DOCKETED

Docket Number:	15-AFC-01
Project Title:	Puente Power Project
TN #:	210502
Document Title:	Application for Certification, Puente Power Project, Oxnard, CA - Refinement to Ammonia Tank Design
Description:	N/A
Filer:	Robert L. Dickson, Jr.
Organization:	Latham & Watkins LLP
Submitter Role:	Applicant Representative
Submission Date:	2/22/2016 4:35:57 PM
Docketed Date:	2/22/2016

Application for Certification
(15-AFC-01)

Puente Power Project (P3)
Oxnard, CA

Refinement to Ammonia Tank Design

February 2016

Submitted to:
The California Energy Commission

Prepared by:

PUENTE POWER PROJECT (15-AFC-01)
REFINEMENT TO AMMONIA TANK DESIGN

1.0 INTRODUCTION

The Puente Power Project (P3) had specified the reuse of the existing Mandalay Generating Station ammonia tank and secondary containment to serve the selective catalytic reduction system for the P3 combustion turbine. After closer review of the California Building Code (CBC) relevant at the time of construction of existing secondary containment, and considering the requirements of the P3 design to meet current CBC, the Applicant intends to construct a new secondary containment and move the existing tank slightly north of the existing tank location; the new secondary containment will fulfill the requirements of CBC 2013. The new secondary containment will be designed with two safety improvements: 1) a smaller overall surface area, which will reduce potential offsite impacts under the worse-case ammonia release scenario; and 2) minimal encumbrances such as piping in the containment space to improve worker access during tank maintenance activities.

2.0 PROPOSED REFINEMENT

The design of the new secondary containment is based on the following assumptions (see attached preliminary sizing and design sketch):

1. 125 percent of tank capacity, which represents a greater containment volume than the contents of the ammonia tank plus a 25-year, 24-hour storm event;

2. Containment of approximately 20 feet by 35 feet by 54 inches tall;

3. One layer of 4-inch or 6-inch high-density polyethylene (HDPE) balls; and

4. The existing tank has a maximum capacity of 14,650 gallons, but administrative controls limit the capacity to 85 percent, or 12,450 gallons. For the purposes of the worst-case scenario analysis, the maximum capacity volume was used.

The following revised Application for Certification (AFC) figures, showing the revised location of the ammonia tank, are attached to this document:

- Revised Figure 2.1-1 Site Plan; and
- Revised Figure 2.7-1 Plot Plan.

3.0 ANALYSIS

To determine the best configuration of the secondary containment, and the mitigation measures required to reduce risk to the surrounding area, Applicant conducted the following tasks.

1. Applicant used a U.S. Environmental Protection Agency (U.S. EPA)-approved computer program to model a potential ammonia chemical release to determine the impact radius from a worst-case release scenario. This analysis assumes that the surface area of the secondary containment was used to determine the rate of ammonia evaporation into the atmosphere. All parameters used in the model were defined using the *General Guidance on Risk Management Programs for Chemical Accident Prevention*, issued by the U.S. EPA and dated March 2009. Three levels of concerns were used to evaluate the potential impacts associated with hypothetical worst-case aqueous ammonia release. The 75-part-per-million (ppm) ammonia concentration endpoint was

used as the reference point to compare offsite impacts in this exercise, while U.S. EPA-required concentrations of 150 and 200 ppm are presented as reference points.

2. With the use of a mitigation measure (one layer of 4-inch or 6-inch HDPE balls in the secondary containment) to reduce the surface area in the secondary containment, a dispersion model was run again, comparing the 75-, 150-, and 200-ppm endpoints with the original run presented in the previous paragraph.

3. A second layer of mitigation measure was evaluated (two layers of 4-inch or 6-inch HDPE balls); the same dispersion model was run for the worst-case release scenario based on the revised mitigation measure, and compared with the same end points.

Other parameters used in the Areal Location of Hazardous Atmospheres (ALOHA) model submitted with the AFC remain the same.

As shown on Revised Figure 4.5-1, the calculated threat zones for 75 ppm (California Energy Commission significance value), 150 ppm (Department of Transportation Emergency Response Program Level 2 "ERPG-2"), and 200 ppm (U.S. EPA/California Accidental Release Prevention Program Toxic Endpoint) are shown below for both the AFC analysis and the analysis for the revised secondary containment design:

Previous AFC analysis:

Condition (19%) (6-inch Balls)	Surface Area (sq. ft.)	Release Rate (lbs/min)	Total Amount Released (lbs)	200 ppm (yards)	150 ppm (yards)	75 ppm (yards)
No mitigation	1,306	30	1,555	404	478	717
One layer	122	3.45	201	127	149	216

Notes:

lbs = pounds
lbs/min = pounds per minute
ppm = parts per million
sq. ft. = square feet

New analysis with revised secondary containment (surface area of approximately 700 square feet) with 6-inch- and 4-inch-diameter balls:

Condition (19%) (6-inch Balls)	Surface Area (sq. ft.)	Release Rate (lbs/min)	Total Amount Released (lbs)	200 ppm (yards)	150 ppm (yards)	75 ppm (yards)
No mitigation	700	17	930	296	349	518
One layer	65.1	1.95	115	94	110	160
Two layers	64.61	1.93	115	94	110	159

Notes:

lbs = pounds
lbs/min = pounds per minute
ppm = parts per million
sq. ft. = square feet

Condition (19%) (4-inch Balls)	Surface Area (sq. ft.)	Release Rate (lbs/min)	Total Amount Released (lbs)	200 ppm (yards)	150 ppm (yards)	75 ppm (yards)
No mitigation	700	17	930	296	349	518
One layer	63.7	1.91	113	94	109	159
Two layers	63.7	1.91	113	94	109	159

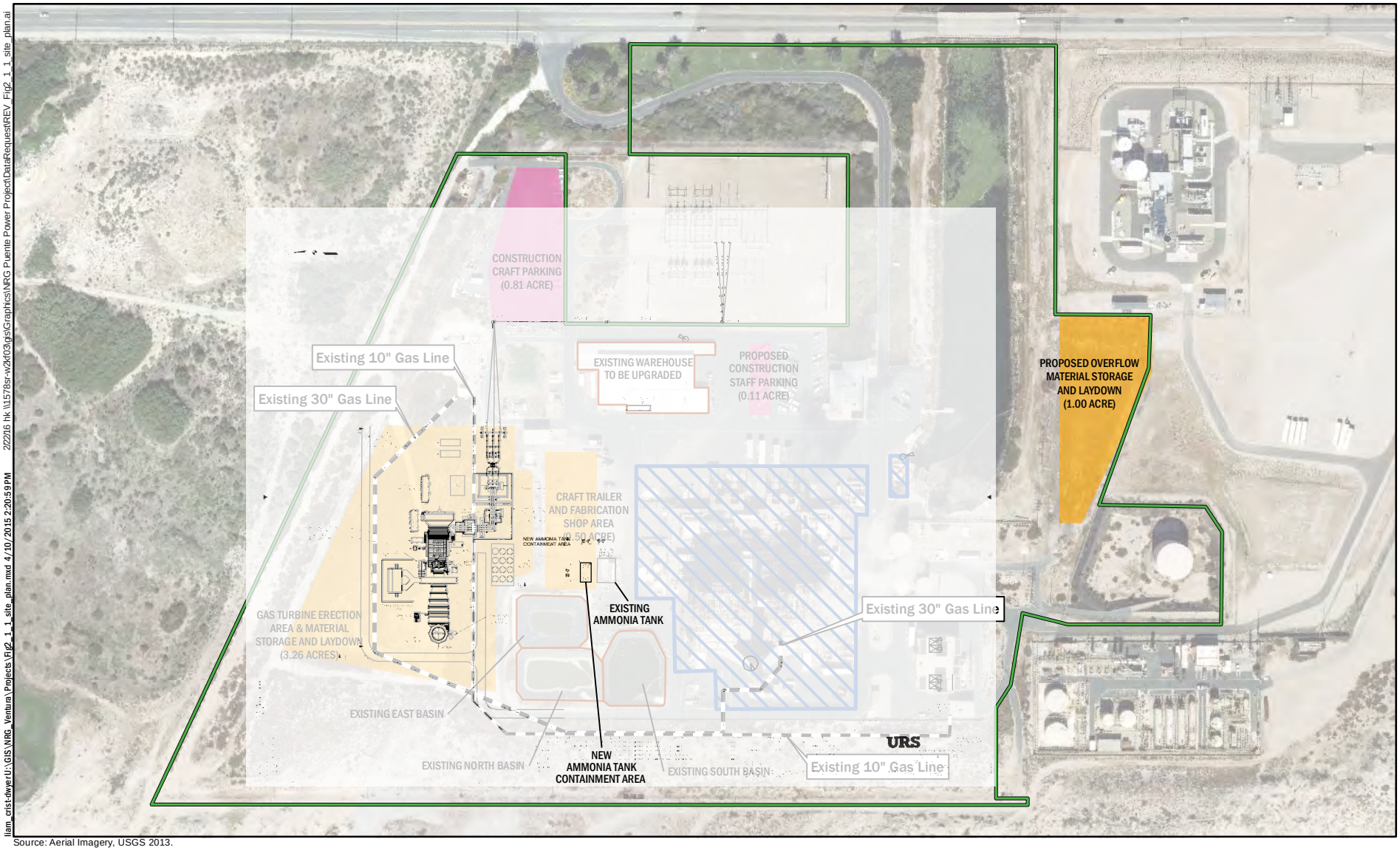
Notes:

lbs = pounds
lbs/min = pounds per minute
ppm = parts per million
sq. ft. = square feet

The nearest existing sensitive receptors to the site are residences along the northern edge of the Oxnard shores neighborhood, approximately 1,200 yards from the aqueous ammonia tank. In the future, the North Shore at Mandalay Bay residential development is anticipated to have residents approximately 0.47 mile from the site. The calculated threat zones above do not extend to any offsite sensitive receptors. A worst-case release from the ammonia tank would have a less-than-significant impact to sensitive receptors. These scenarios were the basis for ammonia dispersion modeling using the ALOHA model currently available from U.S. EPA (Version 5.4.5, released July 2015) and the worst-case meteorological data required by U.S. EPA. This worst-case release analysis relies on numerous conservative assumptions that are extremely unlikely to occur in concert, such as highest possible initial evaporation rate, maximum ambient temperature, lowest wind speeds, and stable atmospheric conditions that would result in the highest ammonia concentrations at the furthest distances from the release point. ALOHA calculated the rate of ammonia release from the resulting pooled liquid and the resulting distance to the selected 75 ppm endpoint concentration. The ALOHA Text Summary and ALOHA Toxic Threat Zone reports, which identify the distance from the release point to the 75-ppm endpoint concentration for the worst-case release, are enclosed with this document.

4.0 CONCLUSION

Taking into account the results from ALOHA modeling for the new configuration of the ammonia tank and secondary containment system, the worst-case release scenario with a single layer of 6-inch HDPE balls as a mitigation measure provides the most optimal results and is the most protective of the offsite receptors. Only a single layer of balls is recommended, because the addition of a second layer of balls had minimal impact to the dispersion model results. This is therefore proposed as the mitigation measure to be implemented on site.



Source: Aerial Imagery, USGS 2013.

Aboveground Demolition

Mandalay Generating Station Property

Construction and Laydown Areas

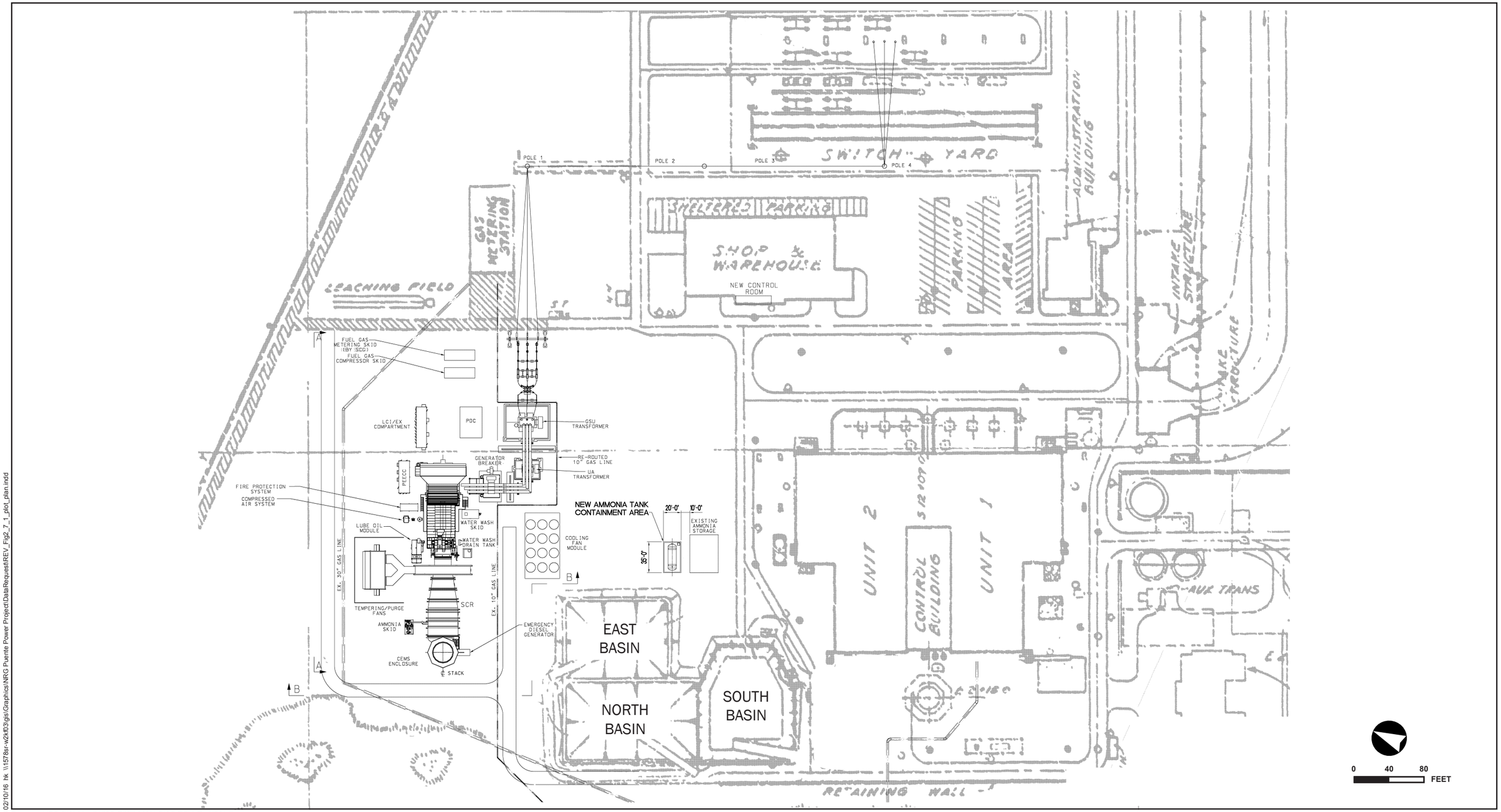
Existing Parking Used During Construction

0 125 250 Feet

SITE PLAN

NRG
Puente Power Project
February 2016 Oxnard, California

REVISED FIGURE 2.1-1



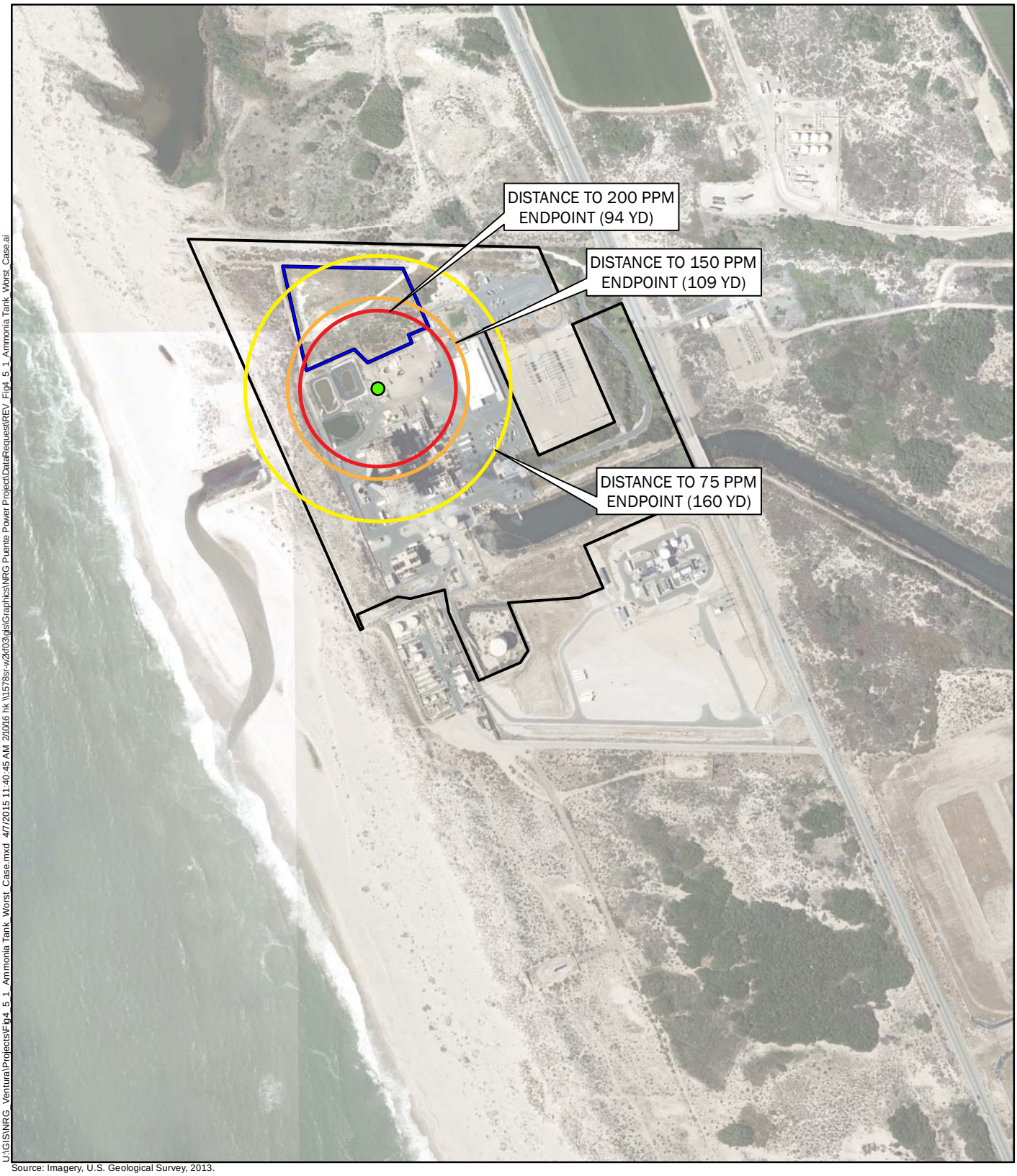
02/10/16 hk \\1578sr-w2k03\gis\Graphics\NRG Puente Power Project\DataRequest\REV_Fig2_7_1_plot_plan.indd

Source: URS DW. No. 31380-P029-MAN-SK 2 REV. E, 1/28/16.

PLOT PLAN

NRG
Puente Power Project
February 2016 Oxnard, California

REVISED FIGURE 2.7-1



U:\GIS\NRG_Ventura\Projects\Fig4_5_1_Ammonia Tank_Worst_Case.mxd 4/7/2015 11:40:45 AM 2/10/16 hk \\15785r-w2kf03\gis\Graphics\NRG Puente Power Project\DataRequestREV_Fig4_5_1_Ammonia Tank_Worst_Case.ai

Source: Imagery, U.S. Geological Survey, 2013.

AMMONIA TANK (19% WITH BALLS)
WORST-CASE RELEASE SCENARIO

Ammonia Tank Location

Puente Power Project (P3) Site

Mandalay Generating Station Property

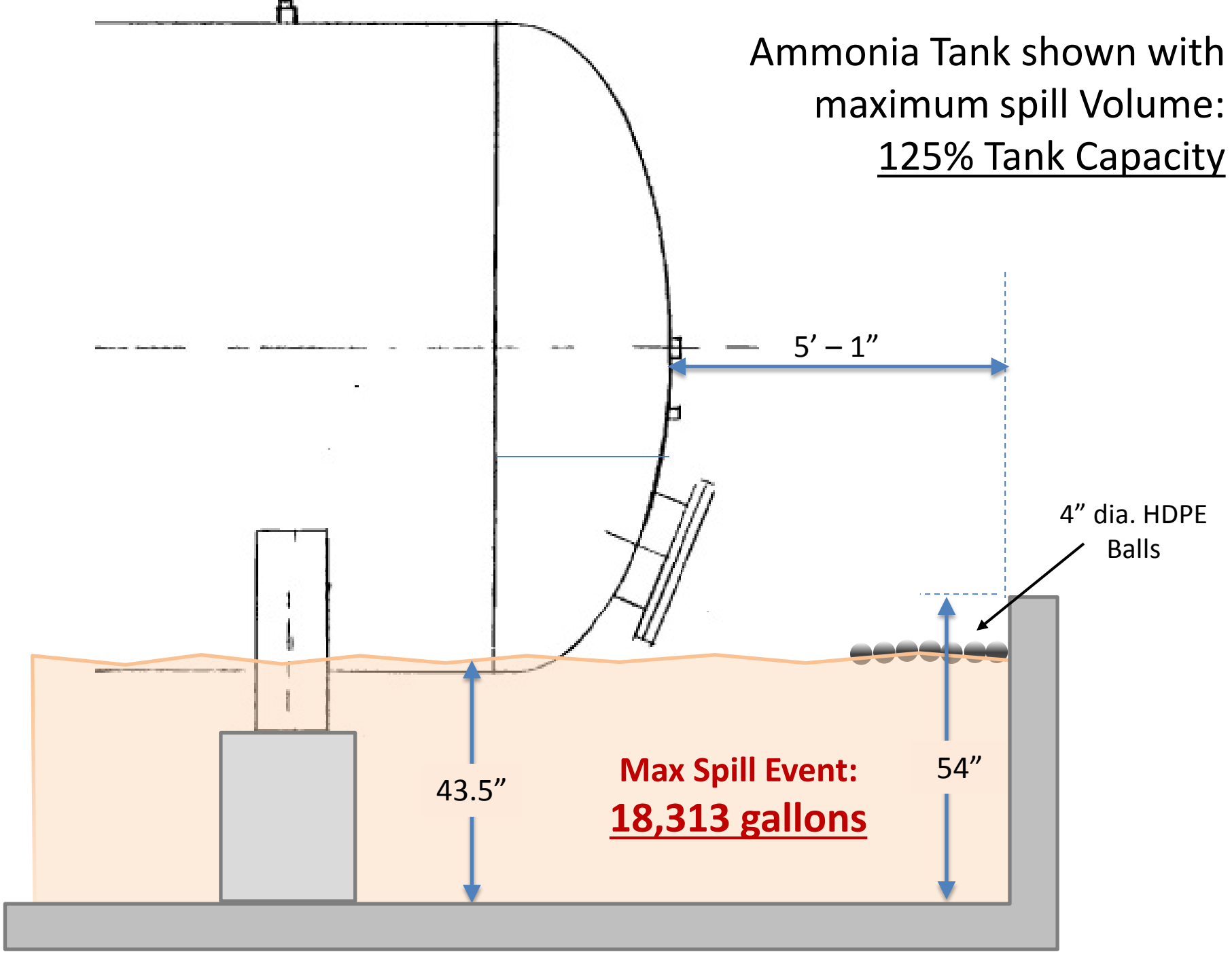
0 250 500 FEET

NRG
Puente Power Project
February 2016 Oxnard, California

REVISED FIGURE 4.5-1

Note: Distances are same for 4" and 6" balls and one or two layers.

Puente Ammonia Tank Containment Sizing	Based on Total Tank Capacity
Containment Dimensions (20'X35' inside) FT2	700
Volume of Ammonia Tank (Gal)	14,650
Foundation Size - 2'-6"X 8'-9"X 2' (FT3) (QTY 2)	87.5
Volume Factor - for rain water	1.25
Conversion of Gal to FT3	0.133681
Ammonia Volume * Volume Factor (Gal)	18,313
Ammonia Volume (FT3)	2,448
Ammonia + Foundation Volume (FT3)	2,536
Containment Height Ammonia Only (Ft)	3.62
Liquid level of spill in Containment (inches)	43.47
Plastic Surface Balls 4" (1 layer)	47.47
Plastic Surface Balls 4" (2 layers)	51.47
Containment Size	20' x 35' x 54"


Ammonia Tank shown with maximum spill Volume:
125% Tank Capacity
5’ – 1”
4” dia. HDPE Balls
43.5”
Max Spill Event:
18,313 gallons
54”

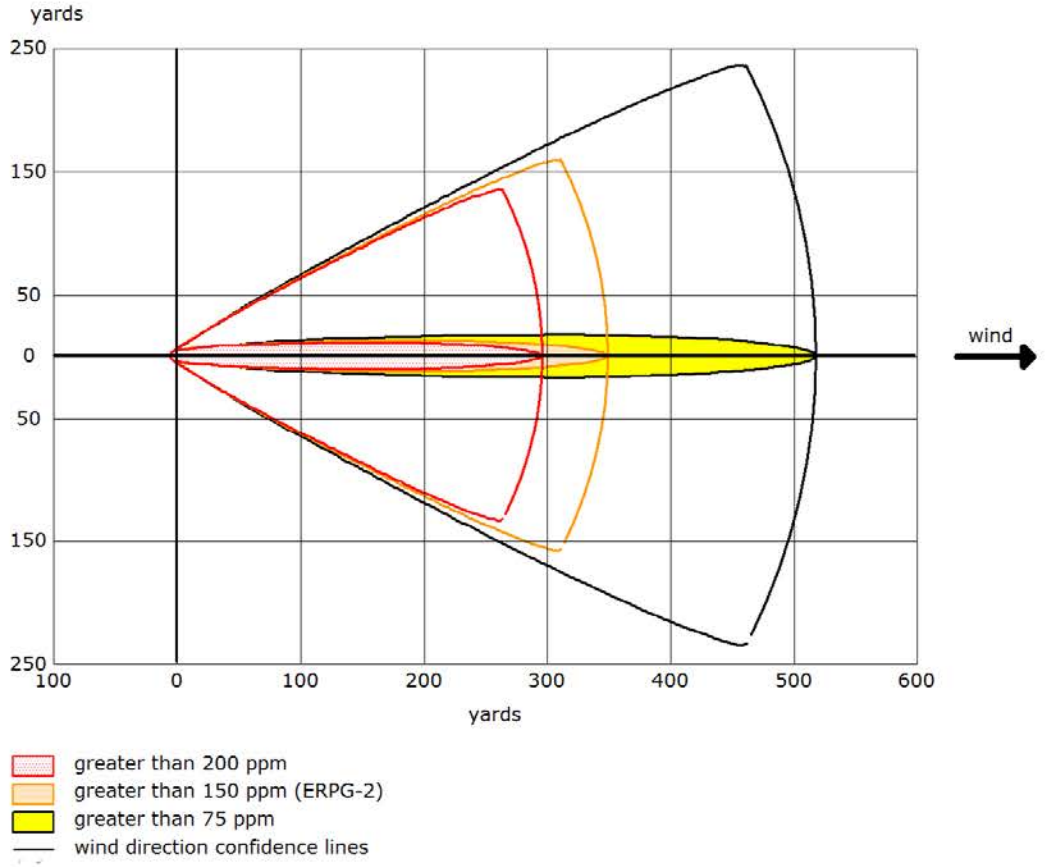
```
SITE DATA:
  Location: OXNARD, CALIFORNIA
  Building Air Exchanges Per Hour: 0.52 (unsheltered single storied)
  Time: January 29, 2016  1342 hours PST (user specified)

CHEMICAL DATA:
  Chemical Name: AQUEOUS AMMONIA
  Solution Strength: 19% (by weight)
  Ambient Boiling Point: 121.2° F
  Partial Pressure at Ambient Temperature: 0.58 atm
  Ambient Saturation Concentration: 580,475 ppm or 58.0%
  Hazardous Component: AMMONIA                Molecular Weight: 17.03 g/mol
  AEGL-1 (60 min): 30 ppm   AEGL-2 (60 min): 160 ppm   AEGL-3 (60 min): 1100
ppm
  IDLH: 300 ppm      LEL: 150000 ppm     UEL: 280000 ppm

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
  Wind: 1.5 meters/second from W at 3 meters
  Ground Roughness: urban or forest      Cloud Cover: 5 tenths
  Air Temperature: 100° F
  Stability Class: F (user override)
  No Inversion Height                    Relative Humidity: 80%

SOURCE STRENGTH:
  Evaporating Puddle (Note: chemical is flammable)
  Puddle Area: 700 square feet           Puddle Volume: 14659 gallons
  Ground Type: Concrete                  Ground Temperature: 100° F
  Initial Puddle Temperature: 81.9° F
  Release Duration: ALOHA limited the duration to 1 hour
  Max Average Sustained Release Rate: 17 pounds/min
     (averaged over a minute or more)
  Total Amount Hazardous Component Released: 930 pounds

THREAT ZONE:
  Model Run: Gaussian
  Red    : 296 yards --- (200 ppm)
  Orange: 349 yards --- (150 ppm = ERPG-2)
  Yellow: 518 yards --- (75 ppm)
```


yards
250
150
50
0
50
150
250
100
0
100
200
300
400
500
600
yards
wind
greater than 200 ppm
greater than 150 ppm (ERPG-2)
greater than 75 ppm
wind direction confidence lines

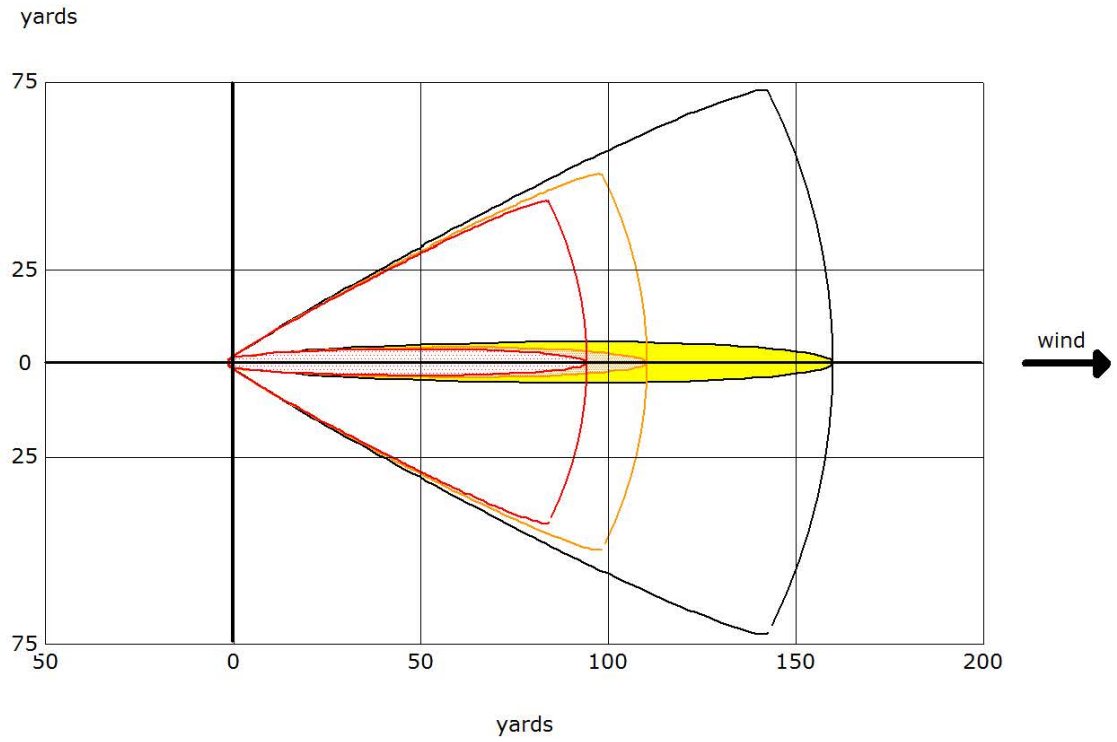
```
 SITE DATA:
   Location: OXNARD, CALIFORNIA
   Building Air Exchanges Per Hour: 0.52 (unsheltered single storied)
   Time: January 29, 2016  1342 hours PST (user specified)

 CHEMICAL DATA:
   Chemical Name: AQUEOUS AMMONIA
   Solution Strength: 19% (by weight)
   Ambient Boiling Point: 121.2° F
   Partial Pressure at Ambient Temperature: 0.58 atm
   Ambient Saturation Concentration: 580,475 ppm or 58.0%
   Hazardous Component: AMMONIA            Molecular Weight: 17.03 g/mol
   AEGL-1 (60 min): 30 ppm   AEGL-2 (60 min): 160 ppm   AEGL-3 (60 min): 1100
ppm
   IDLH: 300 ppm      LEL: 150000 ppm     UEL: 280000 ppm

 ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
   Wind: 1.5 meters/second from W at 3 meters
   Ground Roughness: urban or forest       Cloud Cover: 5 tenths
   Air Temperature: 100° F
   Stability Class: F (user override)
   No Inversion Height                     Relative Humidity: 80%

 SOURCE STRENGTH:
   Evaporating Puddle (Note: chemical is flammable)
   Puddle Area: 65.1 square feet           Puddle Volume: 14659 gallons
   Ground Type: Concrete                   Ground Temperature: 100° F
   Initial Puddle Temperature: 81.9° F
   Release Duration: ALOHA limited the duration to 1 hour
   Max Average Sustained Release Rate: 1.95 pounds/min
      (averaged over a minute or more)
   Total Amount Hazardous Component Released: 115 pounds

 THREAT ZONE:
   Model Run: Gaussian
   Red    : 94 yards --- (200 ppm)
   Orange: 110 yards --- (150 ppm = ERPG-2)
   Yellow: 160 yards --- (75 ppm)
```



greater than 200 ppm
greater than 150 ppm (ERPG-2)
greater than 75 ppm
wind direction confidence lines

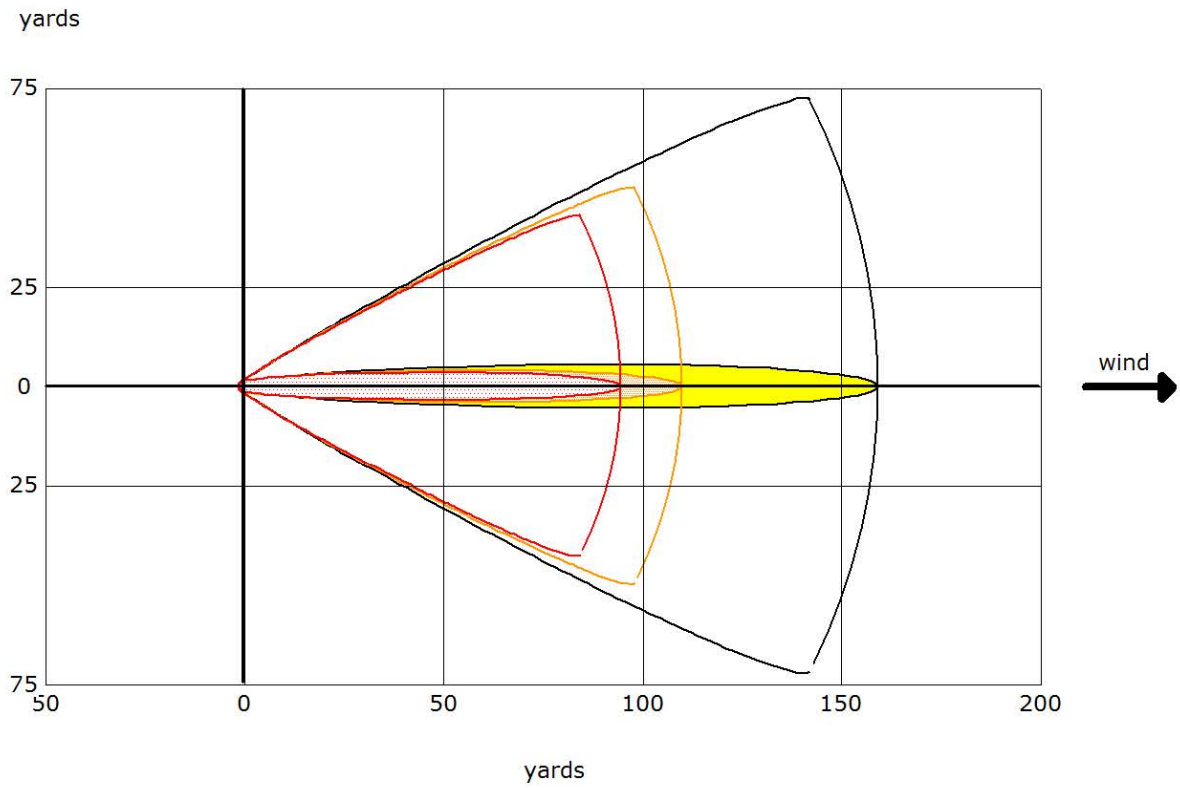
```
 SITE DATA:
   Location: OXNARD, CALIFORNIA
   Building Air Exchanges Per Hour: 0.52 (unsheltered single storied)
   Time: January 29, 2016  1342 hours PST (user specified)

 CHEMICAL DATA:
   Chemical Name: AQUEOUS AMMONIA
   Solution Strength: 19% (by weight)
   Ambient Boiling Point: 121.2° F
   Partial Pressure at Ambient Temperature: 0.58 atm
   Ambient Saturation Concentration: 580,475 ppm or 58.0%
   Hazardous Component: AMMONIA              Molecular Weight: 17.03 g/mol
   AEGL-1 (60 min): 30 ppm   AEGL-2 (60 min): 160 ppm   AEGL-3 (60 min): 1100
ppm
   IDLH: 300 ppm      LEL: 150000 ppm     UEL: 280000 ppm

 ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
   Wind: 1.5 meters/second from W at 3 meters
   Ground Roughness: urban or forest      Cloud Cover: 5 tenths
   Air Temperature: 100° F
   Stability Class: F (user override)
   No Inversion Height                    Relative Humidity: 80%

 SOURCE STRENGTH:
   Evaporating Puddle (Note: chemical is flammable)
   Puddle Area: 64.61 square feet         Puddle Volume: 14659 gallons
   Ground Type: Concrete                  Ground Temperature: 100° F
   Initial Puddle Temperature: 81.9° F
   Release Duration: ALOHA limited the duration to 1 hour
   Max Average Sustained Release Rate: 1.93 pounds/min
      (averaged over a minute or more)
   Total Amount Hazardous Component Released: 115 pounds

 THREAT ZONE:
   Model Run: Gaussian
   Red    : 94 yards --- (200 ppm)
   Orange: 110 yards --- (150 ppm = ERPG-2)
   Yellow: 159 yards --- (75 ppm)
```



greater than 200 ppm
greater than 150 ppm (ERPG-2)
greater than 75 ppm
wind direction confidence lines