

Purpose:

The purpose of this concentration lab was to determine the amount of CO₂ in the room using the HOBO meter. With the information from the CO₂ meter we were able to use the function of the air exchange rate to calculate the ventilation rate and determine Library 312's ventilation efficiency. With this information we are able to figure out whether the CO₂ concentrations have an effect on human health.

Annika Arrieta
Engineering 115
LAB 10

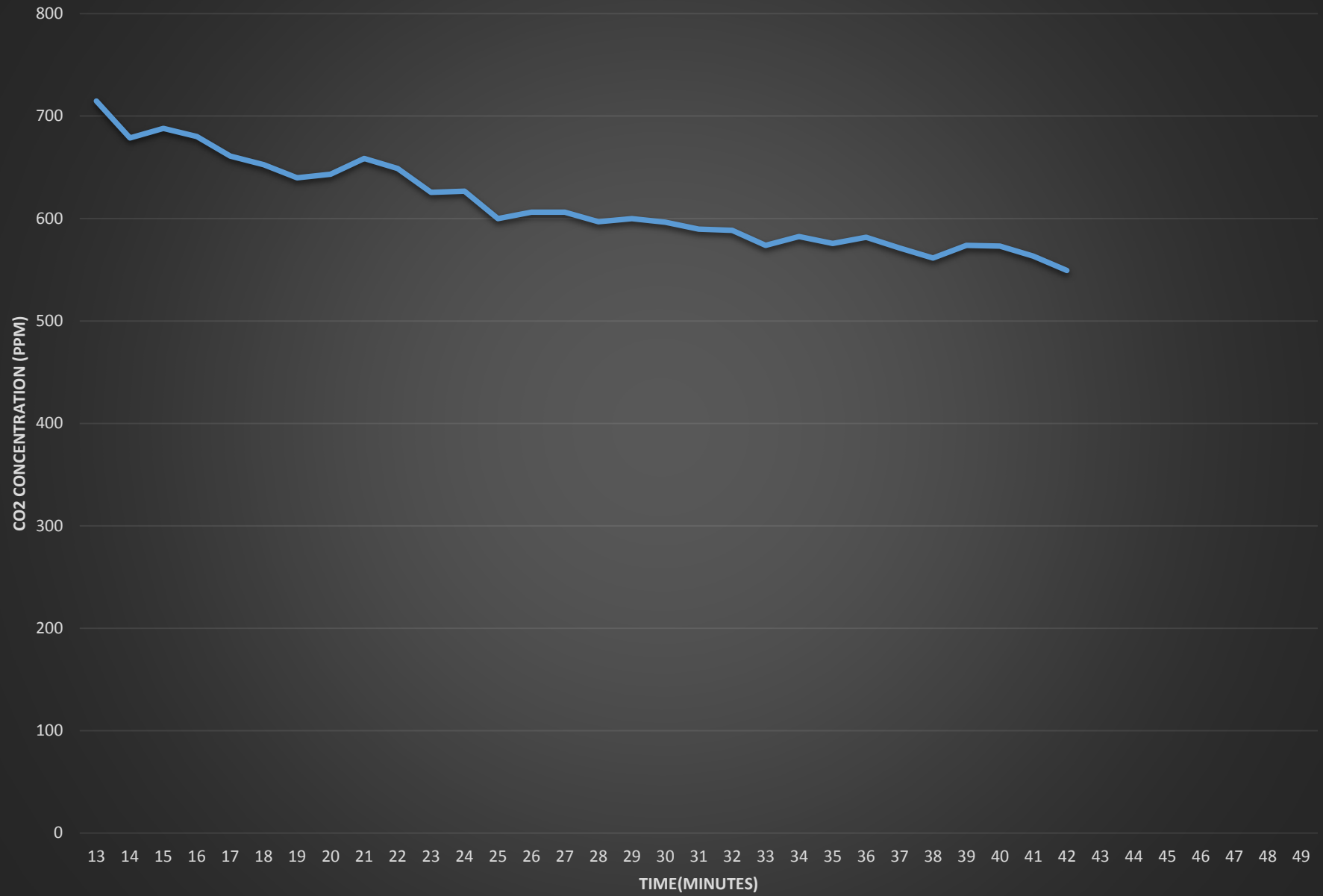
4/1/2016

Input Parameters

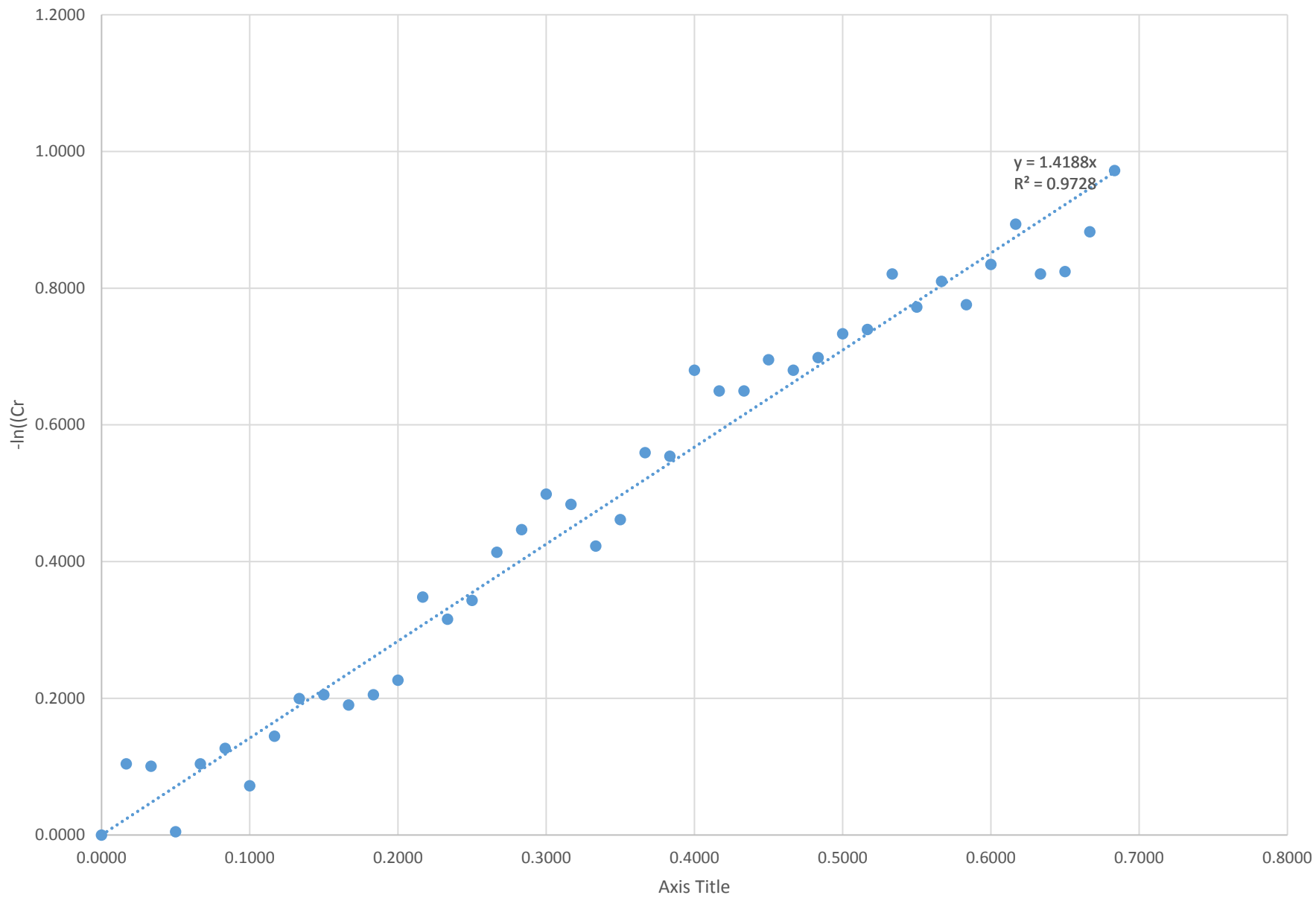
| | |
|------------------------|-----|
| Measured Coutdoor(ppm) | 380 |
| Assumed Coutdoor(ppm) | 400 |
| Correction Factor(ppm) | 20 |

| Measurement | Date and Time | Hobo CO2 concentration(ppm) | Actual CO2 Concentration(ppm) | |
|-------------|-------------------|-----------------------------|-------------------------------|-------------|
| 37 | 4/1/2016 12:17:00 | 774.7 | 794.7 | 0 |
| 38 | 4/1/2016 12:18:00 | 735.7 | 755.7 | 0.098764415 |
| 39 | 4/1/2016 12:19:00 | 736.9 | 756.9 | 0.095575467 |
| 40 | 4/1/2016 12:20:00 | 772.9 | 792.9 | 0.004349934 |
| 41 | 4/1/2016 12:21:00 | 735.7 | 755.7 | 0.098764415 |
| 42 | 4/1/2016 12:22:00 | 727.7 | 747.7 | 0.120287979 |
| 43 | 4/1/2016 12:23:00 | 747.3 | 767.3 | 0.068355781 |
| 44 | 4/1/2016 12:24:00 | 721.6 | 741.6 | 0.137016739 |
| 45 | 4/1/2016 12:25:00 | 703.3 | 723.3 | 0.188950667 |
| 46 | 4/1/2016 12:26:00 | 701.5 | 721.5 | 0.194207688 |
| 47 | 4/1/2016 12:27:00 | 706.3 | 726.3 | 0.180249916 |
| 48 | 4/1/2016 12:28:00 | 701.5 | 721.5 | 0.194207688 |
| 49 | 4/1/2016 12:29:00 | 694.7 | 714.7 | 0.214320759 |
| 50 | 4/1/2016 12:30:00 | 658.7 | 678.7 | 0.328115642 |
| 51 | 4/1/2016 12:31:00 | 667.9 | 687.9 | 0.297780312 |
| 52 | 4/1/2016 12:32:00 | 660 | 680 | 0.323772893 |
| 53 | 4/1/2016 12:33:00 | 641 | 661 | 0.389200698 |
| 54 | 4/1/2016 12:34:00 | 632.5 | 652.5 | 0.419916753 |
| 55 | 4/1/2016 12:35:00 | 619.7 | 639.7 | 0.468028249 |
| 56 | 4/1/2016 12:36:00 | 623.3 | 643.3 | 0.454261301 |
| 57 | 4/1/2016 12:37:00 | 638.6 | 658.6 | 0.397778306 |
| 58 | 4/1/2016 12:38:00 | 628.8 | 648.8 | 0.433587759 |
| 59 | 4/1/2016 12:39:00 | 605.6 | 625.6 | 0.523851171 |
| 60 | 4/1/2016 12:40:00 | 606.8 | 626.8 | 0.518977075 |
| 61 | 4/1/2016 12:41:00 | 580 | 600 | 0.633927821 |
| 62 | 4/1/2016 12:42:00 | 586.1 | 606.1 | 0.606577988 |
| 63 | 4/1/2016 12:43:00 | 586.1 | 606.1 | 0.606577988 |
| 64 | 4/1/2016 12:44:00 | 576.9 | 596.9 | 0.648118949 |
| 65 | 4/1/2016 12:45:00 | 580 | 600 | 0.633927821 |
| 66 | 4/1/2016 12:46:00 | 576.3 | 596.3 | 0.650889034 |
| 67 | 4/1/2016 12:47:00 | 569.6 | 589.6 | 0.682354415 |
| 68 | 4/1/2016 12:48:00 | 568.4 | 588.4 | 0.688096057 |
| 69 | 4/1/2016 12:49:00 | 553.7 | 573.7 | 0.761244797 |
| 70 | 4/1/2016 12:50:00 | 562.3 | 582.3 | 0.717803623 |
| 71 | 4/1/2016 12:51:00 | 555.6 | 575.6 | 0.75148361 |
| 72 | 4/1/2016 12:52:00 | 561.7 | 581.7 | 0.720773922 |
| 73 | 4/1/2016 12:53:00 | 551.3 | 571.3 | 0.773712491 |
| 74 | 4/1/2016 12:54:00 | 541.5 | 561.5 | 0.826299714 |
| 75 | 4/1/2016 12:55:00 | 553.7 | 573.7 | 0.761244797 |
| 76 | 4/1/2016 12:56:00 | 553.1 | 573.1 | 0.764347178 |
| 77 | 4/1/2016 12:57:00 | 543.3 | 563.3 | 0.816431212 |
| 78 | 4/1/2016 12:58:00 | 529.3 | 549.3 | 0.895883078 |

CO2 Concentration Lab 10



Air Exchange Rate in Library 312



Annika Arrieta
Engineering 115
LAB 10

4/1/2016

Input Parameters:

| | |
|------------------------|--------|
| Measured Coudoor(ppm) | 380 |
| Assumed Coudoor(ppm) | 400 |
| Correction Factor(ppm) | 20 |
| Room Volume(ft3) | 2194.5 |
| Room Capacity(people) | 10 |

Calculations:

| | |
|--|--------|
| Air Exchange Rate(1/hr) | 1.4188 |
| Time to remove non-reactive chemical(hr) | 2.11 |
| Ventilation Rate(ft3/min/person) | 5.1893 |

| Measurement | Date and Time | Hobo CO2 concentration(ppm) | Actual CO2 Concentration(ppm) | Experiment time(hr) | Function | |
|-------------|-------------------|-----------------------------|-------------------------------|---------------------|----------|--------|
| 0 | 4/1/2016 12:17:00 | 774.7 | 794.7 | 0.0000 | | 0.0000 |
| 1 | 4/1/2016 12:18:00 | 735.7 | 755.7 | 0.0167 | | 0.1040 |
| 2 | 4/1/2016 12:19:00 | 736.9 | 756.9 | 0.0333 | | 0.1007 |
| 3 | 4/1/2016 12:20:00 | 772.9 | 792.9 | 0.0500 | | 0.0046 |
| 4 | 4/1/2016 12:21:00 | 735.7 | 755.7 | 0.0667 | | 0.1040 |
| 5 | 4/1/2016 12:22:00 | 727.7 | 747.7 | 0.0833 | | 0.1268 |
| 6 | 4/1/2016 12:23:00 | 747.3 | 767.3 | 0.1000 | | 0.0719 |
| 7 | 4/1/2016 12:24:00 | 721.6 | 741.6 | 0.1167 | | 0.1445 |
| 8 | 4/1/2016 12:25:00 | 703.3 | 723.3 | 0.1333 | | 0.1995 |
| 9 | 4/1/2016 12:26:00 | 701.5 | 721.5 | 0.1500 | | 0.2051 |
| 10 | 4/1/2016 12:27:00 | 706.3 | 726.3 | 0.1667 | | 0.1903 |
| 11 | 4/1/2016 12:28:00 | 701.5 | 721.5 | 0.1833 | | 0.2051 |
| 12 | 4/1/2016 12:29:00 | 694.7 | 714.7 | 0.2000 | | 0.2265 |
| 13 | 4/1/2016 12:30:00 | 658.7 | 678.7 | 0.2167 | | 0.3480 |
| 14 | 4/1/2016 12:31:00 | 667.9 | 687.9 | 0.2333 | | 0.3155 |
| 15 | 4/1/2016 12:32:00 | 660 | 680 | 0.2500 | | 0.3433 |
| 16 | 4/1/2016 12:33:00 | 641 | 661 | 0.2667 | | 0.4136 |
| 17 | 4/1/2016 12:34:00 | 632.5 | 652.5 | 0.2833 | | 0.4467 |
| 18 | 4/1/2016 12:35:00 | 619.7 | 639.7 | 0.3000 | | 0.4987 |
| 19 | 4/1/2016 12:36:00 | 623.3 | 643.3 | 0.3167 | | 0.4838 |
| 20 | 4/1/2016 12:37:00 | 638.6 | 658.6 | 0.3333 | | 0.4228 |
| 21 | 4/1/2016 12:38:00 | 628.8 | 648.8 | 0.3500 | | 0.4615 |
| 22 | 4/1/2016 12:39:00 | 605.6 | 625.6 | 0.3667 | | 0.5594 |
| 23 | 4/1/2016 12:40:00 | 606.8 | 626.8 | 0.3833 | | 0.5541 |
| 24 | 4/1/2016 12:41:00 | 580 | 600 | 0.4000 | | 0.6798 |
| 25 | 4/1/2016 12:42:00 | 586.1 | 606.1 | 0.4167 | | 0.6498 |
| 26 | 4/1/2016 12:43:00 | 586.1 | 606.1 | 0.4333 | | 0.6498 |
| 27 | 4/1/2016 12:44:00 | 576.9 | 596.9 | 0.4500 | | 0.6954 |
| 28 | 4/1/2016 12:45:00 | 580 | 600 | 0.4667 | | 0.6798 |
| 29 | 4/1/2016 12:46:00 | 576.3 | 596.3 | 0.4833 | | 0.6985 |
| 30 | 4/1/2016 12:47:00 | 569.6 | 589.6 | 0.5000 | | 0.7332 |
| 31 | 4/1/2016 12:48:00 | 568.4 | 588.4 | 0.5167 | | 0.7386 |
| 32 | 4/1/2016 12:49:00 | 553.7 | 573.7 | 0.5333 | | 0.8208 |
| 33 | 4/1/2016 12:50:00 | 562.3 | 582.3 | 0.5500 | | 0.7725 |
| 34 | 4/1/2016 12:51:00 | 555.6 | 575.6 | 0.5667 | | 0.8099 |
| 35 | 4/1/2016 12:52:00 | 561.7 | 581.7 | 0.5833 | | 0.7758 |
| 36 | 4/1/2016 12:53:00 | 551.3 | 571.3 | 0.6000 | | 0.8347 |
| 37 | 4/1/2016 12:54:00 | 541.5 | 561.5 | 0.6167 | | 0.8936 |
| 38 | 4/1/2016 12:55:00 | 553.7 | 573.7 | 0.6333 | | 0.8208 |
| 39 | 4/1/2016 12:56:00 | 553.1 | 573.1 | 0.6500 | | 0.8243 |
| 40 | 4/1/2016 12:57:00 | 543.3 | 563.3 | 0.6667 | | 0.8825 |
| 41 | 4/1/2016 12:58:00 | 529.3 | 549.3 | 0.6833 | | 0.9722 |

CO2 Lab Questions

1. The air exchange rate for Library room 312 was about 1.4188.
2. For the time it takes to remove the non-reactive chemical from the room was about 2.11 hours. So, I would recommend to anyone that occupies the room to ventilate the room within about two and a half hours.
3. Compared to the ventilation Rate given by the ASHRAE organization which was 15 and the ventilation rate of the Library room 312 with 5.1 the ventilation in the Library room is less than the recommended ventilation rate. So, the occupants are being cheap and not supplying enough air to ventilate the room properly with the amount of occupants.
4. According to the ASHRAE standard rate of 15 I would recommend there not to be more than three people in this room.

Raw Data

| | | |
|----|-------------------|-------|
| 1 | 4/1/2016 11:41:00 | 654.5 |
| 2 | 4/1/2016 11:42:00 | 682.5 |
| 3 | 4/1/2016 11:43:00 | 636.1 |
| 4 | 4/1/2016 11:44:00 | 406 |
| 5 | 4/1/2016 11:45:00 | 402.9 |
| 6 | 4/1/2016 11:46:00 | 409.6 |
| 7 | 4/1/2016 11:47:00 | 382.2 |
| 8 | 4/1/2016 11:48:00 | 385.8 |
| 9 | 4/1/2016 11:49:00 | 378.5 |
| 10 | 4/1/2016 11:50:00 | 386.4 |
| 11 | 4/1/2016 11:51:00 | 449.9 |
| 12 | 4/1/2016 11:52:00 | 544.6 |
| 13 | 4/1/2016 11:53:00 | 562.3 |
| 14 | 4/1/2016 11:54:00 | 550.7 |
| 15 | 4/1/2016 11:55:00 | 557.4 |
| 16 | 4/1/2016 11:56:00 | 573.3 |
| 17 | 4/1/2016 11:57:00 | 617.8 |
| 18 | 4/1/2016 11:58:00 | 623.3 |
| 19 | 4/1/2016 11:59:00 | 640.4 |
| 20 | 4/1/2016 12:00:00 | 641 |
| 21 | 4/1/2016 12:01:00 | 642.9 |
| 22 | 4/1/2016 12:02:00 | 659.3 |
| 23 | 4/1/2016 12:03:00 | 670.9 |
| 24 | 4/1/2016 12:04:00 | 683.8 |
| 25 | 4/1/2016 12:05:00 | 700.9 |
| 26 | 4/1/2016 12:06:00 | 710.6 |
| 27 | 4/1/2016 12:07:00 | 679.5 |
| 28 | 4/1/2016 12:08:00 | 704.5 |
| 29 | 4/1/2016 12:09:00 | 703.3 |
| 30 | 4/1/2016 12:10:00 | 711.2 |
| 31 | 4/1/2016 12:11:00 | 734.4 |
| 32 | 4/1/2016 12:12:00 | 744.2 |
| 33 | 4/1/2016 12:13:00 | 733.8 |
| 34 | 4/1/2016 12:14:00 | 728.3 |
| 35 | 4/1/2016 12:15:00 | 766.8 |
| 36 | 4/1/2016 12:16:00 | 768 |
| 37 | 4/1/2016 12:17:00 | 774.7 |
| 38 | 4/1/2016 12:18:00 | 735.7 |
| 39 | 4/1/2016 12:19:00 | 736.9 |
| 40 | 4/1/2016 12:20:00 | 772.9 |
| 41 | 4/1/2016 12:21:00 | 735.7 |
| 42 | 4/1/2016 12:22:00 | 727.7 |
| 43 | 4/1/2016 12:23:00 | 747.3 |
| 44 | 4/1/2016 12:24:00 | 721.6 |
| 45 | 4/1/2016 12:25:00 | 703.3 |
| 46 | 4/1/2016 12:26:00 | 701.5 |
| 47 | 4/1/2016 12:27:00 | 706.3 |
| 48 | 4/1/2016 12:28:00 | 701.5 |
| 49 | 4/1/2016 12:29:00 | 694.7 |

| | | | | | |
|----|-------------------|-------|--------|--------|--------|
| 50 | 4/1/2016 12:30:00 | 658.7 | | | |
| 51 | 4/1/2016 12:31:00 | 667.9 | | | |
| 52 | 4/1/2016 12:32:00 | 660 | | | |
| 53 | 4/1/2016 12:33:00 | 641 | | | |
| 54 | 4/1/2016 12:34:00 | 632.5 | | | |
| 55 | 4/1/2016 12:35:00 | 619.7 | | | |
| 56 | 4/1/2016 12:36:00 | 623.3 | | | |
| 57 | 4/1/2016 12:37:00 | 638.6 | | | |
| 58 | 4/1/2016 12:38:00 | 628.8 | | | |
| 59 | 4/1/2016 12:39:00 | 605.6 | | | |
| 60 | 4/1/2016 12:40:00 | 606.8 | | | |
| 61 | 4/1/2016 12:41:00 | 580 | | | |
| 62 | 4/1/2016 12:42:00 | 586.1 | | | |
| 63 | 4/1/2016 12:43:00 | 586.1 | | | |
| 64 | 4/1/2016 12:44:00 | 576.9 | | | |
| 65 | 4/1/2016 12:45:00 | 580 | | | |
| 66 | 4/1/2016 12:46:00 | 576.3 | | | |
| 67 | 4/1/2016 12:47:00 | 569.6 | | | |
| 68 | 4/1/2016 12:48:00 | 568.4 | | | |
| 69 | 4/1/2016 12:49:00 | 553.7 | | | |
| 70 | 4/1/2016 12:50:00 | 562.3 | | | |
| 71 | 4/1/2016 12:51:00 | 555.6 | | | |
| 72 | 4/1/2016 12:52:00 | 561.7 | | | |
| 73 | 4/1/2016 12:53:00 | 551.3 | | | |
| 74 | 4/1/2016 12:54:00 | 541.5 | | | |
| 75 | 4/1/2016 12:55:00 | 553.7 | | | |
| 76 | 4/1/2016 12:56:00 | 553.1 | | | |
| 77 | 4/1/2016 12:57:00 | 543.3 | | | |
| 78 | 4/1/2016 12:58:00 | 529.3 | | | |
| 79 | 4/1/2016 12:59:00 | 584.2 | | | |
| 80 | 4/1/2016 13:00:00 | 559.8 | | | |
| 81 | 4/1/2016 13:01:00 | 428 | | | |
| 82 | 4/1/2016 13:02:00 | 404.8 | | | |
| 83 | 4/1/2016 13:03:00 | 434.1 | | | |
| 84 | 4/1/2016 13:04:00 | 366.9 | | | |
| 85 | 4/1/2016 13:05:00 | 389.5 | | | |
| 86 | 4/1/2016 13:05:00 | | Logged | | |
| 87 | 4/1/2016 13:06:00 | | | Logged | Logged |