WorleyParsons (2010a, 2010b) states that the region has a negative net evaporation, thus for the cost estimate it is assumed that approximately 20 mm, or 145 m^3 (net), of leachate will be evaporated annually from each pond. Until sufficient data is available on the monthly MSW and Industrial leachate generation rates, and the net evapo-transpiration rates have been modelled for the post-closure period, the ponds will require monitoring to ensure that acceptable levels are maintained.

Cost estimate for the final closure and post-closure costs for leachate disposal are based on the calculated leachate generation rate estimates presented in Table B and Table C.

4.6 Underdrain Management

It has been assumed that the groundwater control underdrain system (located beneath current MSW and Industrial Landfill Cells) will not be required during final and post-closure periods. The underdrain access wells will be capped and locked to prevent unauthorized access. The underdrain wells will be monitored as part of the annual monitoring to ensure no damage has occurred.

Cost associated with the underdrain system has been assumed to be zero as costs will be minimal and inspections combined with other annual monitoring events. The underdrain wells will be reclaimed as part of the groundwater monitoring reclamation to occur at the end of the post-closure care.

4.7 Leak Detection System

The MSW and Industrial leachate storage ponds (constructed 2011 and 2012, respectively) both have leak detection systems. The leak detection system will be monitored on a monthly basis (as per Leak Detection Response Action Plan) in conjunction to the surface management and leachate management systems monitoring events. Any leak detection liquids will be pumped back into the storage pond it monitors.

The cost estimate assumes minimum maintenance.

4.8 Reclamation

The CNPC Landfill end-use will be agricultural/pasture. The CNPC Landfill area will be reclaimed by grading to conform to the surrounding landscape as is reasonable in order to freely drain. The area assumed for reclamation is the area disturbed by the various landfill components and its associated infrastructure (perimeter access road, ditches, ponds, berms etc.). Approximately 26.5 hectares (ha) of area have been disturbed by CNPC Landfill operations. Approximately 6.8 ha (majority of the Old [Pre-2011] MSW Landfill and Special Waste Cells) have been reclaimed. Approximately 8.9 ha of additional Landfill area will be reclaimed as part of the final landfill cover, of which 3.7 ha have already been progressively capped with a clay barrier layer. The area outside the Landfill Cells (MSW and Industrial) footprint is 10.8 ha.

The reclamation plan will include grading, placement of topsoil, seeding and vegetation establishment within the disturbed area. A final topographic survey will be conducted on the reclaimed area after all the final closure work is completed.

The cost estimate includes reclamation of the area (outside Landfill cells footprint) as per above including the topographic survey of completed area (outside Landfill footprint).

4.9 Equipment

The CNPC Landfill Association has well maintained new or late model facility equipment that would be sold at the end of the final closure period. Some of the equipment has a guaranteed 60% buyback at the end of five years with the equipment vendor. Table D presents the current equipment and its 2016 value that is assumed in the FSP cost estimate.

Table D Landfill Equipment (Value Based on Guaranteed 60% Buyback)

Equipment	Value (CAN$)
2005 Freightliner Vacuum Truck	$65,000
2008 CAR 730 Rock Truck	$125,000
2009 CAT 725 Articulate truck	$150,000
2009 CAT 320 Track Backhoe	$125,000
2011 CAT D6 Track Dozer	$135,000
2011 Peterbuilt 348 Roll Off Truck	$80,000
2012 CAT 938 K Loader	$165,000
2012 CAT 826 H Compactor	$650,000
2013 Pro Pac SD70D Vib Packer	$25,000
2015 CAT D7 Track Dozer	$650,000
2015 CAT 323F Excavator	$300,000
2016 Peterbilt 367 Truck	$155,000
Peterbuilt Rolloff Hoist U2225 and Bins (quantity 11)	$133,000
Total	**$2,758,000**

5. POST-CLOSURE WORK PLAN

5.1 General

The work plan for the post-closure period of the CNPC Landfill will include the following:

- implementation of the Post-Closure Plan (PCP);
- inspection of final cover system;
- implementation of the gas monitoring system;
- maintenance and operations of leachate, surface water and leak detection systems; and
- on-going environmental monitoring (groundwater).

The activities discussed below comply with Sections 6.3(c), 6.3(d) of the Standards (AENV 2010).

The PCP is completed as part of the DFLCP. The PCP will be implemented during post-closure period. The PCP will include the following:

- a plan for maintaining integrity of the final cover;
- a plan for remediation of areas affected by subsidence and differential settlement;
- a plan for maintaining surface water drainage; and
- a plan for maintaining and operating the design systems (groundwater, leachate, leak detection, landfill gas).

Groundwater, surface water, leachate, leak detection, underdrain and landfill gas systems will continue to be protected, monitored and maintained, and any accumulated liquids from leachate and leak detection systems disposed of during the post-closure period. Site inspections and maintenance requirements for the various post-closure components would be coordinated when possible. A Post-Closure Care Annual Report will be prepared and submitted on an annual basis.

The cost estimates include the work plan activities as described above.

5.2 Site Infrastructure

All site infrastructure that is not required for post-closure activities will be dismantled, removed and disposed of appropriately as needed.

Site infrastructure required during the post-closure period includes the surface water management system (ditches, berms, retention pond and storm water retention pond), access roads and monitoring systems (groundwater, leachate, leak detection and landfill gas).

The site infrastructure required for the removal, collection and storage of leachate will remain during the post-closure period. At the end of the post-closure period, the leachate storage ponds (MSW and Industrial) will be remediated and site infrastructure of fencing, barricades and gates removed.

The cost estimate includes general maintenance of the remaining site infrastructure as described above for post-closure activities.

The cost estimate includes the removal and disposal of the fencing, barricades gates, and barricades and leachate storage ponds. It is anticipated that the retention ponds will meet the release criteria at the end of the post-closure period and it is assumed the retention ponds will remain as a component of the end use for future agricultural purposes.

5.3 Cap Structure

Reclamation will include semi-annual inspections (CNPC-RWMA 2007) of the final cover. Maintenance activities will include re-establishing grades where settlement occurs (major and minor subsidence) and re-seeding where vegetation has failed to become established.

The cost estimate assumes semi-annual (typically after spring thaw, summer after the spring rainy season and the fall prior to winter) inspections and minimal maintenance.

5.4 Groundwater Management

During the post-closure period, the groundwater systems will continue to be protected, monitored, sampled and maintained. The groundwater monitoring will be conducted annually (sampling, analytical) for the first five years and every second year afterwards. The parameters included in the groundwater monitoring program may be reduced over time to focus on the most diagnostic parameters. A groundwater monitoring assessment will be performed to identify the compliance wells necessary for post-closure monitoring.

Some of the groundwater wells will be decommissioned at the start of the post-closure period based on the groundwater assessment. By the end of the post-closure period, all monitoring wells will be decommissioned. Decommission/reclamation of the groundwater monitoring wells will be completed by conducting a ground disturbance survey, pulling the well casing or drilling out the well, filling with low permeability grout with work overseen by a hydro geologist (as per AENV 2008). The underdrain wells will be reclaimed in conjunction with the groundwater wells.

The cost estimate assumes no new monitoring wells are installed during the post closure period and reclamation is undertaken as described above. The cost estimate includes the field work, laboratory analysis and reporting requirements as described above. The cost estimate assumes the testing parameters remain constant.

5.5 Surface Water Management

The surface water system consists of ditches, berms and retention/storm water retention ponds and will be inspected and maintained on a semi-annual basis during the post- closure period. Any deficiencies

such as ponding water (in ditches), erosion, and siltation will be identified, corrected and documented. Frequency of inspections will be reduced after five years if warranted.

The cost estimate assumes that surface water is directed into the retention and stormwater retention ponds. The cost estimate assumes semi-annual inspections for the first five years and annual afterwards with minimal maintenance requirements. The retention ponds will remain at the end of post-closure period and incorporated into the final landform.

5.6 Leachate Management

During the post-closure period, the leachate collection and removal system will be protected, monitored (levels and leachate breakouts), maintained (components) and accumulated leachate disposed of. Leachate levels will be monitored monthly. Leachate sampling will be undertaken on an annual basis during the post-closure period at the MSW landfill sump and the Industrial landfill sump, and at the two leachate ponds. At the end of the post-closure period the leachate wells and ponds will be decommissioned and reclaimed.

The cost estimate assumes that MSW leachate (from old and current MSW Landfill Cells) will be disposed of in the MSW Leachate Storage Pond. The cost estimate assumes that Industrial leachate (from old and current Industrial Landfill Cells) will be disposal of to the Industrial Leachate Storage Pond. Based on estimated leachate generation rates, the ponds will have sufficient storage volume to accommodate the leachate generated during the post-closure period, however it has been assumed that offsite disposal will be required periodically. During post-closure period, the leachate storage ponds (MSW and Industrial) will be monitored (levels), maintained and if leachate level in the respective pond exceeds the 0.5 m minimum freeboard the leachate will be disposed of offsite.

The cost estimate includes inspections (monthly), monitoring (monthly), field work, laboratory analysis and general maintenance of the leachate collection and removal system and leachate storage ponds as per frequencies described above and will be done in conjunction with other monitoring events.

Post-closure costs for leachate disposal are based on the estimated leachate generation rates presented in Table C.

5.7 Leak Detection System

The MSW and Industrial leachate storage ponds (constructed 2011 and 2012, respectively) both have leak detection systems. The leak detection system will be monitored on a monthly basis (as per Leak Detection Response Action Plan) in conjunction to the surface management and leachate management systems monitoring events. The leak detection liquids will be returned to the storage pond it monitors. The cost estimate assumes minimum maintenance.

At the end of the post-closure period the leachate storage ponds will be reclaimed.

5.8 Landfill Gas Management

Currently, the Landfill has two dedicated landfill gas monitoring wells (near the site buildings) and also utilize the groundwater monitoring wells as landfill gas monitoring points. The leachate extraction wells to be installed as part of the final closure period will also be used to monitor landfill gas levels in the old MSW Landfill. Additional passive landfill gas venting system will be installed in the current MSW Landfill Cells. At the end of Post-closure period (minimum 25 years) the landfill gas wells will be decommissioned provided the allowable limits for monitoring have been met.

The cost estimate assumes that the landfill gas monitoring program will be monitored and inspected on an annual basis in conjunction with other monitoring events.

6. COST SUMMARY

6.1 General

The cost summary for unplanned or planned closure is presented in Table E. The cost estimate is based on Advisian's experience and standard fees, assuming that Advisian would be implementing the engineering work on behalf of the CNPC Landfill Association, and the CNPC Landfill Association would be utilizing onsite staff and equipment for inspections and regular maintenance where possible. Unit costs for activities are based on unit costs incurred on similar types of projects. Costs for unplanned or planned closure are provided in 2016 Canadian dollars, with no allowance for escalation or future discounting.

Table E Cost Summary for Unplanned or Planned Closure

Activity	Sub-Total
Preparation for Landfill Closure	$125,800
Final Closure	$1,097,311
Equipment Value	($2,758,000)
Post-Closure Care	$2,595,000
10% contingency	$106,011
Total with 10% contingency	**$1,166,122**

6.2 Financial Security Plan

The FSP will provide the CNPC Landfill Association the financial requirements for the preparation for landfill closure, final closure and post-closure periods for the CNPC Landfill and will assist them in establishing a financial reserve to meet those requirements. The type of financial assurance instrument that the CNPC Landfill Association will provide for unplanned or planned closure for the CNPC Landfill may be an irrevocable letter of credit, irrevocable letters of guarantee, performance bonds or surety bonds or other form that is acceptable to AEP. Currently the financial assurance instrument the CNPC Landfill Association has is a Term Deposit designated for Post-closure which is listed on their Financials as Term Deposit Post-Closure. As of March, 2015, the Total Closure fund value is $1,090,164.

The FSP will be maintained in the landfill operating record and the CNPC Landfill Association accounting records. The financial security requirements should be reviewed at least every five years during the CNPC Landfill's lifespan. Updates to the financial security will reflect the CNPC Landfill

status of closure as it will continue to be progressively capped and reclaimed as per the Approval/Amending Approvals.

7. FIGURES FOR REFERENCE

Refer to the following figures for infrastructure, surface water and drainage, and groundwater monitoring system/LFG well information:

- Figure 1: Existing Landfill Development;
- Figure 2: Surface Water Drainage and Management; and
- Figure 3: Groundwater Monitoring Well System and Subsurface Landfill Gas (LFG) Wells.

8. CLOSURE

We trust that this report satisfies your current requirements and provides suitable documentation for your records. If you have any questions or require further details, please contact the undersigned at any time.

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9. REFERENCES

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Tables

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Table 1: Financial Security Plan (Unplanned or Planned Closure) Cost Estimate

CLIENT: Crowsnest/Pincher Creek Landfill Association
PROJECT NO.: 307074-02060
LOCATION Crowsnest Pincher Creek Regional Landfill
PROJECT: Regional Landfill - MSW and Industrial

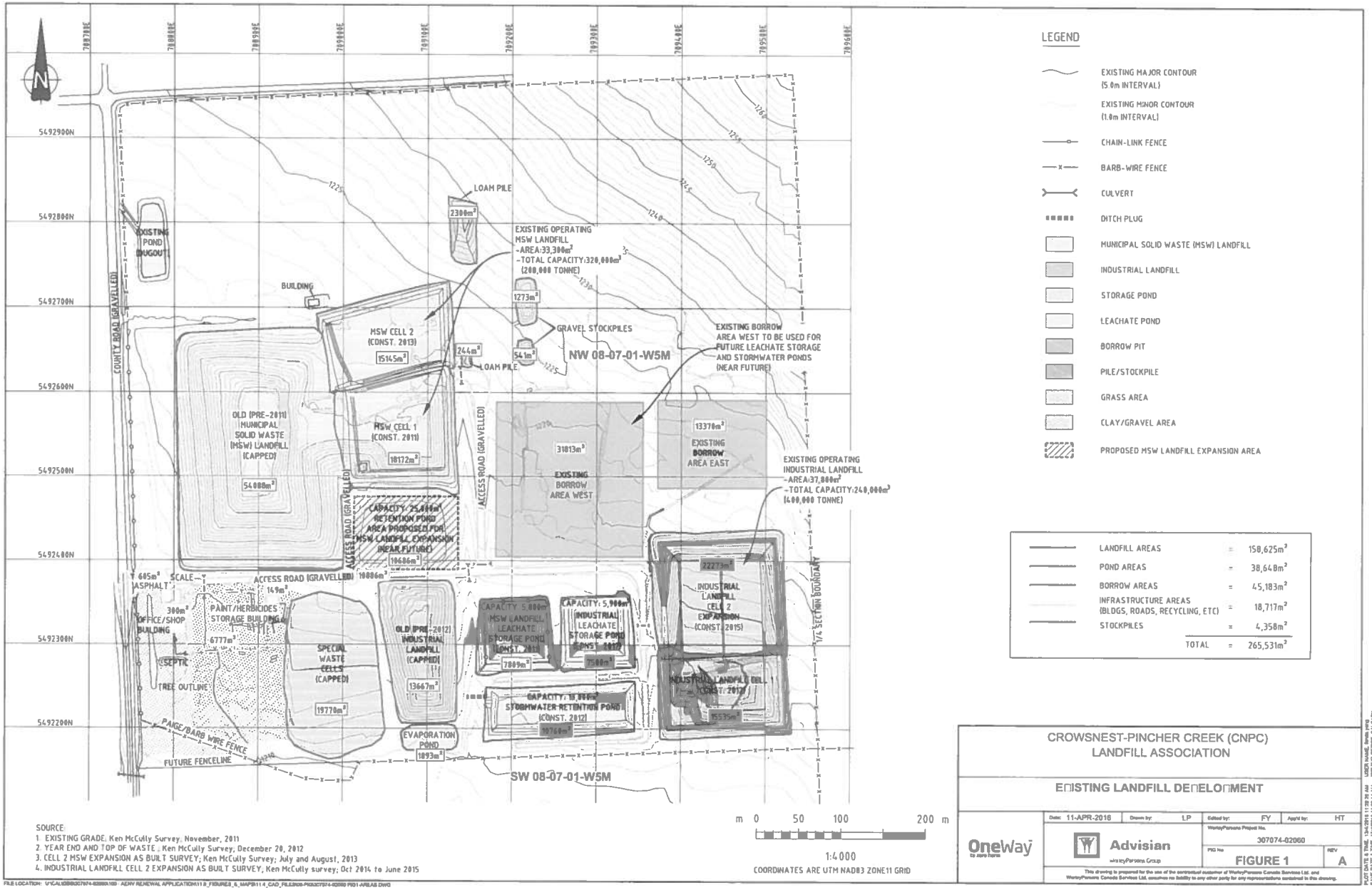
DATE: 13-May-16
BY: K. Hunn
REVISION: 1

Time Period and Activity	Quantity	Units	$/Unit	Activity Total
1. Preparation for Landfill Closure (minimum 180 days prior to Final Closure)				
1. Project Management, Planning, Coordination, Reporting	1	lot	$5,000	$5,000
2. Engineering (Site Supervision)	14	days	$1,200	$16,800
3. Site Assessment (Soils)	1	lot	$5,000	$5,000
4. Preparation of Detailed Final Landfill Closure Plan (Including Post-Closure Plan)	1	lot	$40,000	$40,000
5. Secure the Facility (Fencing, Barricades, Gates)	1	lot	$2,500	$2,500
6. Removal and Disposal of Site Infrastructure (Building, Septic System)	1	lot	$30,000	$30,000
7. Removal and Disposal of Site Infrastructure and Remediation of Area (Paint / Herbicide Storage Building)	1	lot	$5,000	$5,000
8. Removal and Disposal of Site Infrastructure and Remediation of Area (Recycling Drop off Area)	1	lot	$5,000	$5,000
9. Removal and Disposal of Site Infrastructure and Remediation of Area (Storage Area for Oils/Glycols and Batteries)	1	lot	$5,000	$5,000
10. Removal and Disposal of Site Infrastructure and Remediation of Area (Industrial Landfill Area)	1	lot	$5,000	$5,000
11. Removal and Reclamation of Evaporation Pond	1	lot	$1,500	$1,500
12. Topographic Survey of Waste Elevation Where Capping is Required (Barrier Layer), MSW (3.65 ha)	1	lot	$3,500	$3,500
13. Topographic Survey of Waste Elevation Where Capping is Required (Barrier Layer), Industrial (0.91 ha)	1	lot	$1,500	$1,500
			Subtotal	$125,800
2. Final Closure (assume completed within a 18 month period)				
1. Project Management, Planning, Coordination, Reporting	1	lot	$10,000	$10,000
2. Engineering (Construction Specifications and Drawings)	1	lot	$40,000	$40,000
3. Maintenance of Perimeter Access Road, Ditches and Berms	1	lot	$15,000	$15,000
4. Mobilization and Demobilization (External Contractor)	1	lot	$10,000	$10,000
5. Waste Grading in Preparation for Capping (MSW Cap Area)	3.40	ha	$2,500	$8,500
6. Waste Grading in Preparation for Capping (Industrial Cap Area)	1.80	ha	$2,500	$4,500
7. Construction of the Barrier Layer, MSW (Assumed Thickness of 0.6 m and Onsite Material), 3.4 ha	20,053	m^3	$6.00	$120,319
8. Construction of the Barrier Layer, Industrial (Assumed Thickness of 0.6 m and Onsite Material) 1.8 ha	10,657	m^3	$6.00	$63,943
9. Placement of the Subsoil / Topsoil Layer, MSW and Industrial (assumed maximum thickness 0.35 and 0.25, onsite material)	49,237	m^3	$4.00	$196,949
10. Seeding and Vegetation Establishment MSW and Industrial (within Landfill Capped Area), 10.8 ha	8.26	ha	$2,000	$16,520
11. Supervision during Construction	60	days	$1,500	$90,000
12. QA/QC Barrier Layer Testing and Reporting (Submission to AENV)	10	days	$1,500	$15,000
13. Topographic Survey (25 m x 25 m grid) of Completed Final Cover System, MSW and Industrial (10.8 ha)	1	lot	$8,500	$8,500
14. Drafting and Clerical	1	lot	$2,500	$2,500
15. Preparation and Submission of Final Landfill Closure Report (MSW and Industrial)	1	lot	$10,000	$10,000
16. Landfill Gas System Installation, within current MSW Landfill cell (Passive Vents)	6	vents	$1,000	$6,000
17. Installation of Leachate Extraction Wells Within Old MSW Landfill Cell	2	wells	$7,500	$15,000
18. Groundwater Monitoring, Laboratory Analysis and Reporting (Semi-Annual)	3	rounds	$15,000	$45,000
19. Surface Water, Sampling of Down-gradient Stream (three times per year) and annual samples from each retention pond.	5	lot	$1,500	$7,500
20. Leachate, Leak Detection, Surface Water Systems, Protection, Monitoring and Maintenance (Monthly)	18	rounds	$1,500	$27,000
21. Leachate Removal and Disposal MSW (to offsite disposal, municipal wastewater treatment plant))	3150	m^3	$60	$189,000
22. Leachate Removal and Disposal Industrial (to offsite disposal, deep well)	2250	m^3	$60	$135,000
23. Leachate Removal and Disposal MSW (to MSW Leachate Storage Pond)	1,200	m^3	$5	$6,000
24. Leachate Removal and Disposal Industrial (to Industrial Leachate Storage Pond)	1,756	m^3	$5	$8,780
25. Landfill Gas System Protection, Monitoring and Maintenance (Annual, completed in conjunction with GW and other monitoring events)	n/a	n/a	n/a	n/a
26. Site Grading in Preparation for Reclamation (Disturbed Area Outside Landfill Waste Areas), 10.8 ha	10.8	ha	$1,500	$16,200
27. Topsoil, Seeding and Vegetation Establishment (Disturbed Area Outside Landfill Capped Area), 10.8 ha	10.8	ha	$2,000	$21,600
28. Topographic Survey of Reclaimed Disturbed Area Outside Landfill Capped Area (10.4 ha)	1	lot	$8,500	$8,500
			Subtotal	$1,097,311
28. Buyback Landfill Equipment (Articular Truck, Backhoe, Dozer, Roll-off Truck, Loader, Compactor)	1	lot	-$2,758,000	-$2,758,000
			Subtotal	-$1,660,689
3. Post-closure (Minimum 25 years - Annual Maintenance and Monitoring)				
1. Project Management, Planning, Coordination, Reporting	25	year	$2,000	$50,000
2. Removal and Disposal of Site Infrastructure (Site Office, Fencing, Gates, Barricades)	1	lot	$30,000	$30,000
3. Maintenance of Road System for Monitoring (Annual)	25	year	$3,500	$87,500
4. Site Inspections (Annual)	25	year	$1,500	$37,500
5. Reclamation Assessment	1	lot	$2,500	$2,500
6. Final Cover System Maintenance, MSW and Industrial (Semi-Annual, 3x/yr. For First Five Years and 2x/yr. after)	55	rounds	$1,500	$82,500
7. Groundwater Protection, Monitoring, Maintenance, Laboratory Analysis and Reporting (First 5 Years Annually, after 5 Years Every 2 Ye	15	rounds	$10,000	$150,000
8. Leachate, Leak Detection, Surface Water Systems, Protection, Monitoring and Maintenance (Monthly)	300	rounds	$1,500	$450,000
9. Sampling of Down-gradient Stream (3 times Annually) and annual samples from each retention pond	75	rounds	$1,500	$112,500
10. Leachate Laboratory Analysis and Reporting MSW and Industrial - 4 samples per year (Annual)	100	rounds	$3,000	$300,000
11. Leachate Removal and Disposal MSW (to MSW Leachate Collection Pond)	7,100	m^3	$5	$35,500
12. Leachate Removal and Disposal Industrial (to Industrial Leachate Collection Pond)	10,400	m^3	$5	$52,000
13. Leachate Removal and Disposal MSW (Offsite Disposal)	7,100	m^3	$60	$426,000
14. Leachate Removal and Disposal Industrial (Offsite Disposal)	10,400	m^3	$60	$624,000
15. Landfill Gas Systems, Protection, Monitoring and Maintenance (Annual, completed in conjunction with GW and other monitoring events	n/a	n/a	n/a	n/a
16. Preparation and Submission of Post-closure Care Annual Report (Annual)	25	year	$5,000	$125,000
17. Reclamation of Leachate Ponds (MSW and Industrial) at the End of Post-closure Period	2	pond	$2,500	$5,000
18. Decommission of Groundwater Wells at Start and End of Post-closure Period	1	lot	$15,000	$15,000
19. Preparation and Submission of End of Post-closure Report	1	lot	$10,000	$10,000
			Subtotal	$2,595,000
			Contingency 10%	$106,011
			PROJECT TOTAL	**$1,166,122**

Notes:

1. Note these prices do not include GST and do not take inflation into account.
2. MSW refers to both the old MSW (pre-2011) and the current MSW (2011) landfill Cells 1 and 2.
3. Industrial refers to both the old Industrial (pre-2012) and the current Industrial (2012 and 2015) landfill cells 1 and 2.
4. Surface water system includes Stormwater Retention Pond (Industrial) and Retention Pond (MSW).
5. Based on Conditions Anticipated January 2016 (Figure 1, Rev B Closure / Post-closure Planning Model).

Figures



LANDFILL AREAS	=	158,625m²
POND AREAS	=	38,648m²
BORROW AREAS	=	45,183m²
INFRASTRUCTURE AREAS (BLDGS, ROADS, RECYCLING, ETC)	=	18,717m²
STOCKPILES	=	4,358m²
TOTAL	=	265,531m²

SOURCE:
1. EXISTING GRADE; Ken McCully Survey, November, 2011
2. YEAR END AND TOP OF WASTE ; Ken McCully Survey; December 20, 2012
3. CELL 2 MSW EXPANSION AS BUILT SURVEY; Ken McCully Survey; July and August, 2013
4. INDUSTRIAL LANDFILL CELL 2 EXPANSION AS BUILT SURVEY; Ken McCully survey; Oct 2014 to June 2015

CROWSNEST-PINCHER CREEK (CNPC) LANDFILL ASSOCIATION

EXISTING LANDFILL DEVELOPMENT

OneWay

Advisian WorleyParsons Group

Date: 11-APR-2016 | Drawn by: LP | Edited by: FY | Appv'd by: HT

WorleyParsons Project No. 307074-02060

PSG No. FIGURE 1 | REV A

FILE LOCATION: U:\CALGIS\GIS\307074-02060\103 - AENV RENEWAL APPLICATION\113_FIGURES_&_MAPS\114_CAD_FILES\GIS-FIG\307074-02060 FIG1-AREAS.DWG

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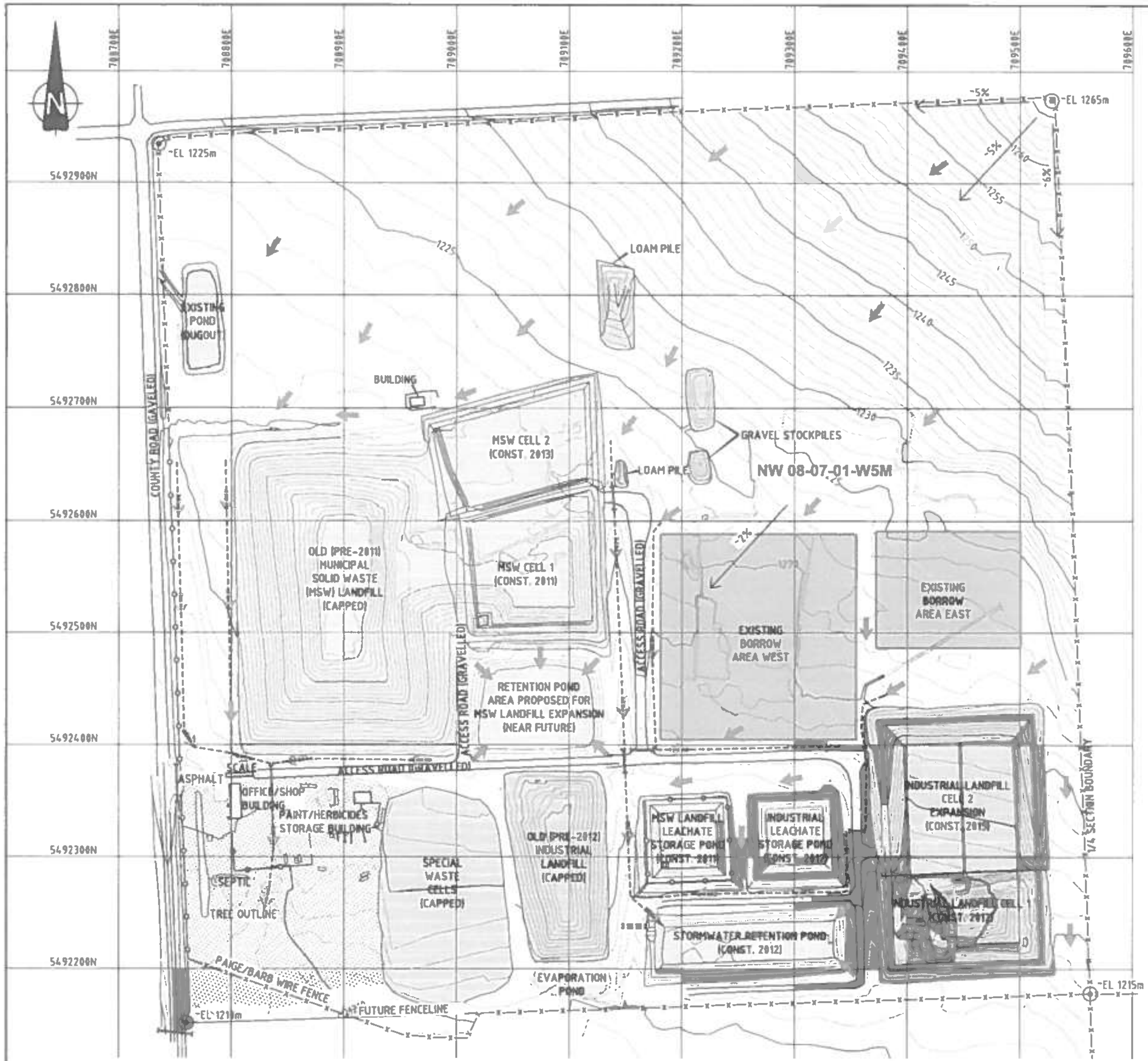

LEGEND

- EXISTING MAJOR CONTOUR (5.0m INTERVAL)
- EXISTING MINOR CONTOUR (1.0m INTERVAL)
- CHAIN-LINK FENCE
- BARB-WIRE FENCE
- CULVERT
- ~EL 1265m — APPROXIMATE EXISTING GROUND ELEVATION AT SITE CORNERS
- ~5% — APPROXIMATE SLOPE OF EXISTING GROUND
- SURFACE DRAINAGE DITCH / SWALE
- SURFACE DRAINAGE DIRECTION
- DITCH PLUG
- MUNICIPAL SOLID WASTE (MSW) LANDFILL
- INDUSTRIAL LANDFILL
- STORAGE POND
- LEACHATE POND
- BORROW PIT
- PILE/STOCKPILE
- GRASS AREA
- CLAY/GRAVEL AREA

SURFACE WATER DRAINAGE AND MANAGEMENT CONDITIONS

TYPE	DESCRIPTION
REGULATORY SETTING	- APPROVAL #18701-01-00 - AMENDING APPROVAL #18701-01-01 - AMENDING APPROVAL #18701-01-02
SITE TOPOGRAPHY	- SEE DRAWING AT LEFT - HIGH POINT = NE CORNER, EL. 1265m - LOW POINT = SW CORNER, EL. 1210m
GENERAL SURFACE FEATURES, LANDFORM AND VEGETATION	- CARDSTON PLAIN PHYSIOGRAPHIC DISTRICT - GENERAL LANDFORM: UNDULATING; INCLINED RIDGES; AND ROLLING, HUMMOCKY TERRAIN - SIGNIFICANT FEATURE: COWLEY RIDGE - GENERAL VEGETATION: FESCUE GRASSLAND ECOREGION
LANDFILL SITE DRAINAGE AND SURFACE WATERCOURSES	- SEE FIGURE 2 (THIS DRAWING)
PRE-DISTURBANCE SETTING AND CONDITION	- LAND MASS USED FOR LIVESTOCK GRAZING PRIOR TO 1976

SOURCE:
1. EXISTING GRADE; Ken McCully Survey; November, 2011
2. YEAR END AND TOP OF WASTE ; Ken McCully Survey; December 20, 2012
3. CELL 2 MSW EXPANSION AS BUILT SURVEY, Ken McCully Survey, July and August, 2013
4. INDUSTRIAL LANDFILL CELL 2 EXPANSION AS BUILT SURVEY, Ken McCully survey; Oct 2014 to June 2015

m 0 50 100 200 m

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COORDINATES ARE UTM NAD83 ZONE11 GRID

CROWSNEST-PINCHER CREEK (CNPC) LANDFILL ASSOCIATION

SURFACE WATER DRAINAGE AND MANAGEMENT

Date: 13-APR-2016 | Drawn by: LP | Edited by: FY | Appr'd by: HT

OneWay

Advisian WorleyParsons Group

WorleyParsons Project No. 307074-02060

FIGURE 2 REV A

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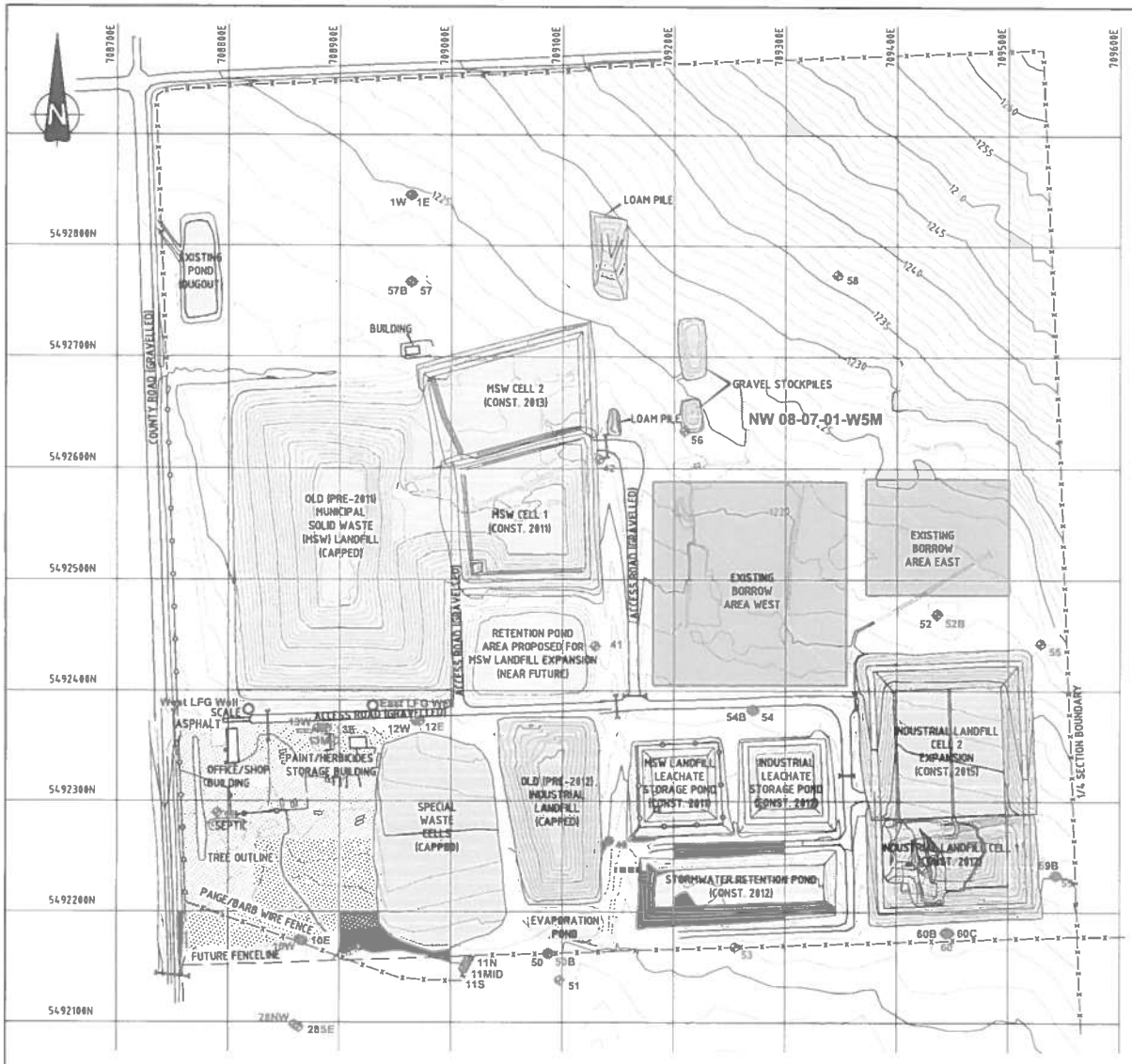
FILE LOCATION: U:\CAL\00083\307074-02060\100 - AENV RENEWAL APPLICATION\11.0_FIGURES_&_MAPS\11.4_CAD_FILES\08-FIG\307074-02060 FIG2 WATER MANAGEMENT.DWG



LEGEND

- EXISTING MAJOR CONTOUR (5.0m INTERVAL)
- EXISTING MINOR CONTOUR (1.0m INTERVAL)
- CHAIN-LINK FENCE
- BARB-WIRE FENCE
- CULVERT
- DITCH PLUG
- MONITORING WELL LOCATION
- SUBSURFACE LANDFILL GAS (LFG) WELL LOCATION
- MUNICIPAL SOLID WASTE (MSW) LANDFILL
- INDUSTRIAL LANDFILL
- STORAGE POND
- LEACHATE POND
- BORROW PIT
- PILE/STOCKPILE
- GRASS AREA
- CLAY/GRAVEL AREA

COORDINATE TABLE

WELL NAME	NORTHING	EASTING	GROUND ELEVATION	TOP OF CASING ELEVATION
1E	5492845.353	708964.981	1224.450	1225.290
1W	5492845.375	708963.233	1224.530	1225.320
9B	5492289.598	708798.414	1214.730	1215.530
10E	5492173.546	708867.510	1211.370	1212.200
10W	5492174.781	708863.563	1211.370	1212.200
11N	5492156.869	708915.564	1209.520	1210.390
11MID	5492152.363	708913.784	1209.520	1210.350
11S	5492148.360	708911.673	1209.510	1210.260
12E	5492372.768	708971.898	1217.170	1218.000
12W	5492372.792	708967.986	1217.170	1217.930
13E	5492366.145	708888.606	1215.630	1216.530
13MID	5492366.896	708884.459	1215.680	1216.530
13W	5492366.114	708880.339	1215.640	1216.200
28NW	5492097.705	708859.717	1209.880	1209.760
28SE	5492095.448	708863.428	1208.960	1209.720
48	5492264.273	709114.774	1214.491	1215.453
41	5492448.147	709129.150	1218.850	1219.450
42	5492680.338	709133.162	1219.950	1220.350
50	5492162.261	709006.573	1210.243	1211.014
50B	5492162.380	709008.295	1210.215	1210.954

COORDINATE TABLE

WELL NAME	NORTHING	EASTING	GROUND ELEVATION	TOP OF CASING ELEVATION
51	5492138.452	709097.742	1209.486	1210.241
52	5492468.680	709435.672	1223.178	1223.886
52B	5492469.394	709436.415	1223.195	1223.982
53	5492168.855	709254.778	1210.528	1211.744
54	5492382.306	709271.897	1218.844	1218.702
54B	5492382.306	709269.806	1218.813	1218.871
55	5492442.278	709528.922	1222.834	1223.450
56	5492633.819	709289.285	1224.456	1225.074
57	5492767.361	708964.789	1222.867	1223.585
57B	5492767.396	708963.342	1222.886	1223.595
58	5492773.642	709346.534	1235.948	1236.529
59	5492233.098	709543.670	1215.188	1215.862
59B	5492233.349	709541.870	1215.152	1215.819
60	5492181.193	709445.057	1212.542	1213.399
60B	5492181.471	709443.658	1212.525	1213.430
60C	5492181.665	709447.304	1212.546	1213.422
East LFG Well	5492386.248	708929.682	-	-
West LFG Well	5492382.727	708818.171	-	-

SOURCE
1. EXISTING GRADE, Ken McCully Survey; November, 2011
2. YEAR END AND TOP OF WASTE , Ken McCully Survey; December 20, 2012
3. CELL 2 MSW EXPANSION AS BUILT SURVEY, Ken McCully Survey; July and August, 2013
4. INDUSTRIAL LANDFILL CELL 2 EXPANSION AS BUILT SURVEY, Ken McCully survey; Oct 2014 to June 2015
5. MONITORING & METHANE WELL LOCATIONS, Ceilidh Environmental Ltd , Dec 2015

CROWSNEST-PINCHER CREEK (CNPC) LANDFILL ASSOCIATION

GROUNDWATER MONITORING WELL SYSTEM AND SUBSURFACE LANDFILL GAS (LFG) WELLS

OneWay

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WorleyParsons Group

Date: 13-APR-2016 | Drawn by: LP | Edited by: FY | Appvd by: HT

WorleyParsons Project No. 307074-02060

FIG No. FIGURE 3 | REV A

FILE LOCATION: U:\CALG\SBS\307074-02060\100 - AEW RENEWAL APPLICATION\11.0_FIGURES_&_MAPS\11.4_CAD_FILES\SGS-PROJ\307074-02060 FIG3-GW MON WELL.DWG

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Appendix 5 Environmental Concerns

Table 1. Environmental Concerns Identified During Stakeholder Engagement

Concern	How the concern will be addressed
Air emissions (generally)	Using the design specifications of a specialized incinerator, the CNPC commissioned an accredited air emissions modelling company to predict emissions and compare them to provincial standards. The emissions are expected to be entirely within regulatory requirements, and in fact will result in a small fraction of the maximums permitted by accepted requirements (e.g. no parameter is predicted to be greater than 4% of the Alberta Ambient Air Quality Objectives (Alberta Environment & Parks, 2016).
Odour	Due to incinerator design, odour from the incinerator is not expected to be negligible at the landfill boundary
Off-site noise concerns	Due to incinerator design, noise from the incinerator is expected to be negligible at the landfill boundary
Appropriateness of technology	The CNPC considers that the design proposed comprises Best Available Technology Economically Achievable (BATEA) for its intended purpose of incineration and that an incinerator is the preferred option of disposal of the waste components identified in this application.
Potential for harmful emissions from plastics incineration	Emissions from plastics incineration varies depending upon the technology used, and the plastic feedstock. based upon the incinerator technology contemplated in the application, and the intended feedstock of agricultural plastics which is intended to be polyethylene (e.g. silage bags, bale twine), which is comprised of carbon and hydrogen.
Polychlorinated biphenyl (PCB) emissions	The CNPC has no plan to process material containing (or that would produce) PCBs.
Input of industrial waste into the incinerator	Similar to how the rest of the landfill operates, the CNPC expects that any Amendment Approval will stipulate what material will be allowed to be inputted to the incinerator.
Potential for variation in the waste mix in future operations	See above.

Concern	How the concern will be addressed
Long term effects on the surrounding area, and timeline for contamination of the surrounding area	The air quality assessment shows that the predicted emissions of contaminants will register as a very small fraction of the maximum of the regulated emission standards (e.g. Alberta Ambient Air Quality Objectives). Such standards are designed, in part, to minimize the potential for long term effects on the surrounding area. Therefore, the CNPC believes the risk of long term effects on the surrounding area is negligible.
Fate of the contaminants emitted	The dispersion plumes modelled show that the maximum contaminant concentrations (which are a small fraction of the regulated emission standards) will occur within the landfill boundary. As distance from the incinerator stack increases, the concentration in the air decreases.
Ash management	The CNPC will update its Operations Plan to ensure that ash is appropriately managed as it is collected and transported to an active landfill cell.
Operations Compliance	Similar to how the rest of the landfill operates, the CNPC expects that any Amendment Approval will stipulate how the incinerator may be operated, and the Approval will include provisions for compliance and enforcement action.
Management of animal-based biomass prior to incineration	The CNPC will have an enclosed storage bay for animal-based biomass that will include a drainage and collection system to capture any liquids.
Potential for contaminants on Oldman River Dam	The CNPC notes that the maximum concentrations of contaminants (which are still a small fraction of the regulated emission standards) will occur within the landfill boundary and will be monitored as per the Amendment Approval.
Toxins within the ash	The CNPC expects there to be negligible toxins within the ash derived from the combustion of animal-derived biomass, polyethylene, and clean wood waste. The CNPC will update its Operations Plan to ensure that ash is disposed of appropriately within the landfill.

Appendix 6 Air Quality Assessment Report

NORTH SHORE
Environmental Consultants

Integrated Sustainability Consultants Ltd.
Air Quality Assessment
Proposed Incinerator Addition
Crowsnest-Pincher Creek Landfill Association (CNPC)

January 2017

EPEA Approval No: 0018701-01-02

Rev: 01

Commissioned for:
Integrated Sustainability Consultants Ltd.
Attn: Amanda Jardine, P. Ag.
600, 540 5th Ave SW
Calgary, Alberta
T2P 0M2

EXECUTIVE SUMMARY

Integrated Sustainability Consultants Ltd. (Integrated Sustainability) retained North Shore Environmental Consultants (North Shore) to perform dispersion modelling for the Crowsnest Pass-Pincher Creek Landfill Association (CNPC) Regional Landfill. CNPC operates under Alberta Environmental Protection and Enhancement Act (EPEA) Approval No. 0018701-01-02 and is located at LSD 12-08-007-01 W5M.

Integrated Sustainability is preparing an EPEA Approval Amendment Application for the addition of an incinerator for the CNPC Landfill. The purpose of the incinerator is for use in the incineration of livestock, poultry, swine and wildlife carcasses from surrounding ranches, farms and municipal districts as well as meat from the Canadian Food Inspection Agency.

North Shore has prepared a dispersion modelling assessment for the Landfill in support of the EPEA Approval Amendment Application. This report is a new revision that incorporates five more contaminants in the assessment. The dispersion modelling was performed to predict ground-level concentrations of the following contaminants resulting from the operation of the incinerator.

- Total Particulate Matter (TPM);
- Particulate matter less than 2.5 microns ($PM_{2.5}$);
- Total oxides of Nitrogen (NOx) that is converted to Nitrogen dioxide (NO_2);
- Carbon Monoxide (CO);
- Sulphur dioxide (SO_2);
- Hydrochloric Acid (HCl);
- Lead (Pb);
- Chromium (Cr);
- Dioxins and Furans;
- Polycyclic aromatic hydrocarbons (PAH);
- Cadmium (Cd);
- Copper (Cu), and;
- Mercury (Hg).

The dispersion modelling was performed according to the requirements of the Alberta Air Quality Model Guideline (AQMG) and used the AERMOD V15181 dispersion model. This report was prepared in accordance with the requirements outlined in the AQMG (October 2013).

Typical expected stack emissions from the incinerator were determined by Eco Waste Solutions. Three waste mixes were considered: Mix 1, Mix 2, and Mix 3. In order to mitigate possible community concern, additional receptor grids were placed at four nearby residences.

The maximum ground level concentration (MGLC) is the sum of predicted concentrations from dispersion modelling and ambient background. Mix 3 was determined to have the highest emissions; the MGLCs for Mix 3 is summarized below:

Table: Maximum Ground Level Concentration (MGLC) results for Mix 3.

Scenario	Averaging Period	Mix 3 ($\mu g/m^3$)	AQS ($\mu g/m^3$)
TPM	24 hour	1.068874	100
	Annual	0.075241	60
$PM_{2.5}$ [(a)]	24 hour	14.19964	28
	Annual	8.262578	10
NO_2 [(b)]	1 hour	32.46643	300
	Annual	11.53421	45
CO	1 hour	345.9537	15000
	8 hour	300.1986	6000
SO_2	1 hour	6.99842	450
	24 hour	4.020009	125
	30 day	2.901321	30
	Annual	2.26956	20
HCl	1 hour	0.870417	75
Pb	1 hour	0.001211	1.5
Cr	1 hour	0.001023	1
Dioxin and Furans [(c)]	24 hour	4.5E-06	0.1
PAH	24 hour	6.41E-07	5E-05
	Annual	4.52E-08	1E-05
Cadmium	24 hour	1.68E-05	0.025
	Annual	1.18E-06	0.005
Copper	24 hour	0.003454	50
Hg	24 hour	1.15E-06	2

Notes: [(a)] $PM_{2.5}$ emission rates were conservatively assumed to be equal to TPM emission rates.

[(b)] Total conversion method was used to convert NO_x to NO_2.

[(c)] Dioxins and Furans concentration is in pg/m^3 TEQ, not $\mu g/m^3$.

The results of the dispersion modelling were compared to applicable Air Quality Standards (AQS) from various jurisdictions. AQS were obtained from Alberta Ambient Air Quality Objectives (AAAQO), Ontario Ambient Air Quality Criteria (OAAQC), and the Canada Ambient Air Quality Standards (CAAQS).

The results of the dispersion modelling indicate that maximum ground-level concentrations (MGLC) of all contaminants emitted from the incinerator are predicted to be well within the AQS and therefore, it is the position of North Shore that the proposed incinerator is not a risk to air quality.

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1 INTRODUCTION

Integrated Sustainability Consultants Ltd. (Integrated Sustainability) retained North Shore Environmental Consultants (North Shore) to perform dispersion modelling for the Crowsnest Pass-Pincher Creek Landfill Association (CNPC) Regional Landfill. CNPC operates under Alberta Environmental Protection and Enhancement Act (EPEA) Approval No. 0018701-01-02 and is located at LSD 12-08-007-01 W5M.

The focus of the assessment is for the addition of a proposed incinerator on site. The purpose of the incinerator is for use in the incineration of livestock, poultry, swine and wildlife carcasses from surrounding ranches, farms and municipal districts as well as meat from the Canadian Food Inspection Agency.

North Shore has prepared this dispersion modelling assessment for the Landfill in support of the EPEA Approval Amendment Application. Dispersion modelling was performed to predict ground-level concentrations of numerous contaminants resulting from the operation of the proposed incinerator.

2 SETTING

The CNPC Landfill is located 3 km southeast from the village of Cowley. The project area map is provided in Figure 1, located in Appendix B.

2.1 Topography

The CNPC Landfill is located in the Subalpine Natural Subregion. Topography within this Subregion ranges from approximately 1350 m in the Grande Prairie area, rising to approximately 1700 m along the Bow River Corridor (Natural Regions Committee 2006). The elevation of CNPC is approximately 1216 m. Topographical maps of the 7.5 km radius around the Plant are provided in Figure 2, located in Appendix B.

2.2 Vegetation

Vegetation patterns in in the Subalpine Natural Subregion are influenced by elevation, topography and latitude. Closed fire-origin lodgepole pine forests with Engelmann spruce and subalpine fir characterize the Lower Subalpine zone. The Upper Subalpine zone is forested by closed Englemann spruce-subalpine fir forests that become more open near the forest line and include subalpine larch and whitebark pine (Natural Regions Committee 2006). Immediately surrounding the CNPC Landfill is primarily grassland and farmland.

2.3 General Climatology

Short, cool, wet summers and long, cold winters with heavy snows are typical of the Subalpine Natural Subregion. It receives more year-round precipitation on average than most other Natural Subregions.

Average winter temperatures are slightly higher than the adjacent Natural Subregions because of the influence of the continental polar cold air masses does not last as long. Chinooks are an infrequent influence in the Subalpine Natural Subregion, except in the major east-west mountain valleys.

Location can play a significant role in diurnal temperature variations and explains in part the very large range in monthly mean, maximum and minimum temperature values, and frost free periods. In the valley bottom and lower slope terrain, daytime temperatures in summer are usually warmer in valleys than on upper slopes. However, cold air can pool in valley bottoms at night, reducing the growing season significantly and retarding or preventing tree growth in some locales where frost may occur at any time (Natural Regions Committee 2006).

2.4 Population and Public Use

The Subalpine Natural Subregion provides valuable wildlife habitat and recreational opportunities. Timber harvesting is a significant activity but productivity is low, regeneration is slow, and harvesting and regeneration can be difficult because of steep slopes. Cattle grazing occurs on native rangelands and disturbed areas (Natural Regions Committee 2006).

3 EMISSION SOURCES

3.1 CNPC Emission Sources

CNPC is proposing to add an incinerator to the Landfill. The purpose of the incinerator is for use in the incineration of livestock, poultry, swine and wildlife carcasses from surrounding ranches, farms and municipal districts as well as meat from the Canadian Food Inspection Agency.

The most dominant source in the CNPC Landfill is the proposed incinerator. There are no other emissions of relevance in the Landfill. The incinerator will emit the following contaminants:

- Total Particulate Matter (TPM);
- Particulate matter less than 2.5 microns ($PM_{2.5}$);
- Total oxides of Nitrogen (NOx) that is converted to Nitrogen dioxide (NO_2);
- Carbon Monoxide (CO);
- Sulphur dioxide (SO_2);
- Hydrochloric Acid (HCl);
- Lead (Pb);
- Chromium (Cr);
- Dioxins and Furans;
- Polycyclic aromatic hydrocarbons (PAH);
- Cadmium (Cd);
- Copper (Cu), and;
- Mercury (Hg).

Typical expected stack emissions from the incinerator were determined by Eco Waste Solutions (see Appendix C for calculations by Eco Waste Solutions). Three waste mixes were considered: Mix 1, Mix 2, and Mix 3. Table 1 describes each mix composition.

Table 1. Waste Mix Compositions

	Carcass	Agricultural Plastics	Wood Wastes
Mix 1	70%	20%	10%
Mix 2	60%	30%	10%
Mix 3	73.9%	17.4%	8.7%

Table 2 shows the details of the incinerator emission and stack parameters for each waste mix.

The incinerator will only be in operation 12 hours a day. The daily emission rate is weighted in order to model the incinerator as a continuous source.

There were no emission rates available for $PM_{2.5}$. However, since this is a substance of community concern, it was included in this assessment. $PM_{2.5}$ was conservatively assumed to be equal to TPM.

Table 2. Incinerator emission and stack parameters

Contaminant		Mix 1		Mix 2		Mix 3	
		Hourly Rate	Daily Rate (12 h)	Hourly Rate	Daily Rate (12 h)	Hourly Rate	Daily Rate (12 h)
		g/s	g/s	g/s	g/s	g/s	g/s
TPM		0.084722	0.042419	0.079722	0.039792	0.103333	0.05169
$PM_{2.5}$		0.084722	0.042419	0.079722	0.039792	0.103333	0.05169
NOx		0.208333	0.10412	0.195278	0.097685	0.253889	0.126887
CO		0.060833	0.03037	0.056944	0.028495	0.073889	0.037014
SO_2		0.105556	0.052789	0.093889	0.046921	0.135556	0.067731
HCl		0.022222	0.011065	0.020833	0.010382	0.026944	0.013484
Pb		3.08E-05	1.54E-05	2.89E-05	1.45E-05	3.75E-05	1.88E-05
Cr		2.61E-05	1.3E-05	2.44E-05	1.22E-05	3.17E-05	1.59E-05
Dioxin and Furans		3.56E-13	1.78E-13	3.33E-13	1.67E-13	4.33E-13	2.18E-13
PAH		5.08E-08	2.55E-08	4.78E-08	2.38E-08	6.19E-08	3.1E-08
Cadmium		1.39E-06	6.94E-07	1.11E-06	5.79E-07	1.67E-06	8.1E-07
Copper		0.000274	0.000137	0.000257	0.000129	0.000334	0.000167
Hg		8.33E-08	4.17E-08	8.33E-08	4.17E-08	1.11E-07	5.56E-08
Stack Height	(m)	11.201					
Stack Diameter	(m)	1.1176					
Stack Flow Rate	(m3/h)	38926		36636		47327	
Exit Velocity	(m/s)	11.02236047		10.3739197		13.40120367	
Exit Temp	(K)	1273.15					

Note: Emission calculations by Eco Waste Solutions (see Appendix C).

3.2 Background Emission Sources

There are no facilities with significant and continuous sources within 5 km of CNPC.

4 DISPERSION MODELLING APPROACH

All dispersion modelling was performed in accordance to the requirements of the Alberta Air Quality Modelling Guideline (AQMG) (August 2013).

4.1 Refined Model

The latest version of the AERMOD dispersion model (V15181) was used in this assessment. AERMOD is a multi-source, steady state plume model that was developed by the United States (US) Environmental Protection Agency (EPA) in collaboration with the American Meteorological Society. More information on the AERMOD model can be found at:

http://www.epa.gov/scram001/7thconf/aermod/aermod_mfd.pdf

The AERMOD output files are provided in Appendix D.

4.2 Meteorology

Five years of meteorological data were extracted from the Alberta Environment and Parks (AEP) Fifth Generation NCAR/Penn State Mesoscale Model V3.5 (MM5). Landuse Classification Codes (LCC) were processed for the study area. The MM5 and LCC data were then processed by AERMET, the meteorological data pre-processor for the AERMOD model.

4.3 Terrain

Canadian Digital Elevation Data was extracted from GeoGratis Canada and processed by AERMAP, the terrain pre-processor for the AERMOD model.

4.4 Receptor Grid

The receptor grids utilized in this assessment follow the requirements as stated in the AQMG. They are as follows:

- 20-m receptor spacing from the origin
- 50-m receptor spacing within 0.5 km from the origin
- 250-m receptor spacing within 2.5 km from the origin
- 500-m spacing within 5 km from the origin
- 1000-m spacing beyond 5 km

As the CNPC Landfill is accessible to the public, receptors were not removed from within the fenceline of the landfill.

Additional receptor networks were placed at nearby residences in order to ensure all sensitive receptors were considered. 20-m receptor spacing was placed at each residence. See Figure 1 in Appendix B for the location of each residence relative to CNPC.

4.5 Air Quality Standards

Results were compared to the Air Quality Standards (AQS). Many of the contaminants included in this assessment did not have an applicable Alberta Ambient Air Quality Objective (AAAQO). Therefore relevant standards from the Ontario were used for comparison.

Table 3 indicates the AQS that were applied.

Table 3. Applicable ambient air quality criteria.

		AQS	Unit	Standard
PM	24 hour	100	µg/m3	AAAQO
	Annual	60	µg/m3	AAAQO
$PM_{2.5}$ [(a)]	24 hour	28	µg/m3	CAAQS
	Annual	10	µg/m3	CAAQS
NO_2	1 hour	300	µg/m3	AAAQO
	Annual	45	µg/m3	AAAQO
CO	1 hour	15000	µg/m3	AAAQO
	8 hour	6000	µg/m3	AAAQO
SO_2	1 hour	450	µg/m3	AAAQO
	24 hour	125	µg/m3	AAAQO
	30 day	30	µg/m3	AAAQO
	Annual	20	µg/m3	AAAQO
HCl	1 hour	75	µg/m3	AAAQO
Pb	1 hour	1.5	µg/m3	AAAQO
Cr	1 hour	1	µg/m3	AAAQO
Dioxin and Furans	24 hour	0.1	pg TEQ/m3	OAAQC
PAH	24 hour	0.00005	µg/m3	OAAQC
	Annual	0.00001	µg/m3	OAAQC
Cadmium	24 hour	0.025	µg/m3	OAAQC
	Annual	0.005	µg/m3	OAAQC
Copper	24 hour	50	µg/m3	OAAQC
Hg	24 hour	2	µg/m3	OAAQC

Notes: [(a)] CAAQS for $PM_{2.5}$ are the 2015 objective standards.

4.6 Relationship between NO_x and NO_2

There are several species of nitrogen oxides, but only NO_2 is specified in the AAAQO. Most sources emit uncertain ratios of these species and these ratios change further in the atmosphere due to chemical reactions. A method to determine the amount of NO_2 emitted from a source of NO_x must be utilized in order to directly compare to the AAAQO.

In this dispersion modelling assessment, a conservative approach called Total Conversion Method was used. This approach assumes that the emission rate of all NO_x species is used in the dispersion model to predict ground-level concentrations of total NO_x. These levels of NO_x are assumed to exist as 100% NO_2.

4.7 Background Concentrations

In accordance with the AQMG, background concentrations are added to the concentrations predicted by the model for a more accurate representation of cumulative predicted ground-level concentrations.

There are no monitoring stations located in a representative area similar to the project study area. The closest monitoring station is the Lethbridge Monitoring Station, located approximately 95 km east of CNPC. The Lethbridge Monitoring Station is located an urban city region, and has much higher baseline emissions than the project study area. In this dispersion modelling assessment, background concentrations from Lethbridge were used for a conservative assessment.

Measured 1-hour values of $PM_{2.5}$, NO_2, CO, and SO_2 from January 1, 2015 to December 31, 2015 were used to estimate the 90th percentile concentrations for each averaging period. See Table 4.

The calculated 90th percentile background concentrations of each contaminant were then added to the ground level concentrations predicted by the air dispersion modelling to calculate the maximum ground level concentration (MGLC). The MGLC is defined as the sum of the predicted modeling results and the ambient background.

The remainder of the contaminants (TPM, HCl, Pb, Cr, Dioxins and Furans, PAH, Cd, Cu, and Hg) are contaminants that are not commonly monitored, and therefore there were no ambient background concentrations available.

Table 4. Ambient background used for calculation of the MGLC

Contaminant	Averging Period	Ambient Background ($\mu g/m^3$)
$PM_{2.5}$	24 hour	13.13
	Annual	8.19
NO_2	1 hour	24.26
	Annual	11.35
CO	1 hour	343.57
	8 hour	297.76
SO_2	1 hour	2.62
	24 hour	2.62
	30 day	2.62
	Annual	2.17

4.8 Approach

This dispersion modelling assessment involves a single source with fixed emission parameters. The only variable is the emission rate per contaminant. Therefore the dispersion for each contaminant will be the same, only the magnitude of concentration will be different. The incinerator was modelled at 1 g/s and post processing calculations determined the ground level concentrations for each contaminant.

5 DISPERSION MODELLING RESULTS

Mix 1, Mix 2, and Mix 3 were modelled. Mix 3 was determined to have the highest emissions and the ground level concentrations of each contaminant predicted by the dispersion modelling are presented in Table 5. The results of Mix 1 and Mix 2 can be seen in Table 8 and Table 9 in Appendix A.

Table 5. Mix 3 maximum predicted ground level concentrations

Scenario	Averaging Period	Location UTM NAD83 Zone 11N		Predicted	Background	MGLC	AQS	Predicted /AQS
		mE	mN	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	%
TPM	24 hour	709004.6	5492300.5	1.069	-	1.069	100	1.07%
	Annual	709064.6	5492340.5	0.075	-	0.075	60	0.13%
$PM_{2.5}$ [(a)]	24 hour	709004.6	5492300.5	1.069	13.1	14.200	28	3.82%
	Annual	709064.6	5492340.5	0.075	8.2	8.263	10	0.75%
NO_2 [(b)]	1 hour	709004.6	5492300.5	8.202	24.265	32.466	300	2.73%
	Annual	709064.6	5492340.5	0.185	11.350	11.534	45	0.41%
CO	1 hour	709004.6	5492300.5	2.387	343.567	345.954	15000	0.02%
	8 hour	709004.6	5492300.5	2.441	297.758	300.199	6000	0.04%
SO_2	1 hour	709004.6	5492300.5	4.379	2.619	6.998	450	0.97%
	24 hour	709004.6	5492300.5	1.401	2.619	4.020	125	1.12%
	30 day	709064.6	5492360.5	0.282	2.619	2.901	30	0.94%
	Annual	709064.6	5492340.5	0.099	2.171	2.270	20	0.49%
HCl	1 hour	709004.6	5492300.5	0.870	-	0.870	75	1.16%
Pb	1 hour	709004.6	5492300.5	0.001	-	0.001	1.5	0.08%
Cr	1 hour	709004.6	5492300.5	0.001	-	0.001	1	0.10%
Dioxin and Furans [(c)]	24 hour	709004.6	5492300.5	0.000004	-	0.000	0.1 pg/m^3	0.004%
PAH	24 hour	709004.6	5492300.5	0.0000006	-	0.000	0.00005	1.28%
	Annual	709064.6	5492340.5	0.00000005	-	0.000	0.00001	0.45%
Cadmium	24 hour	709004.6	5492300.5	0.00002	-	0.000	0.025	0.07%
	Annual	709064.6	5492340.5	0.000001	-	0.000	0.005	0.02%
Copper	24 hour	709004.6	5492300.5	0.003	-	0.003	50	0.01%
Hg	24 hour	709004.6	5492300.5	0.000001	-	0.000	2	0.0001%

Notes: [(a)] $PM_{2.5}$ emission rates were conservatively assumed to be equal to TPM emission rates.
[(b)] Total conversion method was used to convert NO_x to NO_2.
[(c)] Dioxins and Furans concentration is in pg/m^3 TEQ, not $\mu g/m^3$.

The results of the dispersion modelling indicate that the MGLC of all contaminants emitted from the proposed incinerator are predicted to be well within the AQS.

The MGLC for each contaminant was also calculated as a percentage of the applicable AQS. As seen in the last column of Table 5, most of the contaminants are less than 1% of the AQS. The highest percentage is for $PM_{2.5}$, at 3.82% of the AQS.

Figure 3 in Appendix B shows the locations of the MGLC's for all contaminants, all located within the CNPC Landfill fenceline.

5.1 Visual Representation – Concentration Isopleths

Concentration isopleths are used to visually represent the predicted concentrations over the project study area. Isopleths for this assessment can be found in Appendix B.

The AQMG states that "the study area must include all predicted ground-level concentrations (from the project), at or above 10% of the ambient air quality objectives or baseline value, whichever is higher". In this assessment, all predicted ground-level concentrations are below 10% of the ambient air quality objectives or baseline values. Therefore according to the AQMG, there is no relevant study area for this assessment.

However, as a result of the low concentrations predicted by this assessment, predicted concentrations that were greater than 1% (instead of the suggested 10%) of the ambient background or the AQS were determined to have a relevant study area.

Table 6 shows the calculations made to determine the relevant study area based on the dispersion modelling assessment. The last column of Table 6 shows the calculated 1% threshold of the ambient background or AQS per contaminant. Numbers bolded and underlined indicate that the predicted concentration for that contaminant exceeds the 1% threshold.

Table 6. Study area analysis

Scenario	Averaging Period	Predicted	Background	AQS	1% of Background/AQS
		($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)
TPM	24 hour	1.069	-	100	**1.000**
	Annual	0.075	-	60	0.600
$PM_{2.5}$ [(a)]	24 hour	1.069	13.1	28	**0.131**
	Annual	0.075	8.2	10	0.082
NO_2 [(b)]	1 hour	8.202	24.265	300	**0.243**
	Annual	0.185	11.350	45	**0.113**
CO	1 hour	2.387	343.567	15000	3.436
	8 hour	2.441	297.758	6000	2.978
SO_2	1 hour	4.379	2.619	450	**0.026**
	24 hour	1.401	2.619	125	**0.026**
	30 day	0.282	2.619	30	**0.026**
	Annual	0.099	2.171	20	**0.022**

HCl	1 hour	0.870	-	75	**0.750**
Pb	1 hour	0.001	-	1.5	0.015
Cr	1 hour	0.001	-	1	0.010
Dioxin and Furans[c]	24 hour	0.000004	-	0.1	0.001
PAH	24 hour	0.0000006	-	0.00005	**0.0000005**
	Annual	0.00000005	-	0.00001	0.0000001
Cadmium	24 hour	0.00002	-	0.025	0.00025
	Annual	0.000001	-	0.005	0.00005
Copper	24 hour	0.003	-	50	0.500
Hg	24 hour	0.000001	-	2	0.020

TPM (24 hour), $PM_{2.5}$ (24 hour), NO_2 (1 hour and annual), SO_2 (1 hour, 24 hour, 30 day, and annual), HCl (1 hour), and PAH (24 hour) exceeded the 1% threshold. These contaminants were determined to have a relevant study area, and therefore the predicted concentrations can be visually represented as isopleths. These figures can be seen in Appendix B.

5.2 $PM_{2.5}$

$PM_{2.5}$ is fine particulate matter that is less than 2.5 microns in diameter. Sources of $PM_{2.5}$ include all types of combustion activities (motor vehicles, power plants, wood burning, etc.) and certain industrial processes (CIESE, 2017).

Health studies have shown a significant association between exposure to fine particles and premature death from heart or lung disease. Fine particles can aggravate heart and lung diseases and have been linked to effects such as: cardiovascular symptoms; cardiac arrhythmias; heart attacks; respiratory symptoms; asthma attacks; and bronchitis (CIESE, 2017).

Environment Canada and Health Canada have established new air quality standards for fine particulate matter ($PM_{2.5}$) in the form of CAAQS. The new standards play an important role by setting objectives, which require air quality management actions and encourage all levels of governments to work collaboratively to achieve them (Environment and Climate Change Canada, 2013).

Table 7. CAAQS Objectives for $PM_{2.5}$

Averaging Period	Old Standards	New Standards	
		2015	2020
$PM_{2.5}$ Annual	-	10 µg/m3	8.8 µg/m3
$PM_{2.5}$ for 24-hour	30 µg/m3	28 µg/m3	27 µg/m3

Table 7 lists the CAAQS objectives for $PM_{2.5}$. The new standards have a 2015 and 2020 objective. Dispersion modelling results for $PM_{2.5}$ were compared to the relevant 2015 standards, however results also complied with the future 2020 standards.

6 CONCLUSION

The CNPC Regional Landfill is located at LSD 12-08-007-01 W5M and is proposing to add an incinerator to the site. The purpose of the incinerator is for use in the incineration of livestock, poultry, swine and wildlife carcasses from surrounding ranches, farms and municipal districts as well as meat from the Canadian Food Inspection Agency. North Shore, at the request of Integrated Sustainability, has prepared this dispersion modelling assessment for the incinerator in support of the EPEA Approval Amendment Application. The dispersion modelling was performed to predict ground-level concentrations of the following contaminants resulting from the operation of the incinerator: TPM, $PM_{2.5}$, NO_2, CO, SO_2, HCl, Pb, Cr, Dioxins and Furans, PAH, Cd, Cu, and Hg.

Typical expected stack emissions from the incinerator were determined by Eco Waste Solutions. Three waste mixes were considered: Mix 1, Mix 2, and Mix 3. In order to mitigate possible community concern, additional receptor grids were placed at four nearby residences.

The results of the dispersion modelling indicate that MGLCs of all contaminants emitted from the incinerator are predicted to be well within the AQS. Additionally, all MGLCs for each contaminant is less than 4% of the AQS. Therefore, it is the position of North Shore that the proposed Incinerator is not a risk to air quality.

7 DISCLOSURE

North Shore Environmental Consultants Inc. (North Shore) has prepared this report taking into account government regulations available at the time of the assessment. This report is intended for the exclusive use of the company, organization, or individual to whom it is addressed and may not be relied upon by any third party without the express written permission of North Shore. The investigation and reporting has been conducted with a reasonable level of attention and skill, in accordance with standards prevailing in the environmental consulting profession at the time of report date in the location in which the report was prepared.

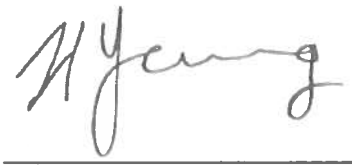
Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. North Shore accepts no responsibility for damages, if any, suffered by any third party as a result of the use of this report or any decisions made or actions based on this report.

Should additional information become available than differs significantly from our understanding of conditions or parameters presented in this report, we request that this information is brought to the attention of North Shore so that North Shore may reassess the conclusions provided herein.

8 CLOSURE

North Shore appreciated the opportunity to work on this project. If we can provide clarification of any part of this report, please contact the undersigned at (403) 228-3095.

This report was prepared by:



Hillary Yeung, B. A. Sc., E.I.T.
Air Quality Consultant

Reviewed By:

Jesse Stetson, B. Sc., P.Eng
Air & Emissions Specialist

9 REFERENCES

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APPENDIX A

Mix 1 and Mix 2 Maximum Predicted Ground Level Concentrations

Table 8. Mix 1 maximum predicted ground level concentrations

Scenario	Averaging Period	Location UTM NAD83 Zone 11N		Predicted	Background	MGLC	AQS	Predicted /AQS
		mE	mN	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	%
TPM	24 hour	709004.6	5492300.5	1.057	-	1.057	100	1.06%
	Annual	709064.6	5492340.5	0.075	-	0.075	60	0.13%
$PM_{2.5}$ [a]	24 hour	709004.6	5492300.5	1.057	13.1	14.188	28	3.77%
	Annual	709064.6	5492340.5	0.075	8.2	8.263	10	0.75%
NO_2 [b]	1 hour	709004.6	5492300.5	7.879	24.265	32.144	300	2.63%
	Annual	709064.6	5492340.5	0.185	11.350	11.535	45	0.41%
CO	1 hour	709004.6	5492300.5	2.301	343.567	345.868	15000	0.02%
	8 hour	708964.6	5492280.5	2.320	297.758	300.078	6000	0.04%
SO_2	1 hour	709004.6	5492300.5	3.992	2.619	6.612	450	0.89%
	24 hour	709004.6	5492300.5	1.315	2.619	3.935	125	1.05%
	30 day	709064.6	5492360.5	0.272	2.619	2.891	30	0.91%
	Annual	709064.6	5492340.5	0.094	2.171	2.265	20	0.47%
HCl	1 hour	709004.6	5492300.5	0.840	-	0.840	75	1.12%
Pb	1 hour	709004.6	5492300.5	0.001	-	0.001	1.5	0.08%
Cr	1 hour	709004.6	5492300.5	0.001	-	0.001	1	0.10%
Dioxin and Furans [c]	24 hour	709004.6	5492300.5	0.000004	-	0.000	0.1	0.004%
PAH	24 hour	709004.6	5492300.5	0.000001	-	0.000	0.00005	1.05%
	Annual	709064.6	5492340.5	0.000000	-	0.000	0.00001	0.37%
Cadmium	24 hour	709004.6	5492300.5	0.000014	-	0.000	0.025	0.06%
	Annual	709064.6	5492340.5	0.000001	-	0.000	0.005	0.02%
Copper	24 hour	709004.6	5492300.5	0.002834	-	0.003	50	0.01%
Hg	24 hour	709004.6	5492300.5	0.000001	-	0.000	2	0.0000%

Notes: [a] $PM_{2.5}$ emission rates were conservatively assumed to be equal to TPM emission rates.

[b] Total conversion method was used to convert NO_x to NO_2.

[c] Dioxins and Furans concentration is in pg/m^3 TEQ, not $\mu g/m^3$.

Table 9. Mix 2 maximum predicted ground level concentrations

Scenario	Averaging Period	Location UTM NAD83 Zone 11N		Predicted	Background	MGLC	AQS	Predicted /AQS
		mE	mN	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	%
TPM	24 hour	709004.6	5492300.5	1.047	-	1.047	100	1.05%
	Annual	709064.6	5492340.5	0.075	-	0.075	60	0.13%
$PM_{2.5}$[(a)]	24 hour	709004.6	5492300.5	1.047	13.1	14.177	28	3.74%
	Annual	709064.6	5492340.5	0.075	8.2	8.263	10	0.75%
NO_2[(b)]	1 hour	708964.6	5492280.5	7.878	24.265	32.143	300	2.63%
	Annual	709064.6	5492340.5	0.185	11.350	11.535	45	0.41%
CO	1 hour	709004.6	5492300.5	2.297	343.567	345.864	15000	0.02%
	8 hour	708964.6	5492280.5	2.329	297.758	300.087	6000	0.04%
SO_2	1 hour	708964.6	5492280.5	3.788	2.619	6.407	450	0.84%
	24 hour	709004.6	5492300.5	1.234	2.619	3.854	125	0.99%
	30 day	709064.6	5492360.5	0.258	2.619	2.877	30	0.86%
	Annual	709064.6	5492340.5	0.089	2.171	2.260	20	0.44%
HCl	1 hour	708964.6	5492280.5	0.840	-	0.840	75	1.12%
Pb	1 hour	708964.6	5492280.5	0.001	-	0.001	1.5	0.08%
Cr	1 hour	708964.6	5492280.5	0.001	-	0.001	1	0.10%
Dioxin and Furans[(c)]	24 hour	709004.6	5492300.5	0.000003	-	0.000	0.1	0.003%
PAH	24 hour	709004.6	5492300.5	0.000000	-	0.000	0.00005	0.99%
	Annual	709064.6	5492340.5	0.000000	-	0.000	0.00001	0.35%
Cadmium	24 hour	709004.6	5492300.5	0.000012	-	0.000	0.025	0.05%
	Annual	709064.6	5492340.5	0.000001	-	0.000	0.005	0.02%
Copper	24 hour	709004.6	5492300.5	0.002659	-	0.003	50	0.01%
Hg	24 hour	709004.6	5492300.5	0.000001	-	0.000	2	0.0000%

Notes: [(a)] $PM_{2.5}$ emission rates were conservatively assumed to be equal to TPM emission rates.

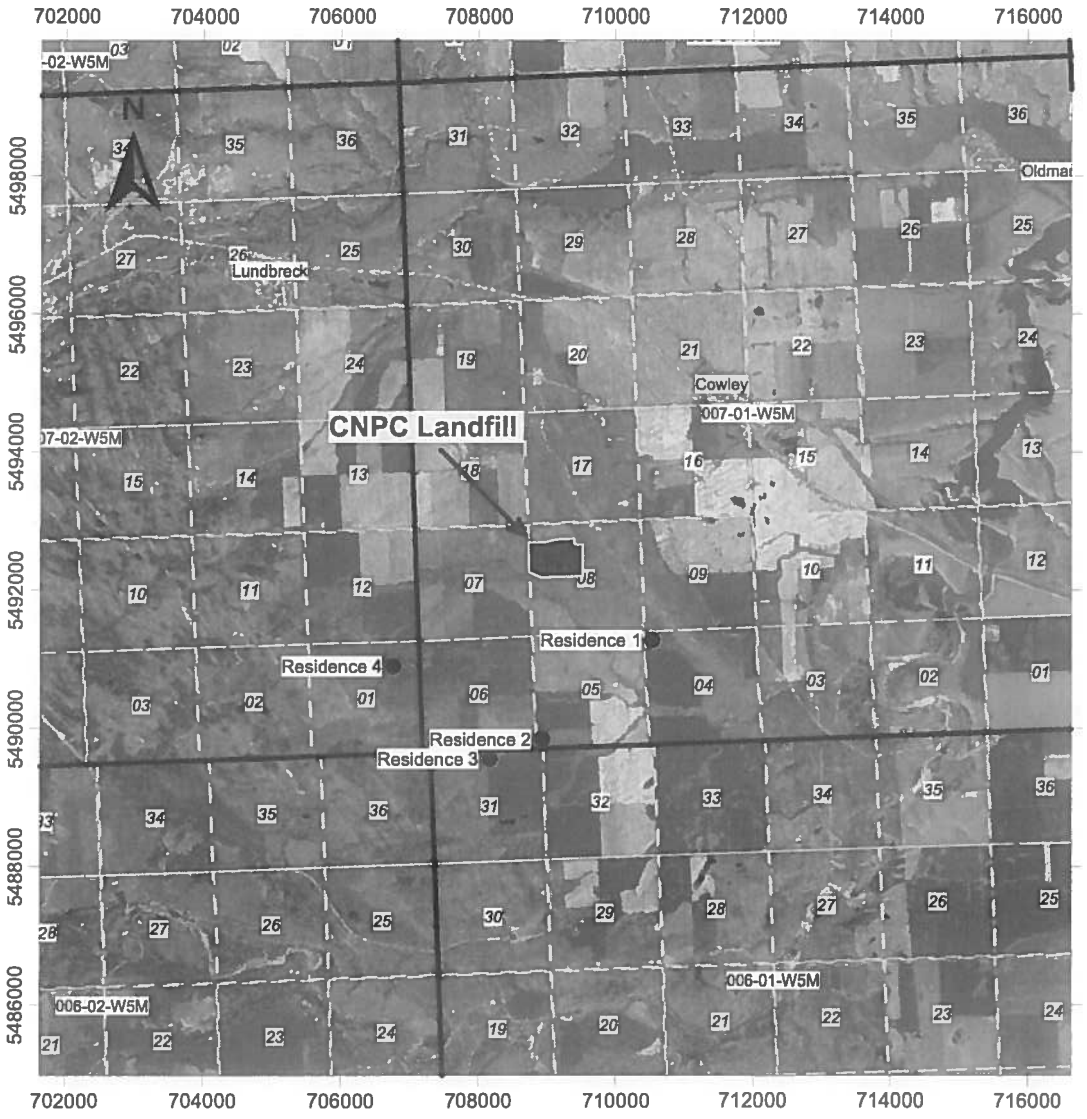
[(b)] Total conversion method was used to convert NO_x to NO_2.

[(c)] Dioxins and Furans concentration is in pg/m^3 TEQ, not $\mu g/m^3$.

APPENDIX B

Project Area Maps

Figure 1. Project Area Map



LEGEND

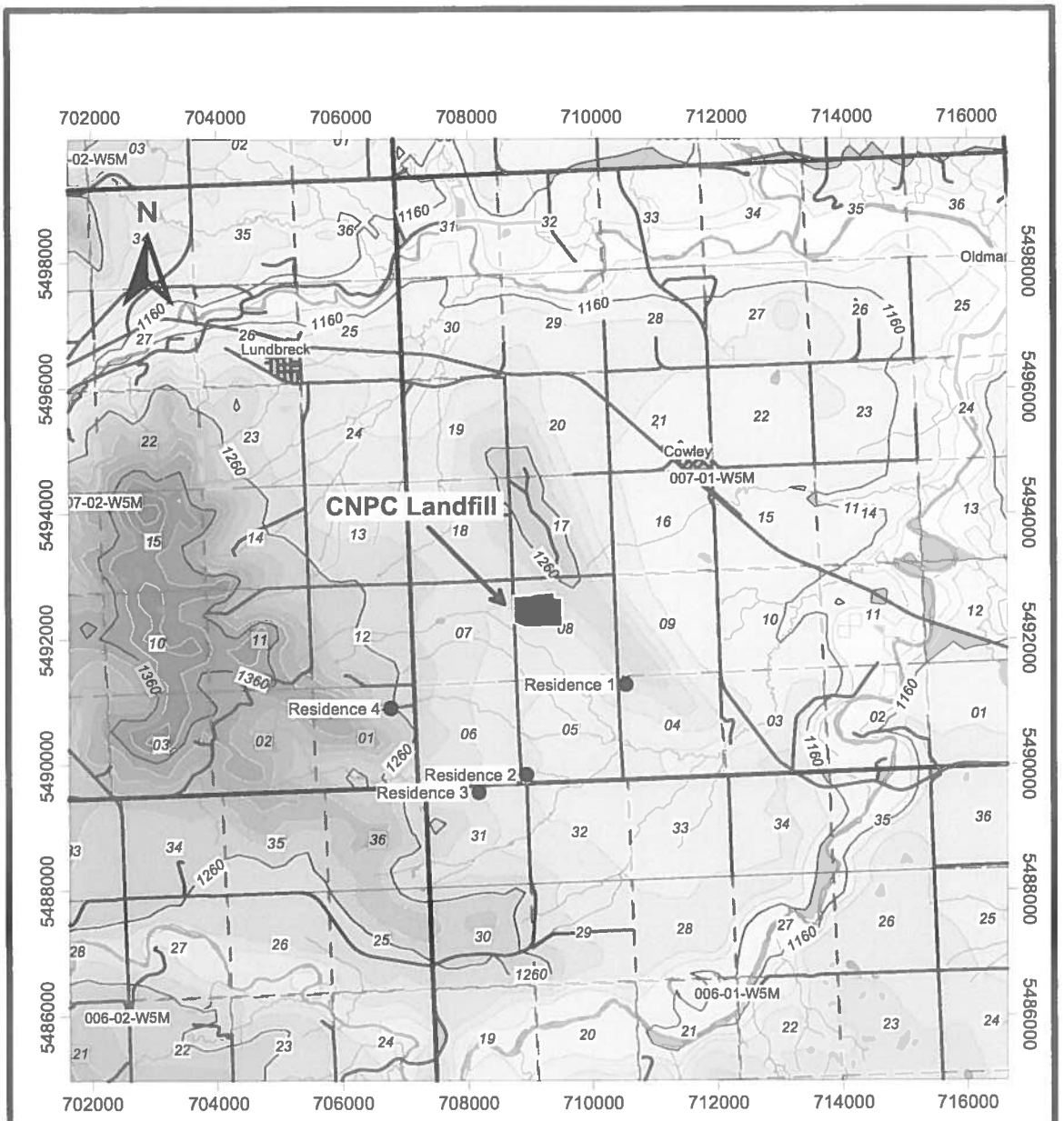
- Crowsnest Pass-Pincher Creek Landfill Association (CNPC) Regional Landfill
- Sensitive Residences
- Section
- Township
- Road
- Water Body

0 1000 2000 3000 4000

Project Area Map

DATE: May 2016	FIGURE 1
CLIENT: Integrated Sustainability Consultants Ltd.	FILE: Area Map.srf
PROJECT: Crowsnest Pass-Pincher Creek Landfill Association (CNPC)	NORTH SHORE
DATUM/PROJECTION: UTM Zone 11N NAD83	#134, 12143 40th Street SE Calgary, Alberta, T2Z 4E6 P: (403) 228-3095

Figure 2. Topographical Maps of the Project Area



Elevation (m):

1060 1080 1100 1120 1140 1160 1180 1200 1220 1240 1260 1280 1300 1320 1340 1360 1380 1400 1420 1440

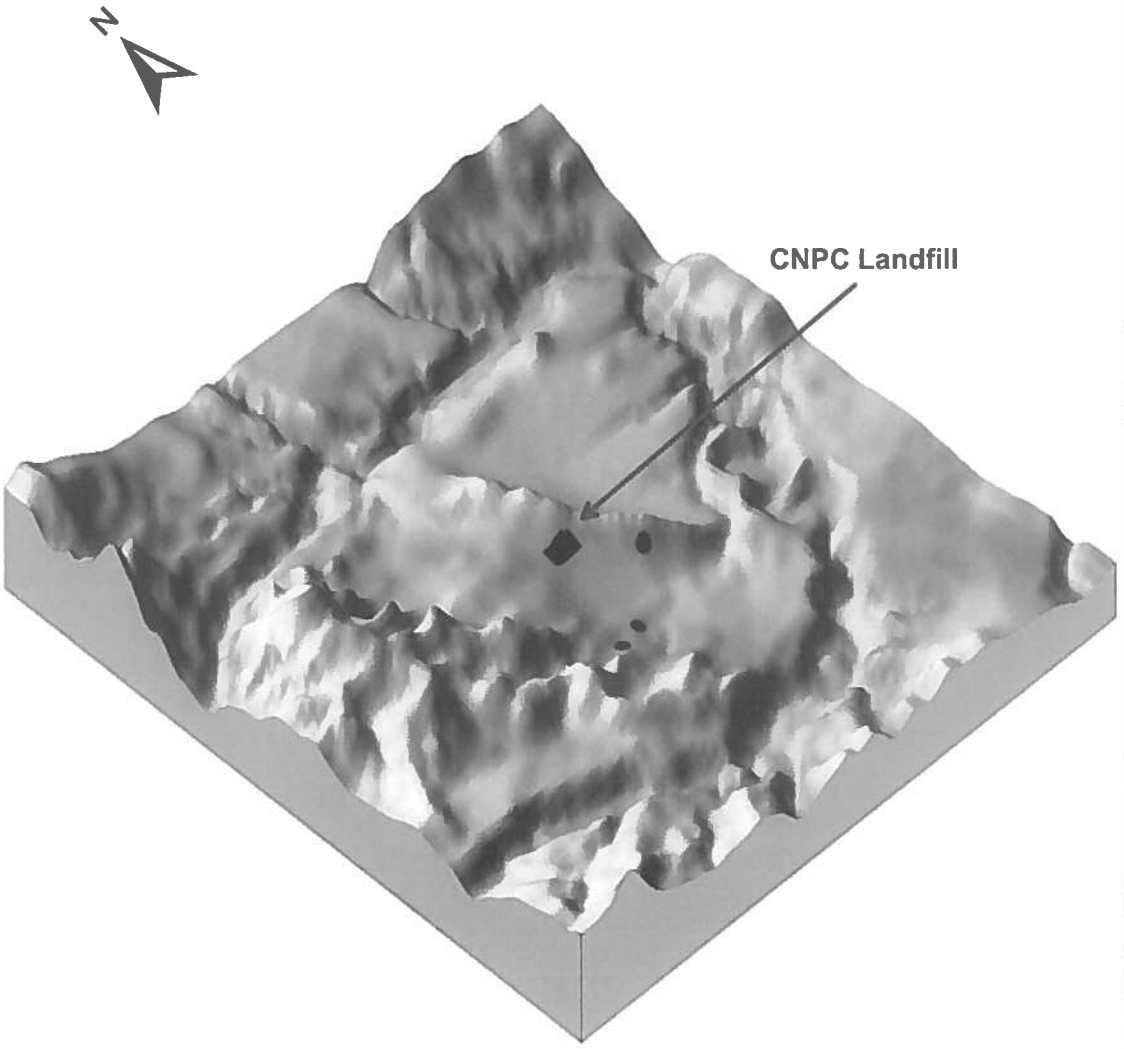
LEGEND

- Crowsnest Pass-Pincher Creek Landfill Association (CNPC) Regional Landfill
- Sensitive Residences
- Section
- Township
- Road
- Water Body

0 1000 2000 3000 4000

Project Area Topographical Contour

DATE: May 2016	FIGURE 2-1
CLIENT: Integrated Sustainability Consultants Ltd.	FILE: Topo.srf
PROJECT: Crowsnest Pass-Pincher Creek Landfill Association (CNPC)	NORTH SHORE
DATUM/PROJECTION: UTM Zone 11N NAD83	#134, 12143 40th Street SE Calgary, Alberta, T2Z 4E6 P (403) 228-3095



Elevation (m):

1080 1100 1120 1140 1160 1180 1200 1220 1240 1260 1280 1300 1320 1340 1360 1380 1400 1420

LEGEND

- Crowsnest Pass-Pincher Creek Landfill Association (CNPC) Regional Landfill
- Sensitive Residences

0 2000 4000 6000 8000

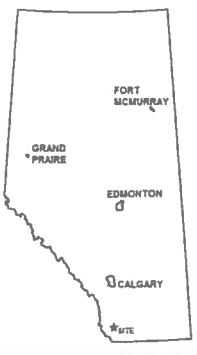
Project Area Topographical Contour

DATE: May 2016	FIGURE 2-2
CLIENT: Integrated Sustainability Consultants Ltd	FILE: 3D Topo.srf
PROJECT: Crowsnest Pass-Pincher Creek Landfill Association (CNPC)	NORTH SHORE Environmental Consultants
DATUM/PROJECTION: UTM Zone 11N NAD83	#134, 12143 40th Street SE Calgary, Alberta, T2Z 4E6 P: (403) 228-3095

Figure 3. Locations of Maximum Ground Level Concentrations

LEGEND

- Crowsnest Pass-Pincher Creek Landfill Association (CNPC) Regional Landfill
- Maximum Concentration at 1-hr, 8-hr, and 24-hr averaging periods
- Maximum Concentration at 30-d averaging period
- Maximum Concentration at annual averaging period
- Sensitive Residences
- Section
- Township
- Road
- Water Body



0 500 1000 1500 2000

Locations of Maximum Ground Level Concentrations

DATE: May 2016	FIGURE 3
CLIENT: Integrated Sustainability Consultants Ltd.	FILE: MGLC srf
PROJECT: Crowsnest Pass-Pincher Creek Landfill Association (CNPC)	NORTH SHORE
DATUM/PROJECTION: UTM Zone 11N NAD83	#134, 12143 40th Street SE Calgary, Alberta, T2Z 4E6 P: (403) 228-3095

Figure 4. TPM 24-hour Concentration Isopleth

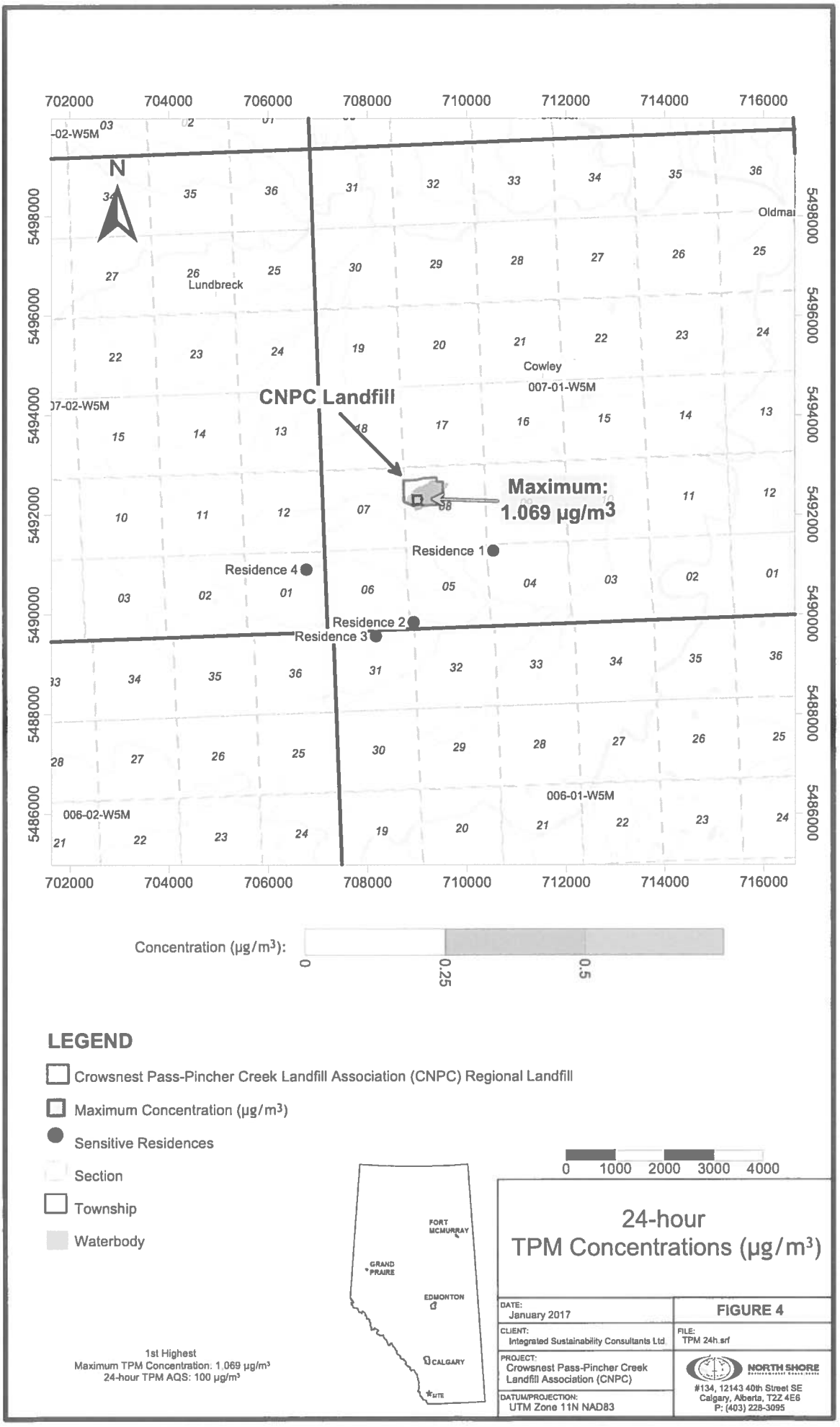

702000
704000
706000
708000
710000
712000
714000
716000
5498000
5496000
5494000
5492000
5490000
5488000
5486000
N
Lundbreck
Cowley
Oldman
CNPC Landfill
Maximum:
1.069 µg/m3
Residence 1
Residence 2
Residence 3
Residence 4
007-01-W5M
006-01-W5M
006-02-W5M
Concentration (µg/m3):
0
0.25
0.5
LEGEND
Crowsnest Pass-Pincher Creek Landfill Association (CNPC) Regional Landfill
Maximum Concentration (µg/m3)
Sensitive Residences
Section
Township
Waterbody
0
1000
2000
3000
4000
FORT MCMURRAY
GRAND PRAIRE
EDMONTON
CALGARY
1st Highest
Maximum TPM Concentration: 1.069 µg/m3
24-hour TPM AQS: 100 µg/m3
24-hour
TPM Concentrations (µg/m3)
DATE: January 2017
FIGURE 4
CLIENT: Integrated Sustainability Consultants Ltd.
FILE: TPM 24h.srf
PROJECT: Crowsnest Pass-Pincher Creek Landfill Association (CNPC)
DATUM/PROJECTION: UTM Zone 11N NAD83
NORTH SHORE
#134, 12143 40th Street SE
Calgary, Alberta, T2Z 4E6
P: (403) 228-3095

Figure 5. $PM_{2.5}$ 24-hour Concentration Isopleth

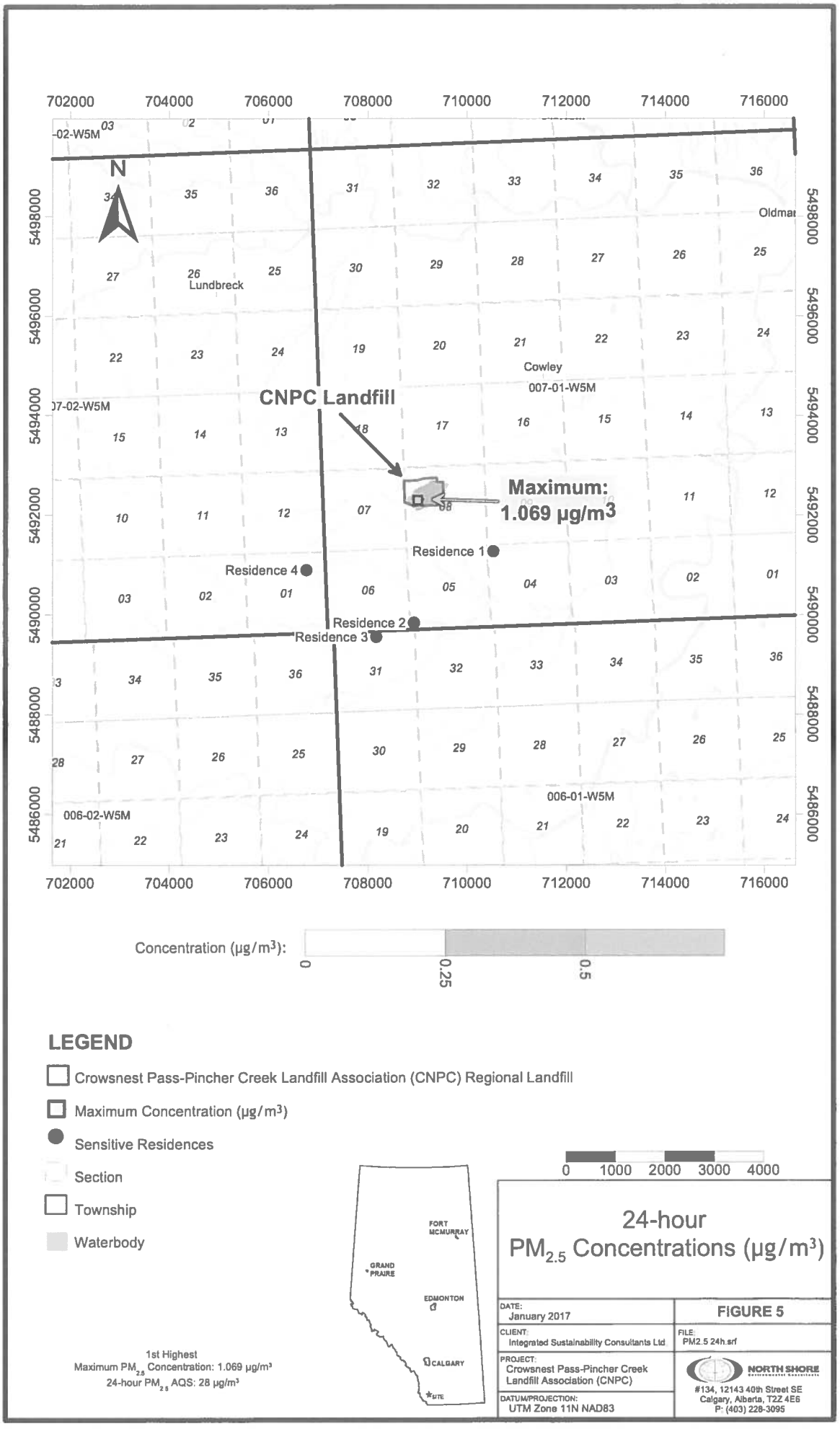

702000
704000
706000
708000
710000
712000
714000
716000
5498000
5496000
5494000
5492000
5490000
5488000
5486000
N
CNPC Landfill
Maximum:
1.069 µg/m3
Residence 1
Residence 2
Residence 3
Residence 4
Lundbreck
Cowley
Oldman
007-01-W5M
006-01-W5M
006-02-W5M
Concentration (µg/m3):
0
0.25
0.5
LEGEND
Crowsnest Pass-Pincher Creek Landfill Association (CNPC) Regional Landfill
Maximum Concentration (µg/m3)
Sensitive Residences
Section
Township
Waterbody
1st Highest
Maximum PM2.5 Concentration: 1.069 µg/m3
24-hour PM2.5 AQS: 28 µg/m3
FORT MCMURRAY
GRAND PRAIRIE
EDMONTON
CALGARY
0
1000
2000
3000
4000
24-hour
PM2.5 Concentrations (µg/m3)
DATE: January 2017
FIGURE 5
CLIENT: Integrated Sustainability Consultants Ltd
FILE: PM2.5 24h.srf
PROJECT: Crowsnest Pass-Pincher Creek Landfill Association (CNPC)
DATUM/PROJECTION: UTM Zone 11N NAD83
NORTH SHORE
#134, 12143 40th Street SE
Calgary, Alberta, T2Z 4E6
P: (403) 228-3095

Figure 6. NO_2 1-hour Concentration Isopleth

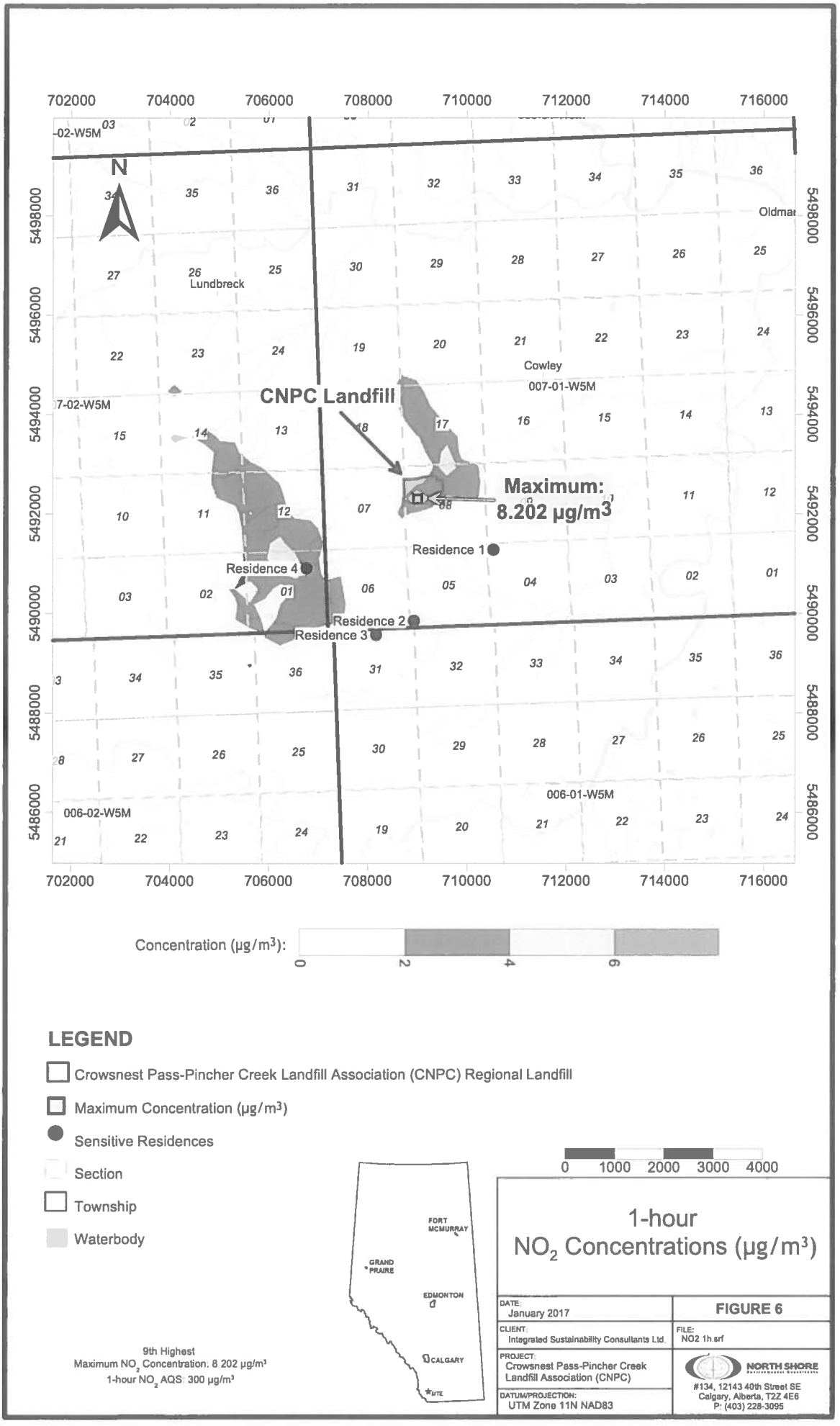

702000
704000
706000
708000
710000
712000
714000
716000
5498000
5496000
5494000
5492000
5490000
5488000
5486000
N
CNPC Landfill
Maximum:
8.202 µg/m3
Residence 1
Residence 2
Residence 3
Residence 4
Lundbreck
Cowley
Oldman
007-01-W5M
006-01-W5M
006-02-W5M
Concentration (µg/m3):
0
2
4
6
LEGEND
Crowsnest Pass-Pincher Creek Landfill Association (CNPC) Regional Landfill
Maximum Concentration (µg/m3)
Sensitive Residences
Section
Township
Waterbody
FORT MCMURRAY
GRAND PRAIRIE
EDMONTON
CALGARY
SITE
0
1000
2000
3000
4000
9th Highest
Maximum NO2 Concentration: 8 202 µg/m3
1-hour NO2 AQS: 300 µg/m3
1-hour
NO2 Concentrations (µg/m3)
DATE:
January 2017
FIGURE 6
CLIENT:
Integrated Sustainability Consultants Ltd.
FILE:
NO2 1h.srf
PROJECT:
Crowsnest Pass-Pincher Creek Landfill Association (CNPC)
NORTH SHORE
DATUM/PROJECTION:
UTM Zone 11N NAD83
#134, 12143 40th Street SE
Calgary, Alberta, T2Z 4E6
P: (403) 228-3095

Figure 7. NO_2 Annual Concentration Isopleth

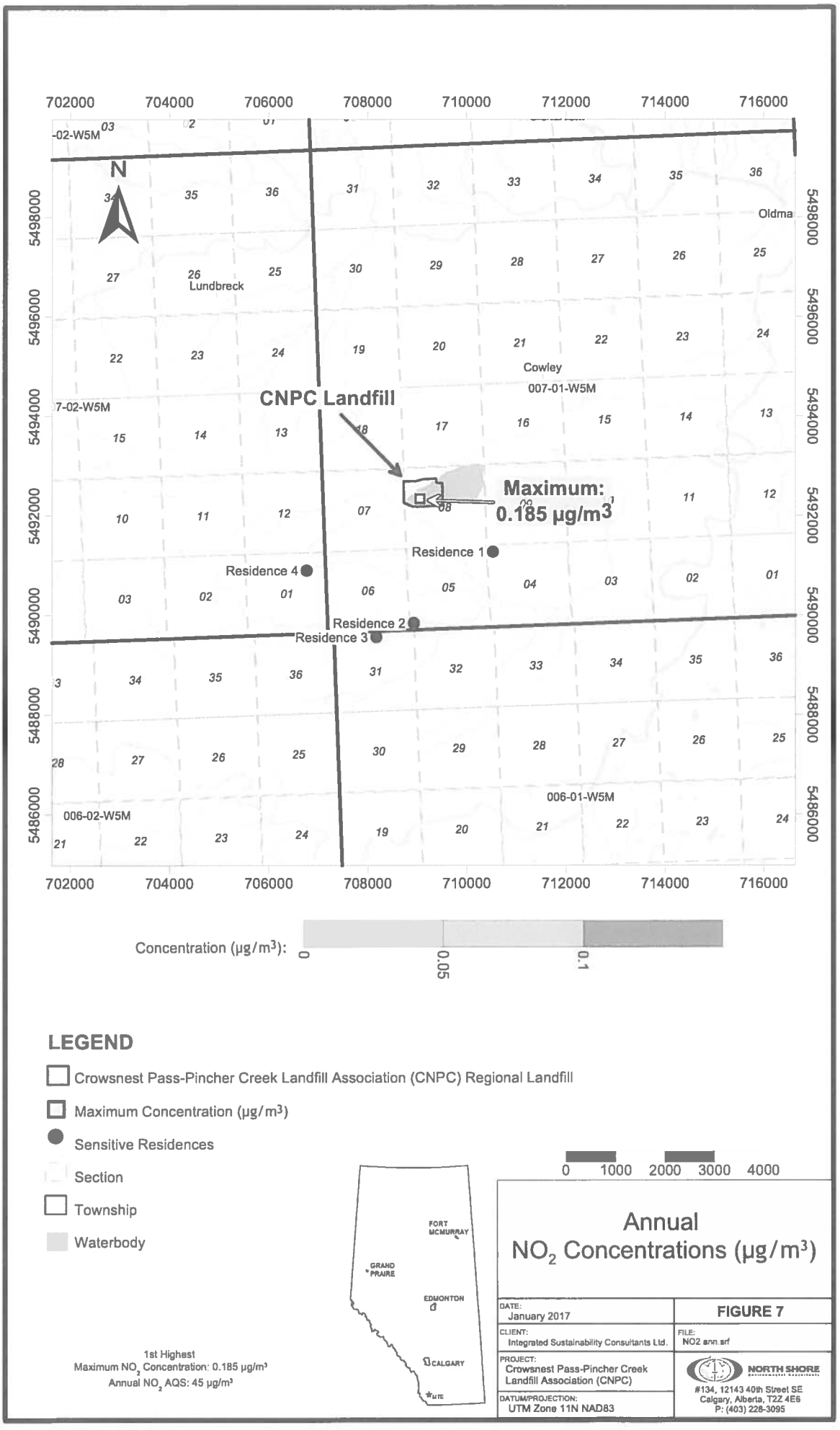

702000
704000
706000
708000
710000
712000
714000
716000
5498000
5496000
5494000
5492000
5490000
5488000
5486000
N
Oldma
Lundbreck
Cowley
007-01-W5M
006-01-W5M
006-02-W5M
CNPC Landfill
Maximum:
0.185 µg/m3
Residence 1
Residence 2
Residence 3
Residence 4
Concentration (µg/m3):
0
0.05
0.1
LEGEND
Crowsnest Pass-Pincher Creek Landfill Association (CNPC) Regional Landfill
Maximum Concentration (µg/m3)
Sensitive Residences
Section
Township
Waterbody
1st Highest
Maximum NO2 Concentration: 0.185 µg/m3
Annual NO2 AQS: 45 µg/m3
FORT MCMURRAY
GRAND PRAIRE
EDMONTON
CALGARY
0
1000
2000
3000
4000
Annual
NO2 Concentrations (µg/m3)
DATE: January 2017
FIGURE 7
CLIENT: Integrated Sustainability Consultants Ltd.
FILE: NO2 ann.srf
PROJECT: Crowsnest Pass-Pincher Creek Landfill Association (CNPC)
DATUM/PROJECTION: UTM Zone 11N NAD83
NORTH SHORE
#134, 12143 40th Street SE
Calgary, Alberta, T2Z 4E6
P: (403) 228-3095

Figure 8. SO_2 1-hour Concentration Isopleth

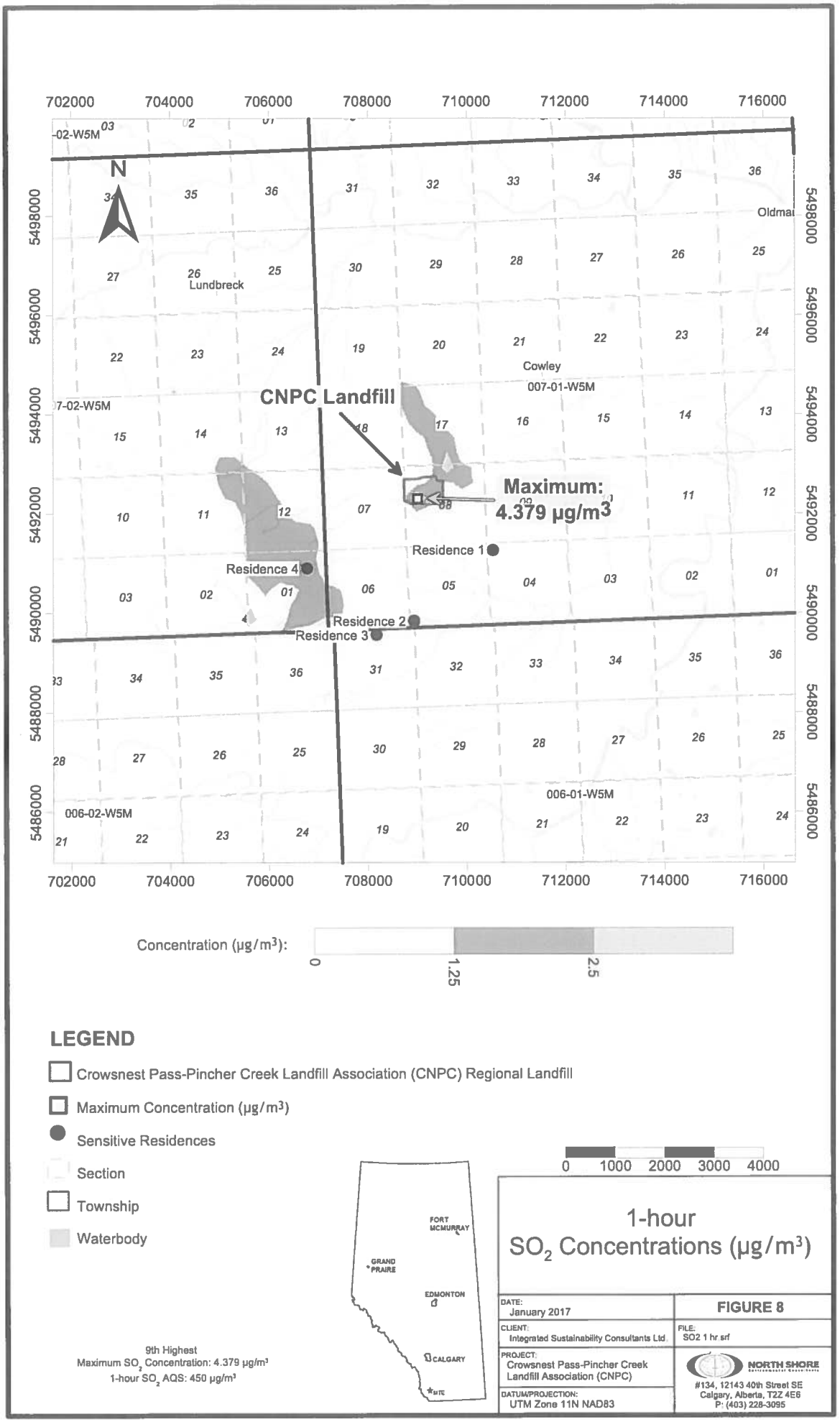
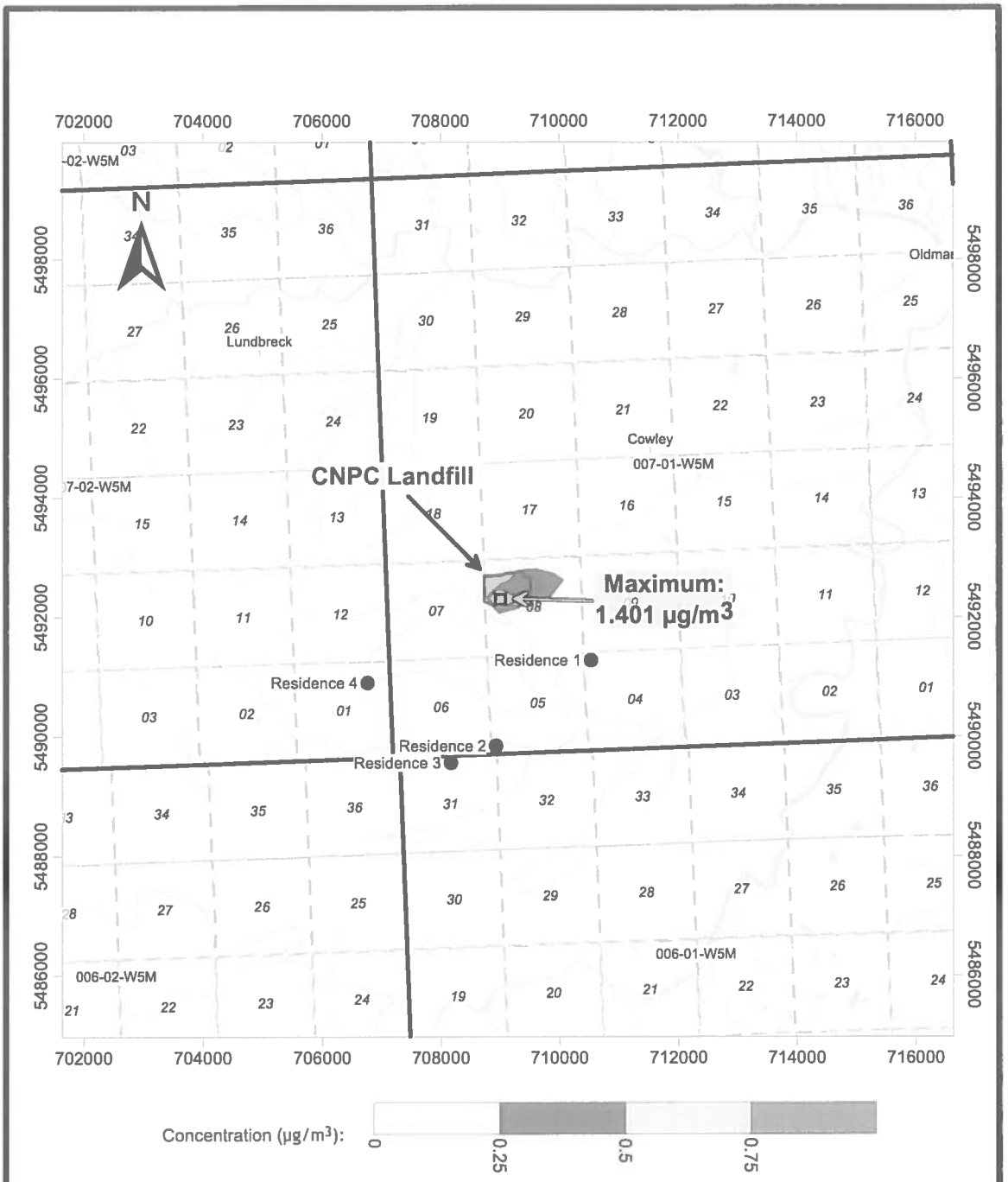

702000
704000
706000
708000
710000
712000
714000
716000
5498000
5496000
5494000
5492000
5490000
5488000
5486000
N
-02-W5M
7-02-W5M
006-02-W5M
006-01-W5M
007-01-W5M
Lundbreck
Cowley
Oldma
CNPC Landfill
Maximum:
4.379 µg/m3
Residence 1
Residence 2
Residence 3
Residence 4
Concentration (µg/m3):
0
1.25
2.5
LEGEND
Crowsnest Pass-Pincher Creek Landfill Association (CNPC) Regional Landfill
Maximum Concentration (µg/m3)
Sensitive Residences
Section
Township
Waterbody
9th Highest
Maximum SO2 Concentration: 4.379 µg/m3
1-hour SO2 AQS: 450 µg/m3
FORT MCMURRAY
GRAND PRAIRE
EDMONTON
CALGARY
0
1000
2000
3000
4000
1-hour
SO2 Concentrations (µg/m3)
DATE:
January 2017
FIGURE 8
CLIENT:
Integrated Sustainability Consultants Ltd.
FILE:
SO2 1 hr.srf
PROJECT:
Crowsnest Pass-Pincher Creek Landfill Association (CNPC)
NORTH SHORE
DATUM/PROJECTION:
UTM Zone 11N NAD83
#134, 12143 40th Street SE
Calgary, Alberta, T2Z 4E6
P: (403) 228-3095

Figure 9. SO_2 24-hour Concentration Isopleth



LEGEND

- Crowsnest Pass-Pincher Creek Landfill Association (CNPC) Regional Landfill
- Maximum Concentration (µg/m³)
- Sensitive Residences
- Section
- Township
- Waterbody

0 1000 2000 3000 4000

1st Highest
Maximum SO_2 Concentration: 1.401 µg/m³
24-hour SO_2 AQS: 125 µg/m³

24-hour SO_2 Concentrations (µg/m³)

DATE: January 2017	FIGURE 9
CLIENT: Integrated Sustainability Consultants Ltd.	FILE: SO2 24 hr.srf
PROJECT: Crowsnest Pass-Pincher Creek Landfill Association (CNPC)	NORTH SHORE
DATUM/PROJECTION: UTM Zone 11N NAD83	#134, 12143 40th Street SE Calgary, Alberta, T2Z 4E6 P: (403) 228-3095

Figure 10. SO_2 30-day Concentration Isopleth

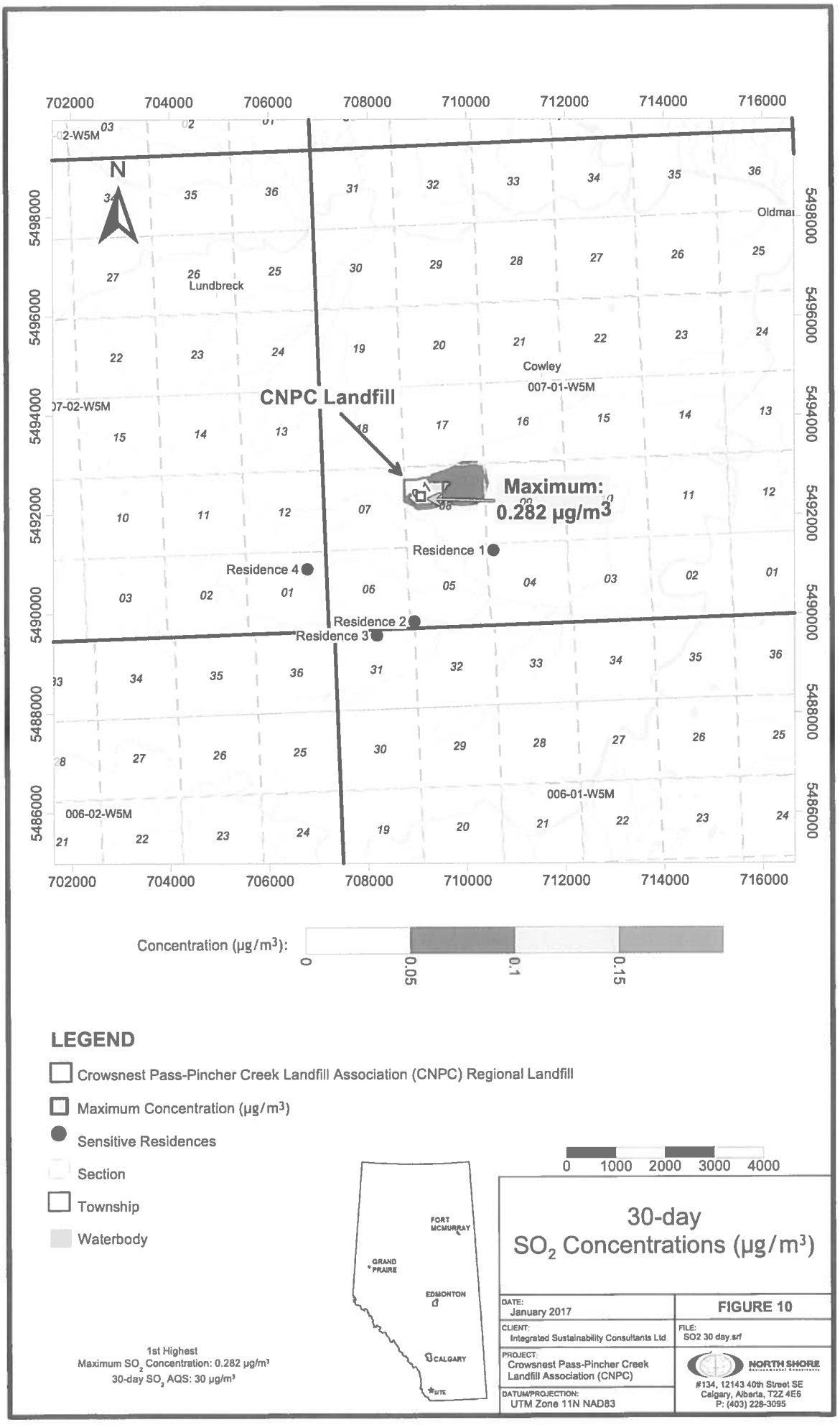

702000
704000
706000
708000
710000
712000
714000
716000
5498000
5496000
5494000
5492000
5490000
5488000
5486000
N
Lundbreck
Cowley
Oldman
CNPC Landfill
Maximum:
0.282 µg/m3
Residence 1
Residence 2
Residence 3
Residence 4
007-01-W5M
006-01-W5M
006-02-W5M
Concentration (µg/m3):
0
0.05
0.1
0.15
LEGEND
Crowsnest Pass-Pincher Creek Landfill Association (CNPC) Regional Landfill
Maximum Concentration (µg/m3)
Sensitive Residences
Section
Township
Waterbody
0 1000 2000 3000 4000
FORT MCMURRAY
GRAND PRAIRIE
EDMONTON
CALGARY
SITE
1st Highest
Maximum SO2 Concentration: 0.282 µg/m3
30-day SO2 AQS: 30 µg/m3
30-day
SO2 Concentrations (µg/m3)
DATE: January 2017
FIGURE 10
CLIENT: Integrated Sustainability Consultants Ltd
FILE: SO2 30 day.srf
PROJECT: Crowsnest Pass-Pincher Creek Landfill Association (CNPC)
DATUM/PROJECTION: UTM Zone 11N NAD83
NORTH SHORE
#134, 12143 40th Street SE
Calgary, Alberta, T2Z 4E6
P: (403) 228-3095

Figure 11. SO_2 Annual Concentration Isopleth

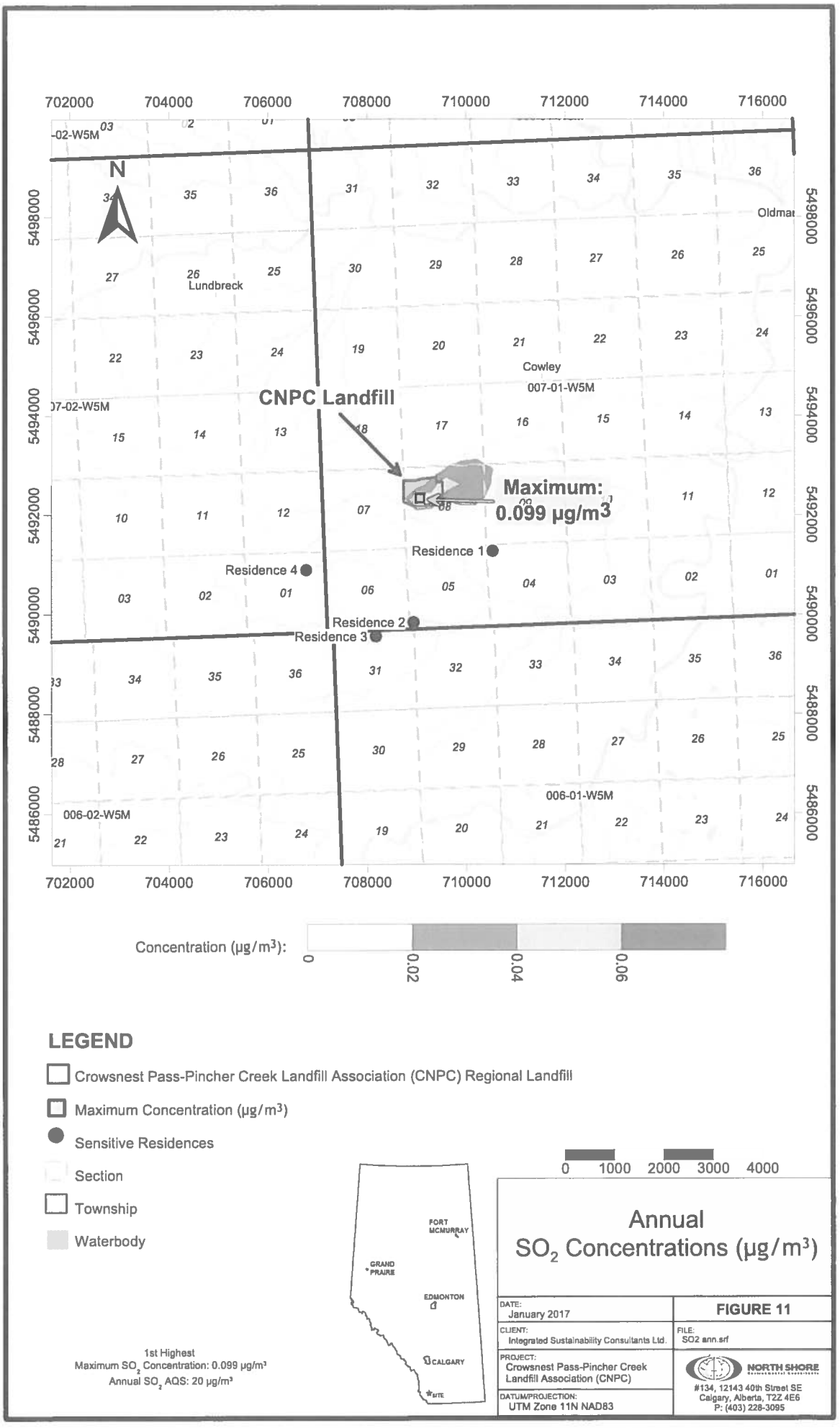

702000
704000
706000
708000
710000
712000
714000
716000
5498000
5496000
5494000
5492000
5490000
5488000
5486000
N
Lundbreck
Cowley
Oldman
CNPC Landfill
Maximum:
0.099 µg/m3
Residence 1
Residence 2
Residence 3
Residence 4
007-01-W5M
006-01-W5M
006-02-W5M
Concentration (µg/m3):
0
0.02
0.04
0.06
LEGEND
Crowsnest Pass-Pincher Creek Landfill Association (CNPC) Regional Landfill
Maximum Concentration (µg/m3)
Sensitive Residences
Section
Township
Waterbody
1st Highest
Maximum SO2 Concentration: 0.099 µg/m3
Annual SO2 AQS: 20 µg/m3
FORT MCMURRAY
GRAND PRAIRIE
EDMONTON
CALGARY
SITE
0
1000
2000
3000
4000
Annual
SO2 Concentrations (µg/m3)
DATE: January 2017
FIGURE 11
CLIENT: Integrated Sustainability Consultants Ltd.
FILE: SO2 ann.srf
PROJECT: Crowsnest Pass-Pincher Creek Landfill Association (CNPC)
DATUM/PROJECTION: UTM Zone 11N NAD83
NORTH SHORE
#134, 12143 40th Street SE
Calgary, Alberta, T2Z 4E6
P: (403) 228-3095

Figure 12. HCl 1-hour Concentration Isopleth

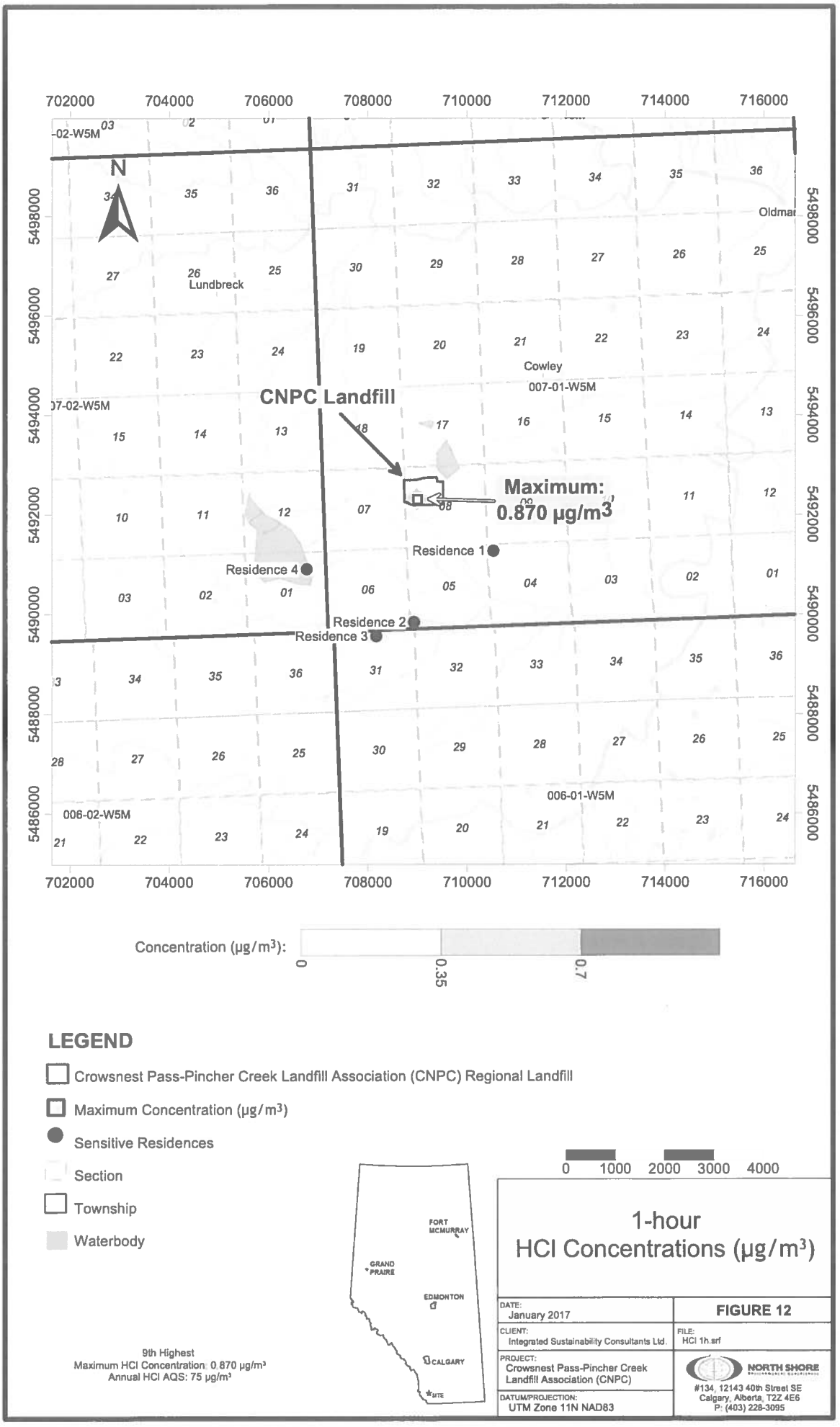
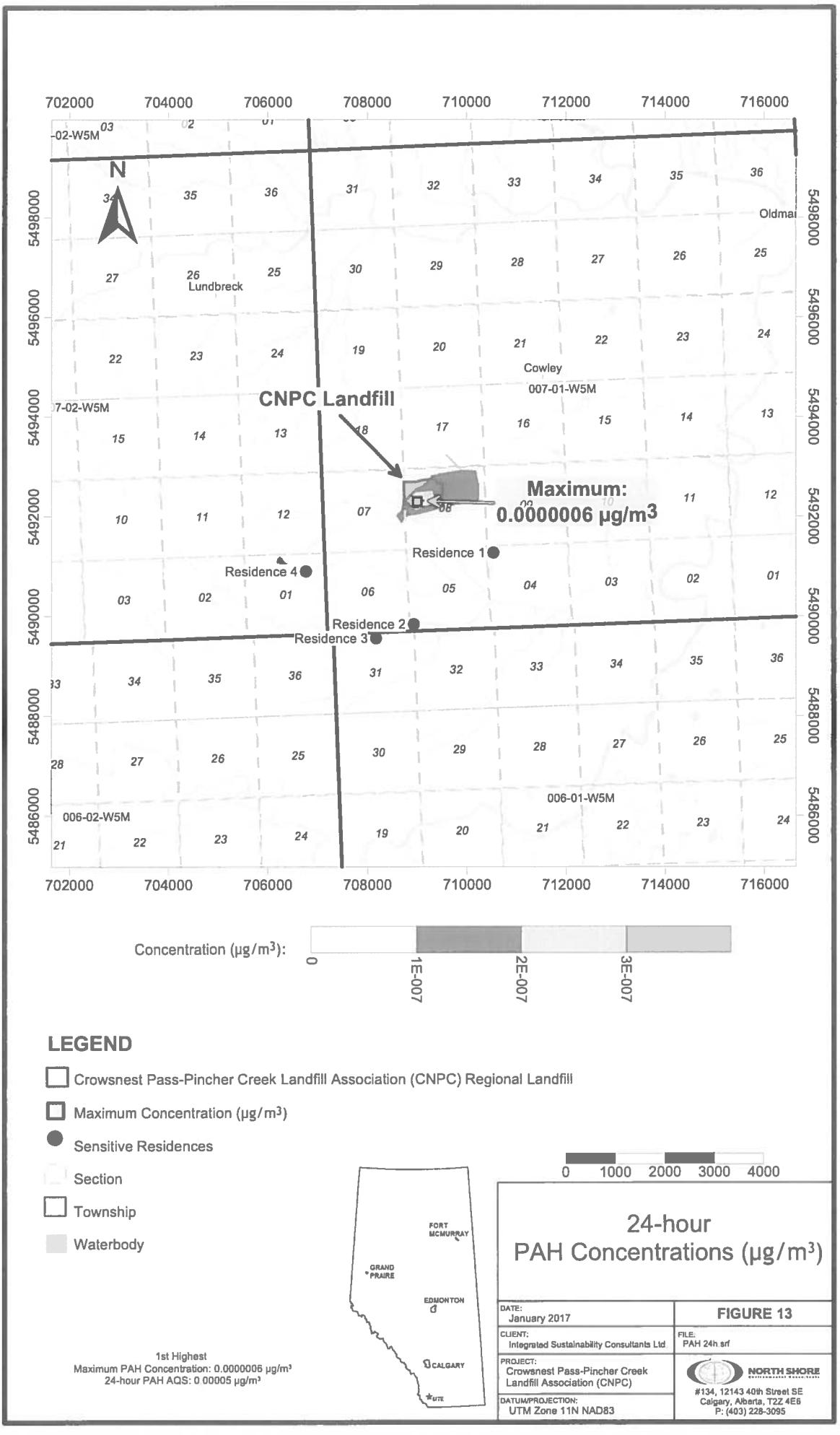

702000
704000
706000
708000
710000
712000
714000
716000
5498000
5496000
5494000
5492000
5490000
5488000
5486000
N
CNPC Landfill
Maximum:
0.870 µg/m3
Residence 1
Residence 2
Residence 3
Residence 4
Lundbreck
Cowley
Oldman
007-01-W5M
006-01-W5M
006-02-W5M
007-02-W5M
Concentration (µg/m3):
0
0.35
0.7
LEGEND
Crowsnest Pass-Pincher Creek Landfill Association (CNPC) Regional Landfill
Maximum Concentration (µg/m3)
Sensitive Residences
Section
Township
Waterbody
9th Highest
Maximum HCl Concentration: 0.870 µg/m3
Annual HCl AQS: 75 µg/m3
FORT MCMURRAY
GRAND PRAIRE
EDMONTON
CALGARY
SITE
0
1000
2000
3000
4000
1-hour
HCl Concentrations (µg/m3)
DATE:
January 2017
FIGURE 12
CLIENT:
Integrated Sustainability Consultants Ltd.
FILE:
HCl 1h.srf
PROJECT:
Crowsnest Pass-Pincher Creek Landfill Association (CNPC)
NORTH SHORE
DATUM/PROJECTION:
UTM Zone 11N NAD83
#134, 12143 40th Street SE
Calgary, Alberta, T2Z 4E6
P: (403) 228-3095

Figure 13. PAH 24-hour Concentration Isopleth



24-hour PAH Concentrations (µg/m3)

DATE: January 2017	FIGURE 13
CLIENT: Integrated Sustainability Consultants Ltd	FILE: PAH 24h srf
PROJECT: Crowsnest Pass-Pincher Creek Landfill Association (CNPC)	NORTH SHORE
DATUM/PROJECTION: UTM Zone 11N NAD83	#134, 12143 40th Street SE Calgary, Alberta, T2Z 4E6 P: (403) 228-3095

APPENDIX C

Eco Waste Solutions – Typical Expected Stack Emissions

Pincher Creek
Waste Mix # 1

ECO WASTE SOLUTIONS

January 21, 2016

Typical Expected Stack Emissions[1]

Solid Waste: 1. Carcass 70%, Agricultural Plastics: 20%, Wood Wastes: 10%

Stack Flow Rate:	10352 kg/hour	38926 m^3/hour
Dry Gas Flow Rate:	9262 kg/hour	32600 m^3/hour
Average Stack Exhaust Temperature:	1000 °C	
Average Oxygen Content:	11% v/v, dry basis	
Average Water Vapor Content:	16% v/v	
Reference Conditions (Dry Basis):	25 °C	
	101.3 kPa	
	11% O_2 (v/v, dry basis)	

Parameter	Expected Emission Level			Stack Emissions	
	Values at Reference Conditions		Actual Emission Values[2]	Hourly Rate	Daily Rate (12h)
	ppmv (%v)	mg/Rm^3	mg/m^3	g/hour	g/day
Particulate Matter (PM)[3]	n/a	40	7.8	305	3665
Nitrogen Oxides	80	98	19	750	8996
Carbon Monoxide (CO)	25	29	6	219	2624
Carbon Dioxide[4]	8%	1429	280	10911	130931
Sulfur Dioxide[4]	19	50	10	380	4561
Hydrogen Chloride[4]	7	10	2	80	956
Hydrogen Fluoride	0	0.0	0.0	0	0
Dioxin and Furans	n/a	2.E-10	3.E-11	1.28E-09	1.54E-08
TOC	15	10	2	75	902
VOC	n/a	8.E-02	1.E-02	5.73E-01	7
PAHs	n/a	2.E-05	5.E-06	1.83E-04	2.20E-03
Co-plane PCBs	n/a	n/a	n/a	n/a	n/a
Hg	n/a	4.E-05	8.E-06	3.E-04	0.00
Cadmium	n/a	6.E-04	1.E-04	5.E-03	0.06
Lead	n/a	0.015	0.003	0.111	1.33
Copper	n/a	0.129	0.025	0.986	11.84
Chromium	n/a	0.012	0.002	0.094	1.12

Note: **1.** Exhaust emissions vary depending on respective concentration presented in waste (function of waste).
The values of emission level in the above table are the arithmetic average concentration based EWS similar emission tests, excluding CO_2, HCL, SO_2

2. Actual emission values are based on actual conditions (at 1 atm, wet basis, average O_2 content and outlet temperature).

3. Particle Size Distribution as per past testing.

4. The volume concentration of carbon dioxide,HCl, SO_2, expressed in [% vol] & Ppm, is not usually obtained by direct measurement, the value in the above table was obtained by calculation.

Pincher Creek
Waste Mix # 2

ECO WASTE SOLUTIONS

January 21, 2016

Typical Expected Stack Emissions[1]

Solid Waste: 1. Carcass 60%, Agricultural Plastics: 30%, Wood Wastes: 10%

Stack Flow Rate:	9732 kg/hour	36636 m^3/hour
Dry Gas Flow Rate:	8690 kg/hour	30588 m^3/hour
Average Stack Exhaust Temperature:	1000 °C	
Average Oxygen Content:	11% v/v, dry basis	
Average Water Vapor Content:	17% v/v	
Reference Conditions (Dry Basis):	25 °C	
	101.3 kPa	
	11% O_2 (v/v, dry basis)	

Parameter	Expected Emission Level			Stack Emissions	
	Values at Reference Conditions		Actual Emission Values[2]	Hourly Rate	Daily Rate (12h)
	ppmv (%v)	mg/Rm^3	mg/m^3	g/hour	g/day
Particulate Matter (PM)[3]	n/a	40	7.8	287	3438
Nitrogen Oxides	80	98	19	703	8440
Carbon Monoxide (CO)	25	29	6	205	2462
Carbon Dioxide[4]	8%	1386	271	9928	119132
Sulfur Dioxide[4]	18	47	9	338	4054
Hydrogen Chloride[4]	7	10	2	75	897
Hydrogen Fluoride	0	0.0	0.0	0	0
Dioxin and Furans	n/a	2.E-10	3.E-11	1.20E-09	1.44E-08
TOC	15	10	2	71	846
VOC	n/a	8.E-02	1.E-02	5.37E-01	6
PAHs	n/a	2.E-05	5.E-06	1.72E-04	2.06E-03
Co-plane PCBs	n/a	n/a	n/a	n/a	n/a
Hg	n/a	4.E-05	8.E-06	3.E-04	0.00
Cadmium	n/a	6.E-04	1.E-04	4.E-03	0.05
Lead	n/a	0.015	0.003	0.104	1.25
Copper	n/a	0.129	0.025	0.926	11.11
Chromium	n/a	0.012	0.002	0.088	1.05

Note: 1. Exhaust emissions vary depending on respective concentration presented in waste (function of waste).
The values of emission level in the above table are the arithmetic average concentration based EWS similar emission tests, excluding CO_2, HCl, SO_2

2. Actual emission values are based on actual conditions (at 1 atm, wet basis, average O_2 content and outlet temperature).

3. Particle Size Distribution as per past testing.

4. The volume concentration of carbon dioxide,HCl, SO_2, expressed in [% vol] & Ppm, is not usually obtained by direct measurement, the value in the above table was obtained by calculation.

Pincher Creek
Waste Mix #3

ECO WASTE SOLUTIONS

January 21, 2016

Typical Expected Stack Emissions[1]

Solid Waste:	**Suggested Waste Mix**	
Stack Flow Rate:	12597 kg/hour	47327 m^3/hour
Dry Gas Flow Rate:	11288 kg/hour	39730 m^3/hour
Average Stack Exhaust Temperature:	1000 °C	
Average Oxygen Content:	11% v/v, dry basis	
Average Water Vapor Content:	16% v/v	
Reference Conditions (Dry Basis):	25 °C	
	101.3 kPa	
	11% O_2 (v/v, dry basis)	

Parameter	Expected Emission Level			Stack Emissions	
	Values at Reference Conditions		Actual Emission Values[2]	Hourly Rate	Daily Rate (12h)
	ppmv (%v)	mg/Rm^3	mg/m^3	g/hour	g/day
Particulate Matter (PM)[3]	n/a	40	7.9	372	4466
Nitrogen Oxides	80	98	19	914	10963
Carbon Monoxide (CO)	25	29	6	266	3198
Carbon Dioxide[4]	8%	1429	281	13297	159568
Sulfur Dioxide[4]	20	52	10	488	5852
Hydrogen Chloride[4]	7	10	2	97	1165
Hydrogen Fluoride	0	0.0	0.0	0	0
Dioxin and Furans	n/a	2.E-10	3.E-11	1.56E-09	1.88E-08
TOC	15	10	2	92	1099
VOC	n/a	8.E-02	1.E-02	6.98E-01	8
PAHs	n/a	2.E-05	5.E-06	2.23E-04	2.68E-03
Co-plane PCBs	n/a	n/a	n/a	n/a	n/a
Hg	n/a	4.E-05	8.E-06	4.E-04	0.00
Cadmium	n/a	6.E-04	1.E-04	6.E-03	0.07
Lead	n/a	0.015	0.003	0.135	1.62
Copper	n/a	0.129	0.025	1.202	14.43
Chromium	n/a	0.012	0.002	0.114	1.37

Note: **1.** Exhaust emissions vary depending on respective concentration presented in waste (function of waste).
The values of emission level in the above table are the arithmetic average concentration based EWS similar emission tests, excluding CO_2, HCL, SO_2

2. Actual emission values are based on actual conditions (at 1 atm, wet basis, average O_2 content and outlet temperature).

3. Particle Size Distribution as per past testing.

4. The volume concentration of carbon dioxide,HCl, SO_2, expressed in [% vol] & Ppm, is not usually obtained by direct measurement, the value in the above table was obtained by calculation.

24.45 l/mol

APPENDIX D

AERMOD Output Files

```
** Lakes Environmental AERMOD MPI
**
****************************************
**
** AERMOD INPUT PRODUCED BY:
** AERMOD VIEW VER. 9.1.0
** LAKES ENVIRONMENTAL SOFTWARE INC.
** DATE: 04/19/16
** FILE: C:\USERS\EPEA\DESKTOP\HY COMPLETED PROJECTS\CNPC LANDFILL\CNPC RECP\CNPC
RECP.ADI
**
****************************************
**
**
****************************************
** AERMOD CONTROL PATHWAY
****************************************
**
**
CO STARTING
   TITLEONE C:\USERS\EPEA\DESKTOP\HY COMPLETED PROJECTS\CNPC LANDFILL\CNPC\CNPC.
   MODELOPT CONC BETA
   AVERTIME 1 8 24 MONTH ANNUAL
   POLLUTID ALL
   RUNORNOT RUN
   ERRORFIL "CNPC RECP.ERR"
CO FINISHED
**
****************************************
** AERMOD SOURCE PATHWAY
****************************************
**
**
SO STARTING
** SOURCE LOCATION **
** SOURCE ID - TYPE - X COORD. - Y COORD. **
   LOCATION MIX3          POINT      708873.350  5492249.440     1215.000
** DESCRSRC MIX 3
   LOCATION MIX2          POINT      708873.350  5492249.440     1215.000
** DESCRSRC MIX 2
   LOCATION MIX1          POINT      708873.350  5492249.440     1215.000
** DESCRSRC MIX 1
** SOURCE PARAMETERS **
   SRCPARAM MIX3               1.0    11.201  1273.150  13.40120     1.118
   SRCPARAM MIX2               1.0    11.201  1273.150  10.37395     1.118
   SRCPARAM MIX1               1.0    11.201  1273.150  11.02236     1.118
   SRCGROUP MIX1     MIX1
   SRCGROUP MIX2     MIX2
   SRCGROUP MIX3     MIX3
SO FINISHED
**
****************************************
** AERMOD RECEPTOR PATHWAY
****************************************
**
**
RE STARTING
   INCLUDED "CNPC RECP.ROU"
RE FINISHED
**
****************************************
** AERMOD METEOROLOGY PATHWAY
****************************************
```

```
**
**
ME STARTING
   SURFFILE "..\MET\CNPC REFINED.SFC"
   PROFFILE "..\MET\CNPC REFINED.PFL"
   SURFDATA 12345 2002
   UAIRDATA 12345678 2002
   PROFBASE 1274.0 METERS
ME FINISHED
**
**************************************
** AERMOD OUTPUT PATHWAY
**************************************
**
**
OU STARTING
   RECTABLE 1 9TH
   RECTABLE 8 1ST
   RECTABLE 24 1ST
   RECTABLE MONTH 1ST
** AUTO-GENERATED PLOTFILES
   PLOTFILE   8 MIX1 1ST "CNPC RECP.AD\08H1G001.PLT" 31
   PLOTFILE   24 MIX1 1ST "CNPC RECP.AD\24H1G001.PLT" 32
   PLOTFILE   MONTH MIX1 1ST "CNPC RECP.AD\MOH1G001.PLT" 33
   PLOTFILE   8 MIX2 1ST "CNPC RECP.AD\08H1G002.PLT" 34
   PLOTFILE   24 MIX2 1ST "CNPC RECP.AD\24H1G002.PLT" 35
   PLOTFILE   MONTH MIX2 1ST "CNPC RECP.AD\MOH1G002.PLT" 36
   PLOTFILE   8 MIX3 1ST "CNPC RECP.AD\08H1G003.PLT" 37
   PLOTFILE   24 MIX3 1ST "CNPC RECP.AD\24H1G003.PLT" 38
   PLOTFILE   MONTH MIX3 1ST "CNPC RECP.AD\MOH1G003.PLT" 39
   PLOTFILE   1 MIX1 9TH "CNPC RECP.AD\01H9G001.PLT" 40
   PLOTFILE   1 MIX2 9TH "CNPC RECP.AD\01H9G002.PLT" 41
   PLOTFILE   1 MIX3 9TH "CNPC RECP.AD\01H9G003.PLT" 42
   PLOTFILE   ANNUAL MIX1 "CNPC RECP.AD\AN00G001.PLT" 43
   PLOTFILE   ANNUAL MIX2 "CNPC RECP.AD\AN00G002.PLT" 44
   PLOTFILE   ANNUAL MIX3 "CNPC RECP.AD\AN00G003.PLT" 45
   SUMMFILE "CNPC RECP.SUM"
OU FINISHED


  *** Message Summary For AERMOD Model Setup ***

  --------- Summary of Total Messages --------

 A Total of            0 Fatal Error Message(s)
 A Total of            1 Warning Message(s)
 A Total of            0 Informational Message(s)


    ******** FATAL ERROR MESSAGES ********
               ***  NONE  ***


    ********   WARNING MESSAGES   ********
 ME W187      70       MEOPEN: ADJ_U* Beta Option for Low Winds used in AERMET
Non-DFAULT

 ***********************************
 *** SETUP Finishes Successfully ***
 ***********************************

♀ *** AERMOD - VERSION  15181 ***   *** C:\USERS\EPEA\DESKTOP\HY COMPLETED
PROJECTS\CNPC LANDFILL\CNPC\CNPC. ***        04/19/16
```

```
 *** AERMET - VERSION  15181 ***   ***
                      ***        16:24:12

                                 PAGE   1
 **MODELOPTs:   NonDFAULT CONC      ELEV      BETA      RURAL     ADJ_U*

                                          ***     MODEL SETUP OPTIONS SUMMARY
 ***
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
- - - - - - - - - - - - - - - - - - - -

 **Model Is Setup For Calculation of Average CONCentration Values.

   --  DEPOSITION LOGIC  --
 **NO GAS DEPOSITION Data Provided.
 **NO PARTICLE DEPOSITION Data Provided.
 **Model Uses NO DRY DEPLETION.  DRYDPLT  =  F
 **Model Uses NO WET DEPLETION.  WETDPLT  =  F

 **Model Uses RURAL Dispersion Only.

 **Model Allows User-Specified Options:
        1. Stack-tip Downwash.
        2. Model Accounts for ELEVated Terrain Effects.
        3. Use Calms Processing Routine.
        4. Use Missing Data Processing Routine.
        5. No Exponential Decay.

 **Other Options Specified:
        ADJ_U*   - Use ADJ_U* BETA option for SBL in AERMET
        CCVR_Sub - Meteorological data includes CCVR substitutions
        TEMP_Sub - Meteorological data includes TEMP substitutions

 **Model Assumes No FLAGPOLE Receptor Heights.

 **The User Specified a Pollutant Type of:  ALL

 **Model Calculates  4 Short Term Average(s) of:   1-HR   8-HR  24-HR  MONTH
     and Calculates ANNUAL Averages

 **This Run Includes:      3 Source(s);       3 Source Group(s); and    4657
Receptor(s)

                with:      3 POINT(s), including
                           0 POINTCAP(s) and      0 POINTHOR(s)
                 and:      0 VOLUME source(s)
                 and:      0 AREA type source(s)
                 and:      0 LINE source(s)
                 and:      0 OPENPIT source(s)


 **Model Set To Continue RUNning After the Setup Testing.

 **The AERMET Input Meteorological Data Version Date:  15181

 **Output Options Selected:
         Model Outputs Tables of ANNUAL Averages by Receptor
         Model Outputs Tables of Highest Short Term Values by Receptor (RECTABLE
Keyword)
         Model Outputs External File(s) of High Values for Plotting (PLOTFILE
Keyword)
         Model Outputs Separate Summary File of High Ranked Values (SUMMFILE
Keyword)
```

```
 **NOTE:  The Following Flags May Appear Following CONC Values:  c for Calm Hours
                                                                 m for Missing Hours
                                                                 b for Both Calm and
Missing Hours

 **Misc. Inputs:  Base Elev. for Pot. Temp. Profile (m MSL) =  1274.00 ;  Decay
Coef. =    0.000     ;  Rot. Angle =     0.0
                   Emission Units = GRAMS/SEC                                 ;
Emission Rate Unit Factor =   0.10000E+07
                   Output Units   = MICROGRAMS/M**3

 **Approximate Storage Requirements of Model =     11.3 MB of RAM.

 **Detailed Error/Message File:   CNPC RECP.ERR

 **File for Summary of Results:   CNPC RECP.SUM

♀ *** AERMOD - VERSION  15181 ***   *** C:\USERS\EPEA\DESKTOP\HY COMPLETED
PROJECTS\CNPC LANDFILL\CNPC\CNPC. ***        04/19/16
 *** AERMET - VERSION  15181 ***   ***
                        ***        16:24:12

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 **MODELOPTs:   NonDFAULT CONC      ELEV      BETA      RURAL     ADJ_U*


                                                  *** POINT SOURCE DATA ***

              NUMBER EMISSION RATE                        BASE     STACK   STACK
STACK     STACK    BLDG   URBAN  CAP/  EMIS RATE
   SOURCE        PART.  (GRAMS/SEC)     X        Y       ELEV.    HEIGHT  TEMP.   EXIT
VEL. DIAMETER  EXISTS SOURCE HOR   SCALAR
     ID          CATS.                (METERS) (METERS) (METERS) (METERS) (DEG.K)
(M/SEC)   (METERS)                     VARY BY
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
- - - - - - - - - - - - - - - - - - - - - -

 MIX3             0   0.10000E+01  708873.4 5492249.4  1215.0    11.20  1273.15
13.40     1.12    NO       NO    NO
 MIX2             0   0.10000E+01  708873.4 5492249.4  1215.0    11.20  1273.15
10.37     1.12    NO       NO    NO
 MIX1             0   0.10000E+01  708873.4 5492249.4  1215.0    11.20  1273.15
11.02     1.12    NO       NO    NO
♀ *** AERMOD - VERSION  15181 ***   *** C:\USERS\EPEA\DESKTOP\HY COMPLETED
PROJECTS\CNPC LANDFILL\CNPC\CNPC. ***        04/19/16
 *** AERMET - VERSION  15181 ***   ***
                        ***        16:24:12

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 **MODELOPTs:   NonDFAULT CONC      ELEV      BETA      RURAL     ADJ_U*


                                              *** SOURCE IDs DEFINING SOURCE GROUPS ***

 SRCGROUP ID                                        SOURCE IDs
 -----------                                        ----------

  MIX1       MIX1        ,

  MIX2       MIX2        ,
```

```
  MIX3       MIX3
♀ *** AERMOD - VERSION  15181 ***   *** C:\USERS\EPEA\DESKTOP\HY COMPLETED
PROJECTS\CNPC LANDFILL\CNPC\CNPC. ***        04/19/16
 *** AERMET - VERSION  15181 ***   ***
                      ***         16:24:12

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 **MODELOPTs:   NonDFAULT CONC      ELEV      BETA      RURAL     ADJ_U*

                                        *** DISCRETE CARTESIAN RECEPTORS ***
                                      (X-COORD, Y-COORD, ZELEV, ZHILL, ZFLAG)
                                                  (METERS)

     ( 710406.0, 5491145.0,    1209.4,    1209.4,       0.0);         ( 710426.0,
5491145.0,    1209.4,    1209.4,       0.0);
     ( 710446.0, 5491145.0,    1210.4,    1210.4,       0.0);         ( 710466.0,
5491145.0,    1210.3,    1210.3,       0.0);
     ( 710486.0, 5491145.0,    1210.3,    1210.3,       0.0);         ( 710506.0,
5491145.0,    1211.3,    1211.3,       0.0);
     ( 710526.0, 5491145.0,    1211.2,    1256.0,       0.0);         ( 710546.0,
5491145.0,    1211.8,    1256.0,       0.0);
     ( 710566.0, 5491145.0,    1212.2,    1257.0,       0.0);         ( 710586.0,
5491145.0,    1213.1,    1257.0,       0.0);
     ( 710606.0, 5491145.0,    1213.7,    1257.0,       0.0);         ( 710626.0,
5491145.0,    1214.1,    1257.0,       0.0);
     ( 710646.0, 5491145.0,    1215.0,    1257.0,       0.0);         ( 710666.0,
5491145.0,    1215.6,    1257.0,       0.0);

…

♀ *** AERMOD - VERSION  15181 ***   *** C:\USERS\EPEA\DESKTOP\HY COMPLETED
PROJECTS\CNPC LANDFILL\CNPC\CNPC. ***        04/19/16
 *** AERMET - VERSION  15181 ***   ***
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 **MODELOPTs:   NonDFAULT CONC      ELEV      BETA      RURAL     ADJ_U*

                                    *** THE SUMMARY OF MAXIMUM ANNUAL RESULTS
AVERAGED OVER   5 YEARS ***


                                     ** CONC OF ALL      IN MICROGRAMS/M**3
             **


                        NETWORK
GROUP ID                      AVERAGE CONC                RECEPTOR  (XR, YR, ZELEV,
ZHILL, ZFLAG)  OF TYPE  GRID-ID
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
- - - - - - - - - - - - - - - - - -

MIX1      1ST HIGHEST VALUE IS       1.77875 AT (  709064.63,  5492340.50,  1218.20,
 1218.20,    0.00)  DC
          2ND HIGHEST VALUE IS       1.75707 AT (  709084.63,  5492340.50,  1218.17,
 1218.17,    0.00)  DC
          3RD HIGHEST VALUE IS       1.74483 AT (  709044.63,  5492340.50,  1218.23,
 1218.23,    0.00)  DC
          4TH HIGHEST VALUE IS       1.73488 AT (  709084.63,  5492360.50,  1219.00,
 1219.00,    0.00)  DC
          5TH HIGHEST VALUE IS       1.72614 AT (  709104.63,  5492360.50,  1219.00,
 1219.00,    0.00)  DC
          6TH HIGHEST VALUE IS       1.72381 AT (  709044.63,  5492320.50,  1217.37,
```

```
 1217.37,    0.00)  DC
          7TH HIGHEST VALUE IS       1.70190 AT (  709064.63,  5492320.50,  1217.67,
 1217.67,    0.00)  DC
          8TH HIGHEST VALUE IS       1.69862 AT (  709104.63,  5492340.50,  1218.13,
 1218.13,    0.00)  DC
          9TH HIGHEST VALUE IS       1.69435 AT (  709064.63,  5492360.50,  1219.00,
 1219.00,    0.00)  DC
         10TH HIGHEST VALUE IS       1.68525 AT (  709024.63,  5492320.50,  1217.40,
 1217.40,    0.00)  DC

MIX2      1ST HIGHEST VALUE IS       1.89468 AT (  709064.63,  5492340.50,  1218.20,
 1218.20,    0.00)  DC
          2ND HIGHEST VALUE IS       1.86800 AT (  709084.63,  5492340.50,  1218.17,
 1218.17,    0.00)  DC
          3RD HIGHEST VALUE IS       1.86233 AT (  709044.63,  5492340.50,  1218.23,
 1218.23,    0.00)  DC
          4TH HIGHEST VALUE IS       1.84496 AT (  709044.63,  5492320.50,  1217.37,
 1217.37,    0.00)  DC
          5TH HIGHEST VALUE IS       1.84118 AT (  709084.63,  5492360.50,  1219.00,
 1219.00,    0.00)  DC
          6TH HIGHEST VALUE IS       1.83112 AT (  709104.63,  5492360.50,  1219.00,
 1219.00,    0.00)  DC
          7TH HIGHEST VALUE IS       1.81480 AT (  709064.63,  5492320.50,  1217.67,
 1217.67,    0.00)  DC
          8TH HIGHEST VALUE IS       1.80894 AT (  709024.63,  5492320.50,  1217.40,
 1217.40,    0.00)  DC
          9TH HIGHEST VALUE IS       1.80348 AT (  709104.63,  5492340.50,  1218.13,
 1218.13,    0.00)  DC
         10TH HIGHEST VALUE IS       1.80097 AT (  709064.63,  5492360.50,  1219.00,
 1219.00,    0.00)  DC

MIX3      1ST HIGHEST VALUE IS       1.45563 AT (  709064.63,  5492340.50,  1218.20,
 1218.20,    0.00)  DC
          2ND HIGHEST VALUE IS       1.44552 AT (  709084.63,  5492340.50,  1218.17,
 1218.17,    0.00)  DC
          3RD HIGHEST VALUE IS       1.43417 AT (  709084.63,  5492360.50,  1219.00,
 1219.00,    0.00)  DC
          4TH HIGHEST VALUE IS       1.43262 AT (  709104.63,  5492360.50,  1219.00,
 1219.00,    0.00)  DC
          5TH HIGHEST VALUE IS       1.41867 AT (  709044.63,  5492340.50,  1218.23,
 1218.23,    0.00)  DC
          6TH HIGHEST VALUE IS       1.40396 AT (  709104.63,  5492340.50,  1218.13,
 1218.13,    0.00)  DC
          7TH HIGHEST VALUE IS       1.40141 AT (  709124.63,  5492360.50,  1218.98,
 1218.98,    0.00)  DC
          8TH HIGHEST VALUE IS       1.39467 AT (  709064.63,  5492360.50,  1219.00,
 1219.00,    0.00)  DC
          9TH HIGHEST VALUE IS       1.39429 AT (  709044.63,  5492320.50,  1217.37,
 1217.37,    0.00)  DC
         10TH HIGHEST VALUE IS       1.38674 AT (  709064.63,  5492320.50,  1217.67,
 1217.67,    0.00)  DC


 *** RECEPTOR TYPES:  GC = GRIDCART
                      GP = GRIDPOLR
                      DC = DISCCART
                      DP = DISCPOLR
♀ *** AERMOD - VERSION  15181 ***   *** C:\USERS\EPEA\DESKTOP\HY COMPLETED
PROJECTS\CNPC LANDFILL\CNPC\CNPC. ***        04/19/16
 *** AERMET - VERSION  15181 ***   ***
                       ***        16:24:12

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 **MODELOPTs:    NonDFAULT CONC       ELEV       BETA       RURAL      ADJ_U*

                                                  *** THE SUMMARY OF HIGHEST  1-HR
RESULTS ***


                                    ** CONC OF ALL       IN MICROGRAMS/M**3
               **

                                                                 DATE
                                                NETWORK
GROUP ID                                  AVERAGE CONC      (YYMMDDHH)              RECEPTOR
(XR, YR, ZELEV, ZHILL, ZFLAG)    OF TYPE  GRID-ID
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
- - - - - - - - - - - - - - - - - - - - - - - -

MIX1      HIGH   9TH HIGH VALUE IS       37.82113  ON 02111807: AT (  709004.63,
5492300.50,  1216.78,  1216.78,    0.00)  DC

MIX2      HIGH   9TH HIGH VALUE IS       40.34257  ON 02111723: AT (  708964.63,
5492280.50,  1216.00,  1216.00,    0.00)  DC

MIX3      HIGH   9TH HIGH VALUE IS       32.30413  ON 04110424: AT (  709004.63,
5492300.50,  1216.78,  1216.78,    0.00)  DC


 *** RECEPTOR TYPES:  GC = GRIDCART
                      GP = GRIDPOLR
                      DC = DISCCART
                      DP = DISCPOLR
♀ *** AERMOD - VERSION  15181 ***   *** C:\USERS\EPEA\DESKTOP\HY COMPLETED
PROJECTS\CNPC LANDFILL\CNPC\CNPC. ***        04/19/16
 *** AERMET - VERSION  15181 ***   ***
                      ***          16:24:12

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 **MODELOPTs:    NonDFAULT CONC       ELEV       BETA       RURAL      ADJ_U*

                                                  *** THE SUMMARY OF HIGHEST  8-HR
RESULTS ***


                                    ** CONC OF ALL       IN MICROGRAMS/M**3
               **

                                                                 DATE
                                                NETWORK
GROUP ID                                  AVERAGE CONC      (YYMMDDHH)              RECEPTOR
(XR, YR, ZELEV, ZHILL, ZFLAG)    OF TYPE  GRID-ID
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
- - - - - - - - - - - - - - - - - - - - - - - -

MIX1      HIGH   1ST HIGH VALUE IS       38.14425  ON 02111808: AT (  708964.63,
5492280.50,  1216.00,  1216.00,    0.00)  DC

MIX2      HIGH   1ST HIGH VALUE IS       40.90312  ON 02111808: AT (  708964.63,
5492280.50,  1216.00,  1216.00,    0.00)  DC

MIX3      HIGH   1ST HIGH VALUE IS       33.03261  ON 02111808: AT (  709004.63,
5492300.50,  1216.78,  1216.78,    0.00)  DC


 *** RECEPTOR TYPES:  GC = GRIDCART
```

```
                    GP = GRIDPOLR
                    DC = DISCCART
                    DP = DISCPOLR
♀ *** AERMOD - VERSION  15181 ***   *** C:\USERS\EPEA\DESKTOP\HY COMPLETED
PROJECTS\CNPC LANDFILL\CNPC\CNPC. ***        04/19/16
 *** AERMET - VERSION  15181 ***   ***
                    ***         16:24:12

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 **MODELOPTs:   NonDFAULT CONC      ELEV      BETA      RURAL     ADJ_U*

                                                *** THE SUMMARY OF HIGHEST 24-HR
RESULTS ***

                                    ** CONC OF ALL      IN MICROGRAMS/M**3
            **

                                                          DATE
                                         NETWORK
GROUP ID                           AVERAGE CONC     (YYMMDDHH)             RECEPTOR
(XR, YR, ZELEV, ZHILL, ZFLAG)    OF TYPE  GRID-ID
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
- - - - - - - - - - - - - - - - - - - - - - - - -

MIX1     HIGH   1ST HIGH VALUE IS      24.91568  ON 02111824: AT (  709004.63,
5492300.50,  1216.78,  1216.78,    0.00)  DC

MIX2     HIGH   1ST HIGH VALUE IS      26.30237  ON 02111824: AT (  709004.63,
5492300.50,  1216.78,  1216.78,    0.00)  DC

MIX3     HIGH   1ST HIGH VALUE IS      20.67862  ON 02111824: AT (  709004.63,
5492300.50,  1216.78,  1216.78,    0.00)  DC


 *** RECEPTOR TYPES:  GC = GRIDCART
                    GP = GRIDPOLR
                    DC = DISCCART
                    DP = DISCPOLR
♀ *** AERMOD - VERSION  15181 ***   *** C:\USERS\EPEA\DESKTOP\HY COMPLETED
PROJECTS\CNPC LANDFILL\CNPC\CNPC. ***        04/19/16
 *** AERMET - VERSION  15181 ***   ***
                    ***         16:24:12

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 **MODELOPTs:   NonDFAULT CONC      ELEV      BETA      RURAL     ADJ_U*

                                                *** THE SUMMARY OF HIGHEST MONTH
RESULTS ***

                                    ** CONC OF ALL      IN MICROGRAMS/M**3
            **

                                                          DATE
                                         NETWORK
GROUP ID                           AVERAGE CONC     (YYMMDDHH)             RECEPTOR
(XR, YR, ZELEV, ZHILL, ZFLAG)    OF TYPE  GRID-ID
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
- - - - - - - - - - - - - - - - - - - - - - - - -

MIX1     HIGH   1ST HIGH VALUE IS       5.14585c ON 06113024: AT (  709064.63,
5492360.50,  1219.00,  1219.00,    0.00)  DC
```

```
MIX2     HIGH   1ST HIGH VALUE IS       5.49821c ON 06113024: AT (  709064.63,
5492360.50,  1219.00,  1219.00,    0.00)  DC

MIX3     HIGH   1ST HIGH VALUE IS       4.16211c ON 06113024: AT (  709064.63,
5492360.50,  1219.00,  1219.00,    0.00)  DC


 *** RECEPTOR TYPES:  GC = GRIDCART
                      GP = GRIDPOLR
                      DC = DISCCART
                      DP = DISCPOLR
♀ *** AERMOD - VERSION  15181 ***   *** C:\USERS\EPEA\DESKTOP\HY COMPLETED
PROJECTS\CNPC LANDFILL\CNPC\CNPC. ***        04/19/16
 *** AERMET - VERSION  15181 ***   ***
                      ***         16:24:12

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 **MODELOPTs:   NonDFAULT CONC      ELEV      BETA      RURAL     ADJ_U*

 *** Message Summary : AERMOD Model Execution ***

  --------- Summary of Total Messages --------

 A Total of            0 Fatal Error Message(s)
 A Total of            1 Warning Message(s)
 A Total of          233 Informational Message(s)

 A Total of        43824 Hours Were Processed

 A Total of          233 Calm Hours Identified

 A Total of            0 Missing Hours Identified (  0.00 Percent)


    ******** FATAL ERROR MESSAGES ********
              ***  NONE  ***


    ********   WARNING MESSAGES   ********
 ME W187      70       MEOPEN: ADJ_U* Beta Option for Low Winds used in AERMET
Non-DFAULT

    ************************************
    *** AERMOD Finishes Successfully ***
    ************************************
```