \frac{lb}{MMBtu}\right)\left(Flare\ Flow\ Rate\ \frac{MMBtu}{hr}\right) =$$

$$CO\ \frac{lbs}{hr} = \left(0.06\frac{lbs}{MMBtu}\right)\left(136.605\frac{MMBtu}{hr}\right) = \mathbf{8.20}\ \frac{\boldsymbol{lbs}}{\boldsymbol{hr}}$$

$$CO\ \frac{tons}{yr} = \left(8.20\frac{lbs}{hr}\right)\left(\frac{8{,}760\ hrs}{yr}\right)\left(\frac{ton}{2{,}000\ lbs}\right) = \mathbf{35.90}\ \frac{\boldsymbol{tons}}{\boldsymbol{yr}}$$

- *Using requested Flare Flow Rate of 2,099,246,400 scf per year for basis for yearly calculations*

$$CO\ \frac{lbs}{hr} = \left(CO\ EF\ \frac{lb}{MMBtu}\right)\left(Flare\ Flow\ Rate\ \frac{MMBtu}{hr}\right) =$$

$$CO\ \frac{lbs}{hr} = \left(0.06\frac{lbs}{MMBtu}\right)\left(119.82\ \frac{MMBtu}{hr}\right) = \mathbf{7.19}\ \frac{\boldsymbol{lbs}}{\boldsymbol{hr}}$$

$$CO\ \frac{tons}{yr} = \left(7.1892\frac{lbs}{hr}\right)\left(\frac{8{,}760\ hrs}{yr}\right)\left(\frac{ton}{2{,}000\ lbs}\right) = \mathbf{31.49}\ \frac{\boldsymbol{tons}}{\boldsymbol{yr}}$$

SO_x Calculations:

SO_x EF (Uncontrolled H_2S):

Concentration of Reduced Sulfur Compounds C_s

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Reduced Sulfur Compound Concentration obtained from the June 2005 LFG test for Sulfur Gases Using ASTM 4404.
$C_s = \Sigma C_p x S_p$
C_s = Concentration of Reduced Sulfur Compounds, ppmv as Sulfur (S)
C_p = Concentration of each Reduced Sulfur Compounds, ppmv
S_p = Number of moles of S produced form the Combustion of each Reduced Sulfur Compound (i.e., 1 for Sulfides, 2 for Disulfides)

Concentration of Reduced Sulfur Compounds C_s = 3,094 ppm or 3.094E-03 $\frac{lb-mol(S)}{lb-mol\ LFG}$

Reduced Sulfur Compounds detected in the June 2005 LFG sampling are Carbonyl sulfide, Hydrogen Sulfide, Methyl Mercaptan, and Dimethyl Sulfide, ppmv or ppmv/1E6 = lb-mol S
<u>SO_x EF:</u>

$$SO_2\ EF\ \frac{lbs}{scf} = \left(TRS\ Concentration\ \left[\frac{lb-mol}{lb-mol\ LFG}\right]\right)\left(\frac{lb-mol\ LFG}{386\ scf}\right)\left(Molecular\ Weight\ of\ \ (S)\right)$$

$$(Ratio\ of\ SO_x{:}S)$$

Where Sulfur (S) Molecular Weight $= 32\ \frac{lb}{lb-mol}$ and the ratio of SO_x:S = $\frac{2\ lbs\ SOx}{1\ lb\ S}$

$$SO_2\ EF\ \frac{lbs}{scf} = \left(3.975E-03\frac{lb-mol(S)}{lb-mol\ LFG}\right)\left(\frac{lb-mol\ LFG}{386\ scf}\right)\left(\frac{32\ lbs}{lb-mol}\right)\left(\frac{2\ lbs\ SO_x}{lb\ S}\right)$$

$$= 6.59067E-04\frac{lbs\ SO_x}{scf}$$

$$\text{Or}\ \left(6.59067E-04\frac{lbs}{scf}\right)\left(\frac{scf}{0.0005\ MMBtu}\right) = 1.3181347\ \frac{lbs}{MMBtu}$$

<u>SO_x EF (Uncontrolled H_2S):</u>

- *<u>Using Flare Flow Rate of 5,000 scfm (Maximum rated capacity for Flare)</u>*

$$SO_x\ \frac{lbs}{hr} = \left(SO_x\ EF\ \left[\frac{lb}{MMBtu}\right]\right)\left(Flare\ Flow\ Rate\ \left[\frac{MMBtu}{hr}\right]\right)$$

$$SO_x\ \frac{lbs}{hr} = \left(1.32\ \frac{lbs}{MMBtu}\right)\left(136.605\ \frac{MMBtu}{hr}\right) = \mathbf{180.32\ \frac{lbs}{hr}}$$

$$SO_x\ \frac{tons}{yr} = \left(1.32\frac{lbs}{MMBtu}\right)\left(136.605\ \frac{MMBtu}{hr}\right)\left(\frac{8{,}760\ hrs}{yr}\right)\left(\frac{ton}{2{,}000\ lbs}\right) = \mathbf{789.80\frac{tons}{yr}}$$

<u>SO_x EF (Controlled 92.2% of H_2S by Desulfurization Process):</u>

The ppm for controlled H_2S is calculated to be 304 ppm.

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$$SO_2\ EF\ \frac{lbs}{scf} = \left(TRS\ Concentration\ \left[\frac{lb-mol}{lb-mol\ LFG}\right]\right)\left(\frac{lb-mol\ LFG}{386\ scf}\right)\left(Molecular\ Weight\ of\ \ (S)\right)$$

$$(Ratio\ of\ SO_x{:}S)$$

Where Sulfur (S) Molecular Weight $= 32\ \frac{lb}{lb-mol}$ and the ratio of SO_x:S = $\frac{2\ lbs\ SOx}{1\ lb\ S}$

$$SO_2\ EF\ \frac{lbs}{scf} = \left(3.094E-04\frac{lb-mol(S)}{lb-mol\ LFG}\right)\left(\frac{lb-mol\ LFG}{386\ scf}\right)\left(\frac{32\ lbs}{lb-mol}\right)\left(\frac{2\ lbs\ SO_x}{lb\ S}\right)$$

$$= 5.13E-05\frac{lbs\ SO_x}{scf}$$

Or $\left(5.13E-05\ \frac{lbs}{scf}\right)\left(\frac{scf}{0.0005\ MMBtu}\right) = 0.1026\ \frac{lbs}{MMBtu}$

- *<u>Using Flare Flow Rate of 5,000 scfm (Maximum rated capacity for Flare)</u>*

$$SO_x\ \frac{lbs}{hr} = \left(SO_x\ EF\ \left[\frac{lb}{MMBtu}\right]\right)\left(Flare\ Flow\ Rate\ \left[\frac{MMBtu}{hr}\right]\right)$$

$$SO_x\ \frac{lbs}{hr} = \left(0.1026\ \frac{lbs}{MMBtu}\right)\left(136.605\frac{MMBtu}{hr}\right) = \mathbf{14.02\ \frac{lbs}{hr}}$$

$$SO_x\ \frac{tons}{yr} = \left(0.1026\ \frac{lbs}{MMBtu}\right)\left(136.605\ \frac{MMBtu}{hr}\right)\left(\frac{8{,}760\ hrs}{yr}\right)\left(\frac{ton}{2{,}000\ lbs}\right) = \mathbf{61.39\ \frac{tons}{yr}}$$

- *<u>Using requested Flare Flow Rate of 2,099,246,400 scf per year for basis for yearly calculations</u>*

$$SO_x\ \frac{lbs}{hr} = \left(SO_x\ EF\ \left[\frac{lb}{MMBtu}\right]\right)\left(Flare\ Flow\ Rate\ \left[\frac{MMBtu}{hr}\right]\right)$$

$$SO_x\ \frac{lbs}{hr} = \left(0.1026\ \frac{lbs}{MMBtu}\right)\left(119.82\ \frac{MMBtu}{hr}\right) = \mathbf{12.29\ \frac{lbs}{hr}}$$

$$SO_x\ \frac{tons}{yr} = \left(0.1026\ \frac{lbs}{MMBtu}\right)\left(119.82\ \frac{MMBtu}{hr}\right)\left(\frac{8{,}760\ hrs}{yr}\right)\left(\frac{ton}{2{,}000\ lbs}\right) = \mathbf{53.85\ \frac{tons}{yr}}$$

<u>PM Calculations</u>:

Emission Factor of 17 lbs/MMSCF for PM_{10} was obtained from AP-42 Chapter 2, Section 2.4, Table 2.4-5 (11/1998). The calculation is based on the amount of methane in the landfill gas; methane only 50% of the total landfill gas.

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$$PM_{10}\ EF\ \frac{lbs}{MMBtu} = \left(PM_{10}\ EF\ \frac{lbs}{MMscf}\right)\left(\frac{MMscf}{1E6\ scf}\right)\left(\frac{5{,}000\ scf}{minute}\right)\left(\frac{60\ minutes}{hr}\right)\left(Flare\ Flow\ Rate\ \left[\frac{hr}{MMBtu}\right]\right)$$

$$\left(PM_{10}\ EF\ \frac{lb}{MMBtu}\right) = \left(\left(17\ \frac{lb}{MMscf}\right)\left(\frac{MMscf}{1E6\ scf}\right)\left(\frac{5{,}000\ scf}{minute}\right)\left(\frac{60\ minutes}{hr}\right)\right)\left(\frac{hr}{136.605\ MMBtu}\right)$$
$$= \mathbf{0.0373\ \frac{lbs}{MMBtu}}$$

$$\left(\mathbf{0.0373\ \frac{lbs}{MMBtu}}\right)(\mathbf{50\%}) = \mathbf{0.01865\ \frac{lbs}{MMBtu}}$$

- <u>*Using Flare Flow Rate of 5,000 scfm (Maximum rated capacity for Flare)*</u>:

$$PM_{10}\ \frac{lbs}{hr} = \left(PM_{10}\ EF\ \frac{lb}{MMscf}\right)\left(\frac{MMscf}{1E6\ scf}\right)(Flare\ Capacity\ [scfm])\left(\frac{60\ minutes}{hr}\right)$$

$$PM_{10}\ \frac{lbs}{hr} = \left(17\ \frac{lb}{MMscf}\right)\left(\frac{MMscf}{1E6\ scf}\right)\left(\frac{5{,}000\ scf}{minute}\right)\left(\frac{60\ minutes}{hr}\right) = \mathbf{5.10\ \frac{lbs}{hr}}$$

$$\left(\mathbf{5.10\ \frac{lbs}{hr}}\right)(\mathbf{50\%}) = \mathbf{2.55\ \frac{lbs}{hr}}$$

$$PM_{10}\ \frac{ton}{yr} = \left(5.10\ \frac{lbs}{hr}\right)\left(\frac{8{,}760\ hrs}{yr}\right)\left(\frac{ton}{2{,}000\ lbs}\right) = \mathbf{22.32\ \frac{tons}{yr}}$$

$$\left(\mathbf{22.32\ \frac{tons}{yr}}\right)(\mathbf{50\%}) = \mathbf{11.16\ \frac{tons}{yr}}$$

- <u>*Using requested Flare Flow Rate of 2,099,246,400 scf per year for basis for yearly calculations*</u>

$$PM_{10}\ \frac{lbs}{hr} = \left(PM_{10}\ EF\ \frac{lb}{MMscf}\right)\left(\frac{MMscf}{1E6\ scf}\right)(Flare\ Capacity\ [scfm])\left(\frac{60\ minutes}{hr}\right)$$

$$PM_{10}\ \frac{lbs}{hr} = \left(17\ \frac{lb}{MMscf}\right)\left(\frac{MMscf}{1E6\ scf}\right)\left(\frac{3{,}994\ scf}{minute}\right)\left(\frac{60\ minutes}{hr}\right) = \mathbf{4.07\ \frac{lbs}{hr}}$$

$$\left(\mathbf{4.07\ \frac{lbs}{hr}}\right)(\mathbf{50\%}) = \mathbf{2.04\ \frac{lbs}{hr}}$$

$$PM_{10}\ \frac{ton}{yr} = \left(4.07\ \frac{lbs}{hr}\right)\left(\frac{8{,}760\ hrs}{yr}\right)\left(\frac{ton}{2{,}000\ lbs}\right) = \mathbf{17.83\ \frac{tons}{yr}}$$

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$$\left(\mathbf{17.83}\,\frac{\boldsymbol{tons}}{\boldsymbol{yr}}\right)(\mathbf{50\%}) = \mathbf{8.92}\,\frac{\boldsymbol{tons}}{\boldsymbol{yr}}$$

VOC Calculations:

The Emission Factor of 5.6 lbs/MMSCF for VOC were obtained from Michigan Department of Environmental Quality's "*Emission Calculation Fact Sheet for Municipal Solid Waste Landfills".*

$$VOC\ \frac{lbs}{hr} = \left(VOC\ EF\ \left[\frac{lb}{MMscf}\right]\right)\left(\frac{MMscf}{1E6\ scf}\right)(Flare\ Capacity\ [scfm])\left(\frac{60\ minutes}{hr}\right)$$

- <u>*Using Flare Flow Rate of 5,000 scfm (Maximum rated capacity for Flare)*</u>

$$VOC\ \frac{lbs}{hr} = \left(5.6\ \frac{lbs}{MMscf}\right)\left(\frac{MMscf}{1E6\ scf}\right)\left(\frac{5{,}000\ scf}{minutes}\right)\left(\frac{60\ minutes}{hr}\right) = \mathbf{1.68}\ \frac{\boldsymbol{lbs}}{\boldsymbol{hr}}$$

$$VOC\ EF\ \frac{lbs}{MMBtu} = \left(VOC\ \frac{lbs}{hr}\right)\left(Flare\ Flow\ Rate\ \left[\frac{hr}{MMBtu}\right]\right)$$

$$\left(VOC\ EF\ \frac{lb}{MMBtu}\right) = \left(1.68\ \frac{lbs}{hr}\right)\left(\frac{hr}{136.605\ MMBtu}\right) = \mathbf{0.012298}\ \frac{\boldsymbol{lbs}}{\boldsymbol{MMBtu}}$$

$$VOC\ \frac{ton}{yr} = \left(0.012298\ \frac{lbs}{MMBtu}\right)\left(136.605\ \frac{MMBtu}{hr}\right)\left(\frac{8{,}760\ hrs}{yr}\right)\left(\frac{ton}{2{,}000\ lbs}\right) = \mathbf{7.36}\ \frac{\boldsymbol{tons}}{\boldsymbol{yr}}$$

- <u>*Using requested Flare Flow Rate of 2,099,246,400 scfm for basis for yearly calculations*</u>

$$VOC\ \frac{lbs}{hr} = \left(5.6\ \frac{lbs}{MMscf}\right)\left(\frac{MMscf}{1E6\ scf}\right)\left(\frac{3{,}994\ scf}{minutes}\right)\left(\frac{60\ minutes}{hr}\right) = \mathbf{1.34}\ \frac{\boldsymbol{lbs}}{\boldsymbol{hr}}$$

$$VOC\ EF\ \frac{lbs}{MMBtu} = \left(VOC\ \frac{lbs}{hr}\right)\left(Flare\ Flow\ Rate\ \left[\frac{hr}{MMBtu}\right]\right)$$

$$\left(VOC\ EF\ \frac{lb}{MMBtu}\right) = \left(1.34\ \frac{lbs}{hr}\right)\left(\frac{hr}{109.12\ MMBtu}\right) = \mathbf{0.012298}\ \frac{\boldsymbol{lbs}}{\boldsymbol{MMBtu}}$$

$$VOC\ \frac{ton}{yr} = \left(0.012298\ \frac{lbs}{MMBtu}\right)\left(109.12\ \frac{MMBtu}{hr}\right)\left(\frac{8{,}760\ hrs}{yr}\right)\left(\frac{ton}{2{,}000\ lbs}\right) = \mathbf{5.88}\ \frac{\boldsymbol{tons}}{\boldsymbol{yr}}$$

HAP Calculations:

HAP $\frac{lbs}{hr}$ PTE estimated by summing each individual HAP $\frac{lbs}{hr}$. A value of 0.01 $\frac{lbs}{hr}$ was assumed for any individual HAP PTE <0.01 $\frac{ton}{yr}$.

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- *Using Flare Flow Rate of 5,000 scfm (Maximum rated capacity for Flare)*

$$HAP\ EF\ \frac{lbs}{MMBtu} = \left(HAP\ \frac{lbs}{hr}\right)\left(Flare\ Flow\ Rate\ \left[\frac{hr}{MMBtu}\right]\right)$$

$$\left(HAP\ EF\ \frac{lb}{MMBtu}\right) = \left(0.1279\ \frac{lbs}{hr}\right)\left(\frac{hr}{136.605\ MMBtu}\right) = \mathbf{0.00094\ \frac{lbs}{MMBtu}}$$

$$HAP\ \frac{ton}{yr} = \left(0.00094\ \frac{lbs}{MMBtu}\right)\left(136.605\ \frac{MMBtu}{hr}\right)\left(\frac{8{,}760\ hrs}{yr}\right)\left(\frac{ton}{2{,}000\ lbs}\right) = \mathbf{0.56\ \frac{tons}{yr}}$$

- *Using requested Flare Flow Rate of 2,099,246,400 scfm for basis for yearly calculations*

$$HAP\ EF\ \frac{lbs}{MMBtu} = \left(HAP\ \frac{lbs}{hr}\right)\left(Flare\ Flow\ Rate\ \left[\frac{hr}{MMBtu}\right]\right)$$

$$\left(HAP\ EF\ \frac{lb}{MMBtu}\right) = \left(0.1279\ \frac{lbs}{hr}\right)\left(\frac{hr}{119.12\ MMBtu}\right) = \mathbf{0.00107\ \frac{lbs}{MMBtu}}$$

$$HAP\ \frac{ton}{yr} = \left(0.00107\ \frac{lbs}{MMBtu}\right)\left(119.12\ \frac{MMBtu}{hr}\right)\left(\frac{8{,}760\ hrs}{yr}\right)\left(\frac{ton}{2{,}000\ lbs}\right) = \mathbf{0.56\ \frac{tons}{yr}}$$

When calculating TCS it was assumed that 100% of H_2S is converted to SO_x during the combustion process; therefore, it is anticipated that TCS emissions, as H_2S, will not exceed $0.01\frac{lbs}{hr}$ and $0.04\ \frac{tons}{yr}$.

- *Using Flare Flow Rate of 5,000 scfm (Maximum rated capacity for Flare)*

$$TCS\ EF\ \frac{lbs}{MMBtu} = \left(TCS\ \frac{lbs}{hr}\right)\left(Flare\ Flow\ Rate\ \left[\frac{hr}{MMBtu}\right]\right)$$

$$\left(TCS\ EF\ \frac{lb}{MMBtu}\right) = \left(0.1126\ \frac{lbs}{hr}\right)\left(\frac{hr}{136.605\ MMBtu}\right) = 8.241E-04\ \mathbf{\frac{lbs}{MMBtu}}$$

$$TCS\ \frac{ton}{yr} = \left(8.241E-04\ \frac{lbs}{MMBtu}\right)\left(136.605\ \frac{MMBtu}{hr}\right)\left(\frac{8{,}760\ hrs}{yr}\right)\left(\frac{ton}{2{,}000\ lbs}\right) = \mathbf{0.49\ \frac{tons}{yr}}$$

- *Using requested Flare Flow Rate of 2,099,246,400 scfm for basis for yearly calculations*

$$TCS\ EF\ \frac{lbs}{MMBtu} = \left(TCS\ \frac{lbs}{hr}\right)\left(Flare\ Flow\ Rate\ \left[\frac{hr}{MMBtu}\right]\right)$$

$$\left(TCS\ EF\ \frac{lb}{MMBtu}\right) = \left(0.098\ \frac{lbs}{hr}\right)\left(\frac{hr}{119.12\ MMBtu}\right) = 8.241E-04\ \frac{lbs}{MMBtu}$$

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$$TCS\ \frac{ton}{yr} = \left(8.241E-04\ \frac{lbs}{MMBtu}\right)\left(119.12\ \frac{MMBtu}{hr}\right)\left(\frac{8{,}760\ hrs}{yr}\right)\left(\frac{ton}{2{,}000\ lbs}\right) = \mathbf{0.43\ \frac{tons}{yr}}$$

AQR Section 12.2 and 12.3 permitting applicability is determined by calculating the PTE for all emission units as unlimited operation, 8,760 hours per year and 2,628,000,000 scf per year and applying the uncontrolled emission factors provided by the manufacturer, EPA AP-42, etc.

The emission calculations for the 5,000 scfm John Zink enclosed combustion flare used manufacturer's information emission factors for NO_X and CO; PM_{10} was obtained from AP-42 Chapter 2, Section 2.4, Table 2.4-5 (11/1998); and the VOC emissions factor was based on Michigan Department of Environmental Quality "*Emission Calculations Fact For Municipal Solid Waste Landfills*". The SO_2 (controlled) emissions factor was based on Michigan Department of Environmental Quality "*Emission Calculations Fact For Municipal Solid Waste Landfills*" and "*Onsite Reduced Sulfur Compounds Concentrations*" summarized in the June 2005 LFG Test for Sulfur gases using ASTM 4404.

Table 3: Uncontrolled PTE of the 5,000 John Zink Enclosed Combustion Flare

EU	Flare Rate (MMBtu/hr)	LFG Flow	EF (lb/MMBtu)	Pollutant	PTE (tons/yr)
W11	136.605	5,000 scfm and 2,628,000,000 ft^3/yr	3.73E-02	**PM_{10} Total**	**11.16**
			3.73E-02	**$PM_{2.5}$ Total**	**11.16**
			2.50E-02	**NO_X Total**	**14.98**
			6.00E-02	**CO Total**	**35.90**
			1.32	**SO_X Total**	**789.80**
			1.23E-02	**VOC Total**	**7.36**
			9.40E-04	**HAP Total**	**0.56**
			8.24E-04	**TCS Total**	**0.49**

Table 4: Summary of Control Requirements per Uncontrolled PTE for the Flare

Pollutant	Source Status for Pollutant	Attainment Status	Significant Levels[1]	Thresholds (tons/year)	Control Requirement	Sources Control Requirements
PM_{10}	Major	PSD	Minor	7.5	RACT	No
			Major	15	BACT	**No**
$PM_{2.5}$	Minor	PSD	Minor	5.0	RACT	No
			Major	**10**	**BACT**	**Yes**
NO_X	Major	Non-Attainment[2]	Minor	20	RACT	No
			Major	40	BACT	No
CO	Major	PSD	Minor	50	RACT	No
			Major	100	BACT	No
SO_2	Major	PSD	Minor	20	RACT	No
			Major	**40**	**BACT**	**Yes**
VOC	Minor	Non-Attainment[2]	Minor	20	RACT	No
			Major	40	BACT	No

[1]Minor NSR Significant Levels or Major Significant Levels.

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[2]Pollutant NO_X and VOC is nonattainment for ozone (O_3)

Republic has requested a reduction in total flow to the flare per year. They have requested that the flare be permitted to operate at 5,000 scfm, but be limited to 2,099,246,400 standard cubic foot per year.

Table 5: Controlled with Operational Limit PTE for the 5,000 scfm Flare

EU	Flare Rate (MMBtu/hr)	LFG Flow	EF (lb/ MMBtu)	Pollutant	PTE	
					lbs/hr	tons/yr
W11	136.605	5,000 scfm and 2,099,246,400 ft^3/yr	3.73E-02	**PM_{10} Total**	2.04	8.92
			3.73E-02	**$PM_{2.5}$ Total**	2.04	8.92
			2.50E-02	**NO_X Total**	3.00	13.12
			6.00E-02	**CO Total**	7.19	31.49
			1.026E-03	**SO_X Total**	12.29	53.85
			1.23E-02	**VOC Total**	1.34	5.88
			9.40E-04	**HAP Total**	0.13	0.56
			8.24E-04	**TCS Total**	0.10	0.43

Operational Limits

1. The Permittee shall limit the actual flow of landfill gas to the enclosed combustor flare (EU: W11) to 5,000 scfm and 2,099,246,400 ft^3/yr. *[AQR 12.4.3.1(e)(10))]*
2. The Permittee shall operate the desulfurization system control device when the enclosed combustor flare (EU: W11) is in operation. *[AQR 12.4.3.1(e)(10)]*
3. The Permittee shall operate the 5,000 scfm enclosed combustor flare (EU: W11) to replace the 1,000 scfm Callidus flare (EU: W07) and 1,400 scfm candlestick flare (EU: G26). Upon commencement of operation of the 5,000 scfm flare (EU: W11), the Permitee shall disable the 1,000 scfm flare (EU: W07) and 1,400 Scfm flare (EU: G26) such that they may be regarded as inoperable. *[AQR 12.4.3.1(e)(10)]*

Production limits were submitted by the source.

Review of Applicable Regulations

The NEI and PTE were calculate and assessed starting with Modification 3 issued in December 2006 and including Modification 4, 5, 6, 8, 9 and any revisions to the Title V Operating Permit. Actual annual emission data was not considered in the NEI calculations for the last five years because the fact that there have not been two consecutive and representative years of actual data collected between modifications.

Table 6: Five Year Permitting Action NEI Summary and 12.4 ATC PTE

	PM_{10}	$PM_{2.5}$	NOx	CO	SOx	VOC	HAP	TCS (H_2S)
Modification 4, Revision 1 NEI	-66.52	0.00	2.07	-0.69	3.95	-0.67	2.88	0.00

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	PM_{10}	$PM_{2.5}$	NOx	CO	SOx	VOC	HAP	TCS (H_2S)
Modification 6 NEI	-0.08	-0.08	0.09	-0.08	0.97	-0.04	-0.03	0.00
Modification 8 NEI	0.00	0.00	0.00	0.00	0.00	0.10	0.01	0.00
Modification 9 NEI	6.26	6.26	12.52	68.07	18.40	8.29	7.33	0.05
Modification 5 NEI	2.30	0.24	9.81	33.25	1.03	0.32	0.02	0.00
Title V Revision NEI	0.73	0.73	10.58	18.33	4.52	8.65	-0.28	0.00
12.4 ATC February 1, 2011 NEI	-5.71	-5.71	-4.29	-36.85	-134.53	3.56	-0.63	0.38
Total NEI [5 year look back]	**-63.02**	**1.44**	**30.78**	**82.03**	**-105.66**	**20.21**	**9.30**	**0.43**
Modification 3 PTE Non-Fugitives: Issued 12/2006	322.76	12.35	106.65	31.88	172.28	10.73	0.43	0.00
Total PTE for 12.4 ATC	**259.74**	**13.79**	**137.43**	**113.91**	**66.62**	**30.94**	**9.72**	**0.43**

Table 7: Summary of Requirements in AQR Sections 12 (tpy)

	PM_{10}	$PM_{2.5}$	NO_X	CO	SO_2	VOC	HAP	H_2S
Non-Fugitive PTE (tpy)	**259.74**	**13.79**	**137.43**	**113.91**	**66.62**	**30.94**	**9.72**	**0.43**
Landfill Fugitive (tpy)	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**32.16**	**147.27**
NEI for AQR 12.4 Project	-5.71	-5.71	-4.29	-36.85	-134.53	3.56	-0.63	0.38
Total NEI for 5 years	-63.02	13.79	30.78	82.03	-105.66	20.21	9.30	0.43
AQR 12.2 Significant Thresholds	15	10	40	100	40	40	10/25	10
Major Source Threshold Non-Attainment Area	70	100	100	100	100	100	10/25	100
Major Source Threshold PSD Area	100/ 250	100/ 250	100/ 250	100/ 250	100/ 250	100/ 250	10/25	100/ 250
Control Technology	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Applicable Regulations:

The 5,000 scfm John Zink enclosed combustion flare is applicable to AQR Sections 4, 5, 6, 8, 9, 12, 13, 14, 18, 25, 26, 40, 43, 70, and 80.

Republic is subject to 40 CFR 60 Subpart WWW – Standards of Performance for Municipal Solid Waste Landfills because the source commenced construction of a MSWL on or after the May 30, 1991, applicability date. The source is also subject to 40 CFR 63 Subpart AAAA – National Emission Standards for Hazardous Air Pollutants: Municipal Solid Waste Landfills.

Control Technology

The proposed action exceeded the NSR significance level for $PM_{2.5}$ and SO_X as defined in AQR 12.2.2(uu). The source is required to install controls that satisfy BACT for PM_{10}, $PM_{2.5}$ and SO_X.

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The source proposed an AQR 12.2 analysis for the noted criteria pollutants, which satisfied the level of control required for this permitting action.

PM_{10} and $PM_{2.5}$ Control Technology:

The source will control PM_{10}/$PM_{2.5}$ for the enclosed combustion flare by maintaining good combustion practices, including proper maintenance and operation. Republic proposes to implement the only identified control option of good combustion practices and proper maintenance and operation, including monitoring for the presence of a flame, the LFG flow rate to the flare, zero percent (0%) opacity, and measuring the percent methane in the LFG as BACT. This was the only control technology identified.

SO_2 Control Technology:

The two controls identified for SO_2 are:

1. Desulfurization System/scrubbing for hydrogen sulfide removal
2. Proper maintenance and operation, including monitoring for the presence of a flame, operational temperature, the LFG flow rate to the flare, zero percent (0%) opacity, and measuring the percent methane in the LFG.

It is technically feasible to use both the desulfurization system and proper maintenance and operation to reduce SO_2 emissions from the flare. The most effective technology is a desulfurization system and then proper maintenance and operation. The top ranking technology in the evaluation of economic, environmental, and energy impacts is a desulfurization system, with the cost per ton of SO_2 removed is $310 per ton. Therefore, Republic elects to use the Paques THIOPAQ desulfurization system/LFG scrubbing system for hydrogen sulfide removal from the LFG to reduce SO_2 emission from the new LFG flare, as well as ensuring proper maintenance and operation of the new LFG flare as BACT. Proper maintenance and operation of the flare will include monitoring for the presence of a flame, the LFG flow rate to the flare, 0% opacity, and measuring the percent methane in the LFG. Republic will monitor methane quarterly and conduct a visual observation weekly.

Monitoring

1. The Permittee shall conduct a daily visual emissions check for visible emissions from the enclosed combustor flare (EU: W11) while they are in operation. *[AQR 12.4.3.1(e)(10)]*
2. If the Permittee, during the visible emissions check, does not see any plume that, on an instantaneous basis, appears to exceed the opacity standard, then the observer shall keep a record of the name of the observer, the date on which the observation was made, the location, and the results of the observation. *[AQR 12.4.3.1(e)(10)]*
3. If the Permittee sees a plume that, on an instantaneous basis, appears to exceed the opacity standard, the Permittee shall: *[AQR 12.4.3.1(e)(10)]*
    a. take immediate action to correct causes of fugitive/stack emissions that appear to exceed allowable opacity limits; or
    b. if practical, have a certified VE observer take an EPA Method 9 observation of the plume and record the results, and take immediate action to correct causes of fugitive

emissions in excess of allowable opacity limits in accordance with 40 CFR 60 Appendix A: Reference Method 9.

4. Visible emissions checks do not require a certified VE observer, except where visible emissions appear to exceed the allowable opacity limit and exceed 30 seconds in duration, and an EPA Method 9 observation is made to establish it does not exceed the standard. *[AQR 12. 4.3.1(e)(10)]*

5. The Permittee shall monitor the time and date of operation of the desulfurization system control device. *[AQR 12. 4.3.1(e)(10)]*

6. The Permittee shall monitor the LFG throughput, in standard cubic feet, to the desulfurization system control device, and calculate monthly the annual volume as a 12-month rolling total. *[AQR 12. 4.3.1(e)(10)]*

7. The Permittee shall monitor the time and date of operation of the enclosed combustor flare (EU: W11). *[AQR 12. 4.3.1(e)(10)]*

8. The Permittee shall monitor the LFG throughput, in standard cubic feet, to the enclosed combustor flare (EU: W11), and calculate monthly the annual volume as a 12-month rolling total. *[AQR 12. 4.3.1(e)(10)]*

9. The Permittee shall calibrate, maintain, and operate according to the manufacturer's specifications the following equipment on the enclosed combustion flare (EU: W11): *[40 CFR 60.756(b)(1) and (2)]*

   a. A temperature monitoring device equipped with a continuous recorder and having a minimum accuracy of ±1 percent of the temperature being measured expressed in degrees Celsius or ±0.5 degrees Celsius, whichever is greater.

   b. A device that records flow to or bypass of the control device. The Permittee shall either:

      i. install, calibrate, and maintain a gas flow rate measuring device that shall record the flow to the control device at least every 15 minutes; or

      ii. secure the bypass line valve in the closed position with a car-seal or a lock-and key type configuration. A visual inspection of the seal or closure mechanism shall be performed at least once every month to ensure that the value is maintained in the closed position and that the gas flow is not diverted through the bypass line.

Testing

1. Performance testing for the enclosed combustor flare (EU: W11) and desulfurization system control device is subject to 40 CFR 60 Subpart A §60.8; 40 CFR Part 60 Subpart WWW and DAQEM's Guideline on Source Testing. *[AQR 12.4.3.1(a)(9), 40 CFR Part 60 Subpart A and 40 CFR 60.754(d)]*

2. The Permittee shall demonstrate initial compliance with the NMOC reduction requirements and H_2S control efficiencies by conducting performance testing no later than 180 days after initial startup and within 60 days after achieving the maximum production rate at which the enclosed combustor flare will be operated. *[AQR 12.4.3.1(a)(9) and 40 CFR 60.754(d)]*

3. The Permittee shall submit for approval a performance testing protocol which contains testing, reporting, and notification schedules, test protocols, and anticipated test dates to the

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Control Officer not less than 45 nor more than 90 days prior to the anticipated date of the performance test. [12.4.3.1(a)(9)].

4. The Permittee shall conduct subsequent performance testing on the enclosed combustor flare (EU: W11) for NMOC reduction on or before the anniversary date of the previous performance test. *[AQR 12.4.3.1(a)(9)]*

5. The Permittee shall demonstrate compliance with the 40 CFR 60 Subpart WWW standard by reducing NMOC by 98 weight-percent or by reducing the outlet concentration of NMOC to less than 20 ppmv for the enclosed combustor flare (EU: W11) in accordance with 40 CFR 60 Appendix A: Method 25, 25C, or 18. Method 3 or 3A shall be used to determine oxygen for correcting the NMOC concentration as hexane to 3 percent. In cases where the outlet concentration is less than 50 ppm NMOC as carbon (8 ppm NMOC as hexane), Method 25A should be used in place of Method 25. If using Method 18, the minimum list of compounds to be tested shall be those published in the most recent Compilation of Air Pollutant emission Factors (AP-42). *[40 CFR 60.754(d)]*.

6. The Permittee shall demonstrate compliance with the desulfurization control device control efficiency in accordance with 40 CFR 60 Appendix A: Method 15 – Determination of Hydrogen Sulfide, Carbonyl Sulfide, and Carbon Disulfide Emissions from Stationary Sources. *[AQR 12.4.3.1(a)(9)]*

7. The Permittee shall submit a complete and comprehensive final performance test report to the Control Officer within 60 days from the end of each performance test. *[AQR 12.4.3.1(e)(15)].*

Mitigation

1. The Permittee has no Federal offset obligation.

Increment

Apex Waste Management Center is a major source in the Hydrographic Area 216 (Garnet Valley) that has applied for a minor modification. Permitted emission units include municipal solid waste landfill operations. Since minor source baseline dates for PM_{10} (December 31, 1980), NO_2 (January 24, 1991) and SO_2 (December 31, 1980) have been triggered, Prevention of Significant Deterioration (PSD) increment analysis is required.

DAQEM modeled the source using AERMOD to track the increment consumption. Stack data submitted by the applicant were used in the model. Five years (1999 to 2003) of meteorological data from the McCarran station and Desert Rock station were used in the model. United States Geological Survey (USGS) National Elevation Dataset (NED) was used to calculate elevations. Table 8 presents the results of the modeling.

Table 8: PSD Increment Consumption

Pollutant	Averaging Period	PSD Increment Consumption by the Source (μg/m^3)	Location of Maximum Impact	
			UTM X (m)	UTM Y (m)
SO_2	3-hour	9.67[1]	691503	4028158
SO_2	24-hour	1.93[1]	691700	4028700
SO_2	Annual	0.31	691413	4029151

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PM_{10}	24-hour	28.23[1]	691536	4027155
PM_{10}	Annual	6.56	691536	4027155
NO_X	Annual	1.57	691521	4027959

[1]Modeled High 2nd High Concentration

Table 8 shows the location of the maximum impact and the potential PSD increment consumed by the source at that location. The impacts are below the PSD increment limits.

Public Notice

This ATC for a 5,000 scfm John Zink enclosed combustion flare is required go to Public Noticed because the source's uncontrolled SO_2 thresholds were above the 250 tons per year for a project for a PSD area, which requires an AQR 12.2 analysis.

Permitting History

1. The last permit was issued on December 31, 2010.
2. The last revision to the Title V Operating Permit was issued on XXXX XX, 2011.
3. The application was received by DAQEM on February 1, 2011.
4. The application was assigned to the Air Quality Specialist on February 10, 2011.
5. The application was deemed complete on April 19, 2011.
6. The TSD and draft permit were submitted for review on May 31, 2011.

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Attachments

NEI for Flare Project (tons/year)								
	PM_{10}	**$PM_{2.5}$**	**NOx**	**CO**	**SOx**	**VOC**	**HAP**	**TCS (H_2S)**
1,000 scfm Callidus Enclosed Combustor Flare EU: W07	8.37	8.37	4.89	0.27	169.98	0.26	0.09	0.01
1,400 scfm John Zink Candlestick Flare EU: W10	6.26	6.26	12.52	68.07	18.40	2.06	1.10	0.04
PTE Subtotals - Removing	**14.63**	**14.63**	**17.41**	**68.34**	**188.38**	**2.32**	**1.19**	**0.05**
5,000 scfm John Zink Enclosed Combustor Flare EU: W11	8.92	8.92	13.12	31.49	53.85	5.88	0.56	0.43
PTE Total for Project	**-5.71**	**-5.71**	**-4.29**	**-36.85**	**-134.53**	**3.56**	**-0.63**	**0.38**

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