WARDROP

June 5, 2006

0222880801-LTR-V0001-00

Mr. Joe Murdoch
Nunavut Water Board
P.O. Box 119
Gjoa Haven, Nunavut X0B, 1J0

Dear Mr. Murdoch

Subject Proposed Landfarm – Kugaaruk

This is in response to your correspondence, dated May 10, 2006, to Mr. Navjit Sidhu regarding the review of the Water Licence Application submitted by Wardrop Engineering for a soil treatment landfarm near the Hamlet of Kugaaruk. Mr. Sidhu has directed Wardrop to provide responses to the issues raised in your letter.

1. Splash Pad and Discharge Route

The exact location of the splash pad will be determined in the field since topographic drawings do not necessarily reveal the required level of local detail. The intent will be to use a location where downstream flow can dissipate over a relatively broad area via existing natural drainage contours, instead of promoting channelized flow.

The splash pad will be constructed of two layers of nonwoven geotextile covering an area of approximately 50 m^2. The geotextile will be covered with riprap to a depth of 250 mm. Riprap will consist of local rock sized from 20 to 150 mm. The base will be cleared of debris and compacted with local equipment before placement of the geotextile. The configuration of the pad will broaden toward the downstream end to promote wider distribution of the discharge. During discharge periods, the line from the pump will be fixed at the upstream side of the splash pad. The discharge will be visually monitored on a frequent basis. The location of the discharge line will be adjusted as necessary to optimize the flow conditions over the pad and the riprap blanket will be repaired as necessary by adjusting the configuration of the stone layer.

The most likely location for the splash pad will be to the west of the retention cell. The design of the pad and an approximated dispersal path from that point is illustrated on sketch SKT-M0001-A (attached).

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2. Berm Construction

The landfarm berms were constructed to the same specifications as the containment berms at the new petroleum tank farm in Kugaaruk. The tank farm is now in operation. The attached letter from Kudlik Construction provides details on the construction methods. The letter, signed by Mr. Rene Deziel, P.Eng., confirms that their works exceeded the project specifications. Kudlik had conducted a lab analysis on a sample of the cover material used on the berms and confirmed that it exceeded the material specifications provided by Wardrop. A copy of the relevant project specifications issued by Wardrop is attached.

As indicated in the correspondence of May 1, 2006, a Wardrop employee was on site on the week after completion of the landfarm construction. The inspector has prior experience with soil compaction testing and granular material analysis. The primary purpose of the inspection was to confirm that the construction of the landfarm complied with the specifications provided to the contractor. The inspector used visual observations to estimate the material size distribution in reference to percent passing a No. 4 sieve size.

3. Water Treatment and Snow Removal

An activated carbon treatment process will be used to reduce hydrocarbon levels in the water retention pond discharge if allowable limits are exceeded. Activated carbon is a universally accepted method for removing organic contaminants in wastewater discharges. Portable equipment supplied by Calgon Carbon will be used for this purpose. Assuming that the contaminated soil is placed in the landfarm in 2006, a small (Disposesorb) unit will be shipped to Kugaaruk prior to spring melt in 2007. If lab tests done after spring melt indicate elevated levels of hydrocarbons in the retention cell, the small unit will be used to conduct treatability tests to determine the parameters required to achieve an adequate level of contaminant removal. Based on the test results, an appropriately sized treatment system will be ordered and shipped to the site. Manufacturer's brochures for typical treatment options are attached.

Although the service life of the carbon is entirely dependent on the contaminant levels in the influent, it is anticipated that a unit will be selected that will provide one full season's service before having to change the media. If necessary the treatment system would be shipped back to the manufacturer for service during the winter months.

Use of the carbon treatment system will require a reduction in the flow rate of the discharge from the retention cell, thereby increasing the time frame for discharge of the retention cell. After going through the treatment system, the water would be discharged directly to the splash pad.

4. Water Treatment and Snow Removal (cont'd)

In terms of the planned snow removal, the primary message to the operators will be to use common sense to ensure that the soil treatment pile is not disturbed and the berms are not damaged. Quantification of a "buffer layer" would be difficult to communicate or apply due to expected irregularities in the surface of the soil treatment pile. It should also be noted that snow removal will take place near the end of winter and the berms and soil pile will be frozen solid and will be extremely difficult to penetrate with snow removal equipment. This condition in itself provides a level of protection. The direction to the personnel involved with the snow removal will be to work one area at time and to conduct a walk-over in advance to confirm the thickness of the snow cover. Areas may be staked, if appropriate, to indicate the maximum depth of snow removal.

5. Soil Amendments

Recent research conducted in both arctic and Antarctic conditions has shown that the addition of nutrients to organic-deficient soils impacted by diesel fuel resulted in a marked increase in the population of naturally occurring microbes that break down hydrocarbons. The literature review conducted by Wardrop indicates that a similar approach may be advantageous for the Kugaaruk project. With the approval of the Water Board, Wardrop is proposing to incorporate a slow release granular nitrogen-phosphorus fertilizer into the impacted soil. Initially, the soil will be placed in the treatment cell as previously described. The required volume of fertilizer would be placed over the top layer prior to the first time the soil is turned for aeration. The aeration process will then incorporate the granular material into the soil treatment layer. The same process would be carried out on each subsequent soil layer.

Based on optimum carbon-nitrogen-phosphorus ratios stated in the literature for biostimulation in cold climates, a total of approximately 2500 kg of nitrogen and 800 kg of phosphorus would be incorporated into the entire soil mass in the treatment cell. A more accurate calculation of the quantity of nutrient to be added for each soil layer would be carried out based on the actual profile of the soil after placement in the treatment cell.

With the addition of the nutrient, the retention cell water sampling program will be amended to include a nutrient scan.

In the event that the analysis of subsequent soil samples indicate that an acceptable rate of contaminant reduction is not being achieved, soil samples will be submitted to a bioremediation firm for an assessment to determine whether further amendments are required. Typically these amendments may include bacteria, enzymes or a combination of both. Until the assessment is conducted it would be difficult to predict this requirement. Any future plans for further amendments to the soil would be submitted to the Water Board in advance.

We trust that this adequately addresses the issues raised in your May 10 letter. Please contact me if any further clarification is required. It is our understanding that the application, with our subsequent responses, will now be circulated for review before a decision is made on licensing the landfarm. Our client is anxious to receive authorization from your agency to operate the landfarm so they can proceed with the excavation of impacted soil that has previously been identified as a potential exposure risk to the residents of Kugaaruk.

Sincerely

WARDROP ENGINEERING INC.

For David Ediger, P.Eng.
Senior Environmental Engineer

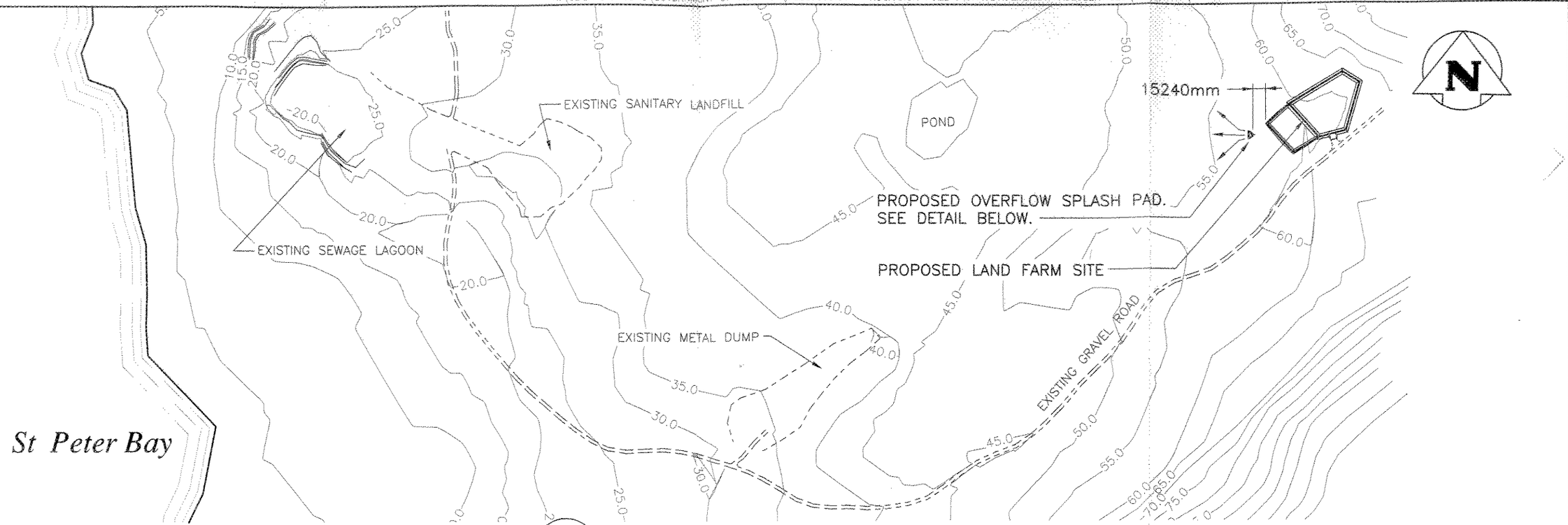
Approved by

WARDROP ENGINEERING INC.

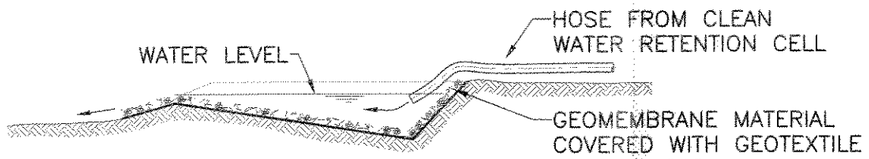
Lorne Stone, Principal
Mechanical Department Manager

Copy Nunavut Department of Public Works and Services

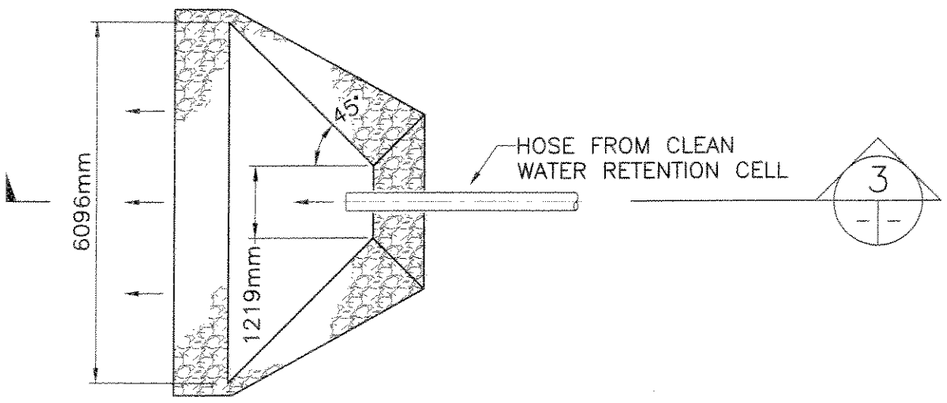
Attachment



1 SITE PLAN
1:5000



3 SPLASH PAD – SECTION
N.T.S.



2 SPLASH PAD – PLAN
N.T.S.

100 0 100 200m
1:5000

PRELIMINARY DRAWING ONLY
NOT TO BE USED FOR CONSTRUCTION
(REMOVE WHEN DRAWING IS FINAL)

WARDROP | Engineering Inc.

Nunavut
Department of Public Works & Services

LANDFARM WATER HANDLING FACILITIES
KUGAARUK, NUNAVUT
OVERALL SITE PLAN & DETAILS

DESIGNED BY: LS	DRAWN BY: SR	DWG NO.
CHECKED BY:	DATE: 06.05.31	0222880801-SKT-M0001-A

KUDLIK CONSTRUCTION LTD
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May 18th, 2006

WARDROP Engineering Inc.
400 – 386 Broadway
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R3C 4M8

Attention: David Ediger, P. Engineer

Project: Fuel Storage Facility Expansion and Relocation. Kugaaruk, Nunavut

Dear David,

As discussed on our last telephonic conversations, this letter is to confirm our works for the construction of the landfarm facilities in Kugaaruk.

We realized all works for the construction of the landfarm as per standard industries practice and specifications for this facility.

1. We removed, excavated all non-appropriate soil over the surface to permafrost line. (Topsoil, loose rock)
2. We excavate a peripheral ditch to get a positive drainage of the area.
3. We backfilled and compacted a layer of coarse gravel in the natural ditch and over the bottom to level all the area.
4. We build all berms with selected gravel fill and compacted it by layer of +- 300mm as per practice industries.
5. We placed and compacted a 150mm layer of sand over all the area.
6. We installed a nonwoven geotextile LP10.
7. A specialist of Layfield Environmental Systems Ltd verified all surfaces area, installed, tested and approved the geomembrane HDPE 60 textured liner along berms and bottom surfaces. They supplied a warranty already transmitted for the geomembranes material and installation.
8. We installed another layer of geotxtile LP10 to protect the liner.
9. We covered the geotextile with sand and finally with fine gravel.
10. The compactor utilized for compaction was a Caterpillar Cs553 for all plane surfaces and a hand vibrating plate where the big compactor could not reach.

All of those works had been realized during the autumn in 2004. After receiving the test result from sample took over the surfaces, we added in 2005 another layer of fine gravel, which contained more stone to be conforming to the specified gradation as per test, sent last autumn.

From the informations received from the site, Daily reports, pictures and a site visit last year, I could confirm that all the works we executed for this construction **exceed the specifications** received and a HDPE liner had been installed instead of Arctic liner which increasing the quality of the project. We realized those works with the same qualified team of workers, which had built many soil-contaminated cells in North.

However, we realized those works two years ago and a spring inspection and maintenance has to be done prior to utilize the area. (Freeze and unfreeze period affect the compaction, water inside of the cell affect it, there are no fence around the area and ATV are riding around and in it.). We expect to pump some water from those cells and maybe regrade and recompact some berm area if necessary.

Regards

Rene Deziel, P. Eng. Manager

PART 1 - GENERAL

1.1 Related Work

.1	Summary of the Work	Section 01010
.2	HDPE Liner Membrane	Section 02592
.3	RPE Liner Membrane	Section 02593
.4	Fencing, Signs and Markers	Section 02831
.5	Tankage	Section 15060
.6	Non-Woven Geotextile	Section 02270

1.2 Reference Standards

.1 Specifications for aggregates and soils and the compaction of aggregates and soils refer to ASTM Sieve Analyses and ASTM Tests.

.2 Other materials are specified with reference to CGSB Standards, CSA Standards and ASTM Standards.

1.3 Submittals

.1 At least two (2) weeks before beginning work, the Contractor shall submit to the Engineer for review, a complete and detailed outline of the procedures and methods that he will employ for this section of the Work.

.2 The Contractor shall not begin work until the Engineer has reviewed the submittal.

1.4 Product Delivery, Storage and Handling

.1 Deliver materials to the site and store in a manner such that granular materials are kept in separate piles and manufactured materials are stored according to the recommendations of the manufacturer.

.2 Sand and gravel material required shall be selected from available local sources within approximately 3-kilometre radius of the site. These sources shall be subject to the Engineer's approval, and Land Use Permits shall be obtained and paid for by the Contractor for the use of these materials.

.3 The Contractor shall pay all royalty fees. No separate payment will be made for royalty fees. Should the Contractor wish to obtain sand and gravel from municipal pits in the Hamlet of Kugaaruk, the royalty fee is $6 per cubic metre.

.4 It is estimated a volume of 20,000 m^3 of material available for screening for the gravel and 10,000 m^3 for screening to obtain the sand. Geotechnical report included shows location of borrow pit and sieve analysis of sample obtained.

.5 The Contractor is advised that screening and mixing of the material, especially for the fine gravel and sand, may be required to meet the specifications. The Contractor shall at no additional cost to the Owner screen and blend materials from one or more sources to achieve the gradations shown and to permit compaction to the required levels called for in this Section.

.6 The Owner reserves the right to have sampling of granular material and concrete as well as compaction tests carried out by an independent material testing firm to satisfy himself the specifications are met. Should results indicate that the specifications are not met, all costs related to the sampling, testing and correction of the problem will be charged to the Contractor, unless the Contractor can produce proof of compliance.

.7 Frozen material and ice will not be accepted as backfill material.

1.5 Job Conditions and Regulations

.1 Perform work in accordance with the Safety Act and General Safety Regulations of the Northwest Territories.

.2 Perform work in a manner that will cause the least disruption or danger to traffic and pedestrians.

.3 The Contractor is responsible for posting of warning and traffic signs, supply and placing of barricades, and protective hoarding.

1.6 Quality Assurance

.1 Refer to Section 01400 Quality Control.

.2 Submit to the Engineer a list of sources of materials including sand, gravel and borrow materials.

.3 Provide samples, test results, sieve analyses and reports for preliminary approval of materials.

1.7 Minimum Quality Control Test Frequencies

.1 The following frequencies of testing are the minimum required. The Contractor shall perform as many tests as are necessary to ensure that the Work conforms to the requirements of the contract regardless of the minimum number specified.

.2 Provide moisture/density curves for each type of material from each source of material to be compacted to a specified density.

.3 Field densities:

- Structures and Embankments (from excavated material) - one for each 400 m^2 of each compacted layers.
- Pipe Bedding - one for each 100 m of pipe installed.
- Pipe Zone Backfill - one for each 100 m of pipe installed.
- Trench Backfill - one for every 100 m of trench of 1.0 metres fill depth.
- Subgrade Preparation - one field density for every 200 m^2 of 150 mm compacted layers.
- Road Sub-base and Base course - one field density for every 100 m^2 of sub-base and one field density for every 100 m^2 of base course.

1.8 Disposal

.1 All materials on site whether stockpiled, stored or excavated are the property of the Owner, and the Owner reserves the right to keep any part or all of the material.

.2 The Contractor shall dispose of debris, waste, unsuitable material, rock or excess material in accordance with the specifications.

.3 The Contractor is encouraged to reuse materials encountered on site to the extent they comply with the specifications in this Section.

.4 Disposal sites must be approved by the community and the Engineer.

.5 The Contractor shall dispose of all materials at sites, located by the Contractor, in cooperation with the community.

1.9 Measurement for Payment

.1 Supply and installation of fine gravel, course gravel, common fill, sand, and rip rap will be paid for at the contract unit price per cubic meter for each type of material from measurements taken by the contractor administrator. The material will be measured in place.

.2 Excavation will be paid for at the contract unit price per cubic meter for solid excavated and removed from the site.

PART 2 - PRODUCTS

2.1 Granular Materials

.1 Fine Gravel shall comply with the following gradation. It shall be native, clean, well graded, organic free gravel.

Sieve Size	Percent Passing by Weight
25 mm	100
19 mm	95 - 100
13 mm	65 - 95
No. 4	35 - 60
No. 16	20 - 35
No. 50	10 - 20
No. 200	2 - 8

.2 Coarse Gravel shall comply with the following gradation, except that no more than 10% of the fill material shall pass through a No. 200 sieve. It shall be native, clean, well graded, organic free gravel.

Sieve Size	Percent Passing by Weight
100 mm	100
No. 4	35 min.
No. 200	0 - 10

.3 Sand shall comply with the following gradation. It shall be native, clean, salt free, well graded, organic free, rounded or angular pieces containing no more than 4% particles passing a No. 200 sieve.

Sieve Size	Percent Passing by Weight
10 mm	100
No. 4	80 - 100
No. 16	50 - 75
No. 50	15 - 30
No. 100	2 - 8

Sand shall be used as topping material for vertical tank bases, below and above membranes at dike walls, around underground piping and electrical conduits, and where called for elsewhere on the Drawings.

2.2 Common Fill

.1 Shall be native material found on site or imported, and free of stones larger than 100 mm in size, frozen matter, rubbish, and organics or vegetation.

2.3 Rip Rap

.1 Use Class 1 Nominal Size 300 mm hand placed rock rip rap.

.2 Rip Rap shall be:

- 100% smaller than 450 mm or 136 kg
- 20% larger than 350 mm or 68 kg
- 50% larger than 300 mm or 36 kg
- 80% larger than 200 mm or 11 kg

2.4 Culvert

.1 Corrugated Steel Pipe in accordance with CSA CAN3-G401-M81.

.2 Round, Plain Galvanized, 68 x 13 mm corrugations.

.3 Diameter and length - as indicated on the Drawings.

.4 Wall Thickness - 16 gauge.

.5 Couplings - Hugger Band type c/w O-Ring Gaskets.

.6 Culvert for pipe support shall be corrugated steel, nestable sections, 14 gauge, galvanized.

.7 Culvert shall be as manufactured by Armco or approved equivalent.

PART 3 - EXECUTION

3.1 Construction Methods - General

.1 The Contractor is advised that the Drawings and specifications are not based on a legal survey plan of the existing facilities or detailed survey information of existing site conditions.

.2 The location of property limits, fences and bench marks are shown on the Plot Plans and the Grading and Drainage Plans. The Contractor is responsible to maintain and safeguard these throughout the construction period.

.3 Should a bench mark have to be relocated for the purpose of construction, it shall be relocated on a permanent structure and properly identified.

.4 The elevations and dimensions shown on the Drawings are for the purpose of construction, measurement and evaluating progress payments. The Contractor shall ensure that final elevations are adhered to.

.5 The Contractor is responsible for all construction surveys and documentation to verify quantities for payment.

.6 The Owner reserves the right to carry out independent testing of backfill materials and concrete as indicated in other sections.

3.2 Site Preparation

.1 At all developed areas, along pipelines and at spill basins.

.1 Prior to proceeding with any backfill operation, the Contractor shall prepare the sites as indicated below or as specifically directed by other parts of the Contract Documents.

.2 Remove all boulders resting on the ground in excess of 300 mm in size. Buried boulders in excess of 300 mm in size and so protruding from the grade that they interfere with new work, shall be removed and the hole left in the ground shall be backfilled immediately with fine gravel compacted to 95% standard proctor density (SPD). Extent of backfill shall exceed the hole by at least 1000 mm on all sides and extend a minimum of 450 mm above adjacent ground elevations. Slope backfill sides at 2:1 maximum.

.3 Level off areas as required and prepare for backfilling operation as outlined below in order to reach the finish levels shown on the Drawings.

.4 Carry out an accurate survey to act as a reference for payment of material quantities.

.5 Clear as required at spill basin area and along pipeline route(s) to depth required by the Drawings.

.6 Proper precautions shall be taken during excavation so as not to expose unduly the permafrost surface. Prolonged exposure of the frozen soil may result in excessive thawing and water accumulation in the excavation. Backfill operation must follow soon after the excavation is undertaken. Limit and minimize the extent of clearing to allow backfill operation to follow soon after, so as to ensure that a 150 mm minimum layer of backfill material is present at all times over excavated areas.

3.3 Placing and Compaction of Backfill Material

.1 Backfill material shall be in accordance with the specifications outlined in 2.1 above.

.2 Throughout the developed areas, coarse gravel material shall be added, as required, in maximum 200 mm lifts (150 mm compacted thickness) to 350 mm from the finished grades shown on the Drawings, except at the base for vertical tanks where the coarse gravel shall terminate at a minimum of 600 mm from tank base elevations, i.e., at perimeter of tanks. Each lift shall be compacted to 95% SPD.

.3 Granular base for vertical tanks:

.1 Shall be built to the details and thickness shown on the Drawings. Fine gravel material shall be placed in lifts no greater than 150 mm and each lift shall be compacted to 95% SPD. The top surface of the granular base shall be domed as recommended in API 650 to a slope of 1:120.

.2 Compaction equipment shall consist of a vibratory roller with an operating weight of not less than 1000 kilograms, or other equipment of similar capacity acceptable to the Engineer. Light hand-operated compactors, such as jumping jacks, and tracked equipment will not be considered adequate for compaction of tank foundations. The Contractor shall control the moisture level in the backfill material so as to achieve the required compaction levels.

.4 Granular dike wall:

.1 The construction of granular dike walls shall be done when the liner material is rolled clear of the working area. Suitable steps shall be taken to protect the liner and top of compacted gravel layer from damage due to equipment running over these areas during dike wall construction. The method of protection shall be reviewed and approved by the Engineer.

.2 The core of the dike walls shall be built up with common fill, coarse gravel or fine gravel materials. Sand shall not be used as fill material for the dike core. The dike walls shall be constructed to the dimensions and elevations as shown on the Drawings.

.3 The top of the dike walls shall be not less than 600 mm wide. Backfill at dike walls shall be compacted in maximum 200 mm lifts to 95% SPD. A trench shall be provided on top of exterior dike walls for anchoring of the liner membrane as per the details on the Drawings.

.5 Areas inside of the dike walls:

.1 A sand bed shall be installed on the fine gravel material to receive the liner membrane. This sand bed shall be placed in a single lift and compacted to 95% SPD. The bedding surface shall be uniform and all depressions greater than 12 mm shall be filled and smoothed with additional sand material to assure proper bearing for the liner membrane. The bedding surface shall be sloped towards the sump location as indicated on the Drawings, at a minimum slope of 1:200, and so as to assure proper drainage of surface water towards the sump.

.2 Prior to the liner membrane installation, the Engineer shall inspect the bedding to ensure that it is satisfactory, and any defects noted shall be rectified. The Contractor is responsible for providing at least seven (7) days notice to the Engineer to ensure that he is available for the inspection. The liner membrane installation and testing shall be as detailed in Section 02592, and shall be fully accepted by the Engineer before covering.

.3 Following the liner membrane installation, a sand layer shall be placed on top of the liner membrane and compacted to 95% SPD in the presence of the Engineer and Liner Technician engaged by the Contractor. All necessary precautions shall be taken during this operation to ensure that no damage is done to the liner membrane. Any damage to the liner membrane shall be repaired at the Contractor's expense, to the satisfaction of the Engineer.

.4 A geotextile fabric shall be placed over the sand layer as specified in Section 02270.

.5 At areas other than vertical tank base, cover material consisting of fine gravel shall be placed on top of the sand cover and geotextile fabric in a single lift, graded and compacted to 95% SPD with a manually operated roller of minimum 230 kilogram weight. The cover material shall be placed so as to attain the final grades shown on the Drawings, and so as not to damage the liner membrane.

.6 At areas under vertical tank bases:

.1 Cover material consisting of fine gravel shall be placed as per 3.3.3. A sand bed shall be placed on the fine granular material in a single lift, graded and compacted to 95% SPD. The top surface of the sand bed shall to domed to a slope of 1:120 as shown on the Drawings.

.7 Under horizontal tanks:

.1 Provide a granular pad exceeding the horizontal tank layout by a minimum of 1000 mm all around. The fine gravel material shall be added over the thickness required by item 3.3.5.5, in order to provide a level pad for the horizontal tanks to the elevations shown on the Drawings. The backfill shall be level and compacted to 95% SPD.

.8 At areas outside the dikes:

.1 At developed areas adjacent to the dike walls, including the vehicular traffic areas, fine gravel material shall be placed on top of the coarse gravel in maximum 200 mm (150 mm compacted) lifts, to the elevations and details shown on the Drawings, and compacted to 95% SPD. The top surface of the fine gravel material shall be uniform and to the grades shown on the Drawings, i.e., sloped to permit surface water runoff as shown.

.9 At pipeline rights-of-way:

.1 Clear off boulders interfering with the proposed pipeline.

.2 Section 01010 describes the work to be done at pipeline rights-of-way.

.3 Where pipelines are to be installed on new pipe supports, granular pads shall be provided under each support. The size of the granular pads will vary due to the irregularity of terrain along the pipeline route(s). Where the pipeline right-of-way crosses an existing ditch, culvert sections full of rip-rap material shall be provided under supports to prevent erosion of support bases, refer to the details on the Drawings.

.10 The ground at the pipe supports:

.1 Level to receive a gravel base for the pipe supports, i.e., boulders or rock outcrops shall be removed per item 3.2.2. The gravel base at the pipe supports shall be constructed to the thickness required by the field conditions, so as to insure a uniform slope for the piping and such that piping elevations as shown on the Drawings are maintained.

.2 Backfill with coarse gravel material placed and compacted to 90% SPD, in 200 mm maximum (150 mm compacted) lifts to an elevation 350 mm below finished elevations. Fine gravel shall be placed on top of the coarse gravel in maximum 200 mm lifts, to the elevations and details shown on the Drawings, and each lift shall be compacted to 90% SPD. The top surface of the fine gravel shall be uniform.

.11 Spill basin and vehicular traffic areas:

.1 Backfill with coarse gravel material placed and compacted to 95% SPD, in 200 mm maximum lifts to an elevation 350 mm below finished elevations. Fine gravel shall be placed on top of the coarse gravel in maximum 200 mm lifts, to the elevations and details shown on the Drawings, and each lift shall be compacted to 95% SPD. The top surface of the fine gravel shall be uniform and to the grades shown on the Drawings.

.12 Backfill under concrete slabs, sidewalks, pipe supports and anchoring blocks:

.1 Backfill with fine gravel minimum 150 mm thick, compacted to 95% SPD.

.13 Backfill under dispenser buildings and operator's shelter building:

.1 Backfill with fine gravel material, minimum 150 mm in thickness, graded and compacted to 95% SPD, unless noted otherwise on the Drawings.

.2 A shallow diked containment area shall be constructed under dispenser buildings complete with an impervious liner, as shown on the Drawings.

.14 Base of Landfarming Facility

.1 Shall be built in accordance with the specifications outlined in section 3.1, 3.2, and 3.3.1 and 3.3.2, unless otherwise indicated on the drawings.

.15 Granular Dike Wall at Landfarming Facility

.1 Shall be built in accordance with the specifications outlined in section 3.3.4, unless otherwise indicated on the drawings.

.16 Area inside of dike walls at landfarming facility

.1 Shall be built in accordance with the specifications outlined in section 3.3.5, unless otherwise indicated on the drawings, with the following exception.

.1 Liner membrane installation and testing shall be performed as detailed in Section 02593 and Clause 3.5.2 of that Section.

3.4 Drainage of Excavations

.1 The Contractor shall take all the necessary measures to keep the excavations free of water at all times and to protect the excavations from damage that may be caused by rain, surface water run-off, ground thawing or otherwise. Create low points as required for pumping water out of the excavations or create temporary ditches to direct water away from the excavations.

.2 The Contractor shall, at his cost, be responsible for any additional excavation and backfill that may be required due to lack of proper drainage of the excavations, and which would have as an effect, the softening of the ground, and consequently, reduction in its bearing capacity.

3.5 Dike Drain Sump

.1 The dike areas shall be provided with a drain sump(s) fabricated from a 205 litre steel drum or 610 mm diameter galvanized culvert section, cut and with perforations as shown on the Drawings. The drain sump(s) shall be located at the low points in the diked area as shown on the Drawings, and the top of the drain sumps are to be level with the finished ground elevation at those points.

3.6 Ditches

.1 Ditches are to be provided where and as shown on the Drawings.

3.7 Cleanup

.1 The Contractor shall cleanup and dispose of all excess material, boulders and other debris as the Work progresses. All petroleum hydrocarbon contaminated soil must be excavated and hauled as indicated in Section 3.8, and be replaced with clean compacted fill.

.2 Before the Work is considered complete, the Contractor shall remove all construction equipment, appliances, barricades, surplus materials, etc., and do such other work as may be necessary to leave the site or any other premises occupied by him in a neat, workmanlike condition, as required by the Engineer.

3.8 Removal of Contaminated Soil

.1 Petroleum hydrocarbon contaminated soil shall be excavated to the limits identified in the Dillon Engineering Consultants Environmental Site Assessment report provided in Appendix A (approximate volume is 3, 500 m^3), or as directed by the Engineer.

.2 All contaminated soil shall be transported to the newly constructed landfarming facility and deposited as a continuous uncompacted layer of thickness as shown on the drawings. All necessary precautions will be taken during this operation to ensure that no damage is done to the underlying liner membrane. Any damage to the liner membrane shall be repaired at the contractor's expense, to the satisfaction of the engineer.

END OF SECTION 02224

INSPEC-SOL INC.

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2590, avenue Dalton
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Tél. : (418) 658-0112
Fax : (418) 658-2144

☐ THETFORD MINES
128, rue Notre-Dame Nord
Thetford Mines (Québec)
G6G 2J8
Tél. : (418) 338-0636
Fax : (418) 338-4882

☐ VICTORIAVILLE
103, rue St-Jean-Baptiste
Victoriaville (Québec)
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Tél. : (819) 752-3675
Fax : (819) 752-2277

ISO 9001

TÉLÉCOPIE / FAX

REF. Q-7801 DATE 05-10-13

À / TO RENÉ DÉZIEL / KUDLIK CONSTRUCTION

DE / FROM Suzanne Glasson pour SIMON DESJARDINS

TÉLÉCOPIEUR / FAX 871-8141 TÉL.

NB DE PAGES 2 INCLUANT PAGE COUVERTURE / INCLUDING COVER PAGE

OBJET / RE : Résultats essai Proctor Modifié

RÉSULTATS MG-20

SALUTATIONS

Suzanne Glasson pour

Simon Desjardins ing. jr.

INSPEC-SOL

SOILS AND AGGREGATE ANALYSIS

CLIENT: KUDLIK CONSTRUCTION
1781, route de l'Aéroport
Anjemme-Loretie
G2E 3M3

PROJECT: Contrôle et essais 2005.

PROJECT NO: 6005-07801

SAMPLE NO: 22809

DATE: 2005-10-06

DESCRIPTION OF MATERIAL: MG 20

ORIGIN:

PROPOSED USE: Fondation inférieure

LOCATION: LAND FARM TANK FARM PELY BAY SURFACE

LOT NO:

SAMPLE NO:

TONNAGE:

SAMPLE BY: CLIENT

DATE : 2005-10-01

SIEVE ANALYSIS (% PASSING)

Sieve	Sep.	Comb.	Spec.
112 mm			
80 mm			
56 mm			
40 mm			
31,5 mm		100	100
20 mm	95	98	90-100
14 mm	70	87	68-93
10 mm	42	75	
5 mm		57	35-60
2,5 mm	75	43	
1,25 mm	45	26	19-36
630 µm	26	15	
315 µm	17	9	9-17
160 µm	11	6	
80 µm	7.9	4,5	2-7

ESSAI PROCTOR

Max dry unit weight	Kg/m³
Optimum moisture content	%
Stone	%
Method	
Permeability K (cm/sec)	
W % at test	

Test	
Petrographic index	
Los Angeles ( ) (%)	
Micro Deval ( ) (%)	
Friability (%)	
Organic content (%)	
MgSO4 > 5 mm (%)	
MgSO4 < 5 mm (%)	
Methyl blue index	
Crushed particles (%)	
Flat particules content (%)	
Elong. particules cont. (%)	
Flow coefficient	
Micro Deval LC21-101	
	%
	%
	%
	%
	%
	%
	%

VARIOUS TEST

Specifications		
	Spec. grav. S.S.D. < 5 mm	
	Bulk density < 5 mm	
	App. density < 5 mm	
	Absorption < 5 mm (%)	
	Spec. grav. S.S.D.> 5mm	
	Bulk density > 5mm	
	App. density > 5mm	
	Absorption > 5 mm (%)	
	Fineness modulus	
	Coefficient of uniformity	16,6
	Loose unit weight (Kg/m³)	
	Comp. unit weight (Kg/m³)	
	Water content (%)	

CONSTITUANTS

COMMENTS:

Prepared by ALBERT DELISLE

Verified by: SIMON DESJARDINS, ing. jr.

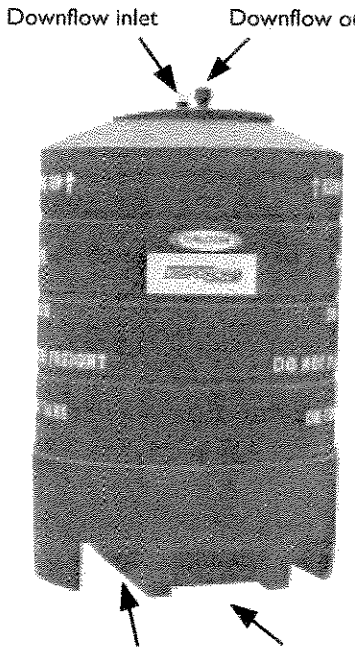
CALGON
CALGON CARBON CORPORATION

Making Water and Air Safer and Cleaner

DISPOSORB®

DISPOSORB® has been developed by Calgon Carbon Corporation for cleanup of off-spec product batches, accidental spills, contaminated rainwater in tank-farm containment dikes, and many other uses. It is the first disposable, compact, granular activated carbon adsorber providing all the essentials of a full-scale system. Available in two sizes, 350 gallon capacity and 55 gallon capacity.

350 gal DISPOSORB®



Applications

Hazardous/Toxic Dissolved Organic Removal

- Process Stream Purification
- In-Plant Spill Treatment
- Laboratory Bench Drains
- Storage Tank Washdown
- Monitoring Well Discharges
- Dechlorination
- Dechlorination of Liquids
- Small Wastewater Streams

Evaluation of Adsorption for Liquid Processes

- Feasibility Studies
- Laboratory Investigation
- Pilot Plant Studies

55 gal DISPOSORB®

Specifications

	55 gal DISPOSORB®	*350 gal DISPOSORB®*
GAC per unit (lbs.) approx.	165	1,000
Dimensions, approx.	23" D x 36" H	44" D x 67" H
Connections	3/4" NPT inlet	1 1/2" male NPT inlet
	1" NPT outlet	1 1/2" male NPT outlet
Container	HMWPE	1/4" polyethlene

Equipment and Systems

Visit our website at www.calgoncarbon.com, or call 800-422-7266 to learn more about our complete range of products and services, and obtain local contact information.

ES-EB1003-0404

DISPOSORB®

How DISPOSORB® Works

DISPOSORB® contains granular activated carbon which removes dissolved pollutants from water by a process called adsorption. As water passes through the porous granules of activated carbon, molecules of the organic pollutants are attracted to the surface of the pores and are held there by weak physical forces. The phenomenon is somewhat similar to iron filings being held by a magnet.

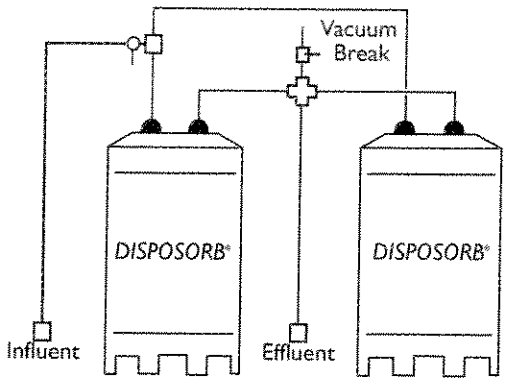
The ability of granular activated carbon to remove large quantities of organic impurities is a function of its highly developed internal pore structure. This unique pore structure is created during the manufacturing process which involves the crushing and thermal "activation" of select grades of bituminous coal under carefully controlled conditions. As a result of this processing, an extensive network of pores is created inside each carbon granule providing an enormous internal surface area.

Granular activated carbon's great porosity is responsible for its high capacity for trapping and holding organic molecules. For example, just one pound of carbon granules has an effective total (external and internal) surface area equal to that of a 100-acre farm.

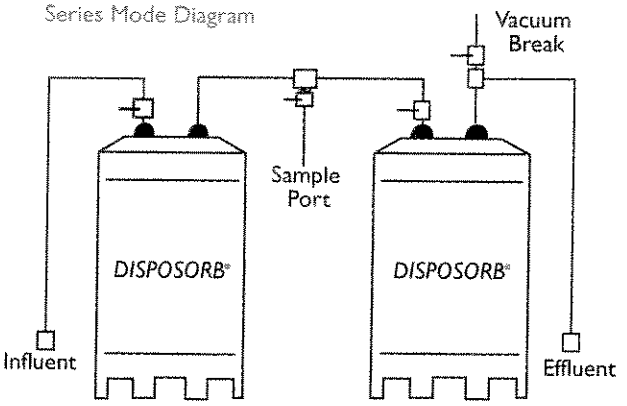
In general, the adsorption capacity for non-polar organic compounds increases with concentration, molecular weight, and decreased solubility. Compounds which adsorb well are aromatic and unsaturated aliphatic compounds and halogenated solvents.

Low-molecular-weight (less than 50) and/or high-polar compounds, highly soluble in water - such as formaldehyde, alcohols, glycols - will not be readily adsorbed. When the concentration of organic wastes in the effluent equals the concentration in the influent, the DISPOSORB® unit is saturated with the maximum organic loading possible.

Parallel Mode Diagram



Series Mode Diagram



The Inside Story

The DISPOSORB® units can be ordered with any of Calgon Carbon Corporation's extensive product line of granular activated carbon.* A Technical Service Representative can assist is selecting the most cost effective carbon for your application.

The internals of the DISPOSORB® are a combination of PVC and stainless steel. In applications involving contaminants which attack these materials, alternative internal construction materials can be ordered.

DISPOSORB® units are constructed of polyethylene. They are not suitable for applications where solvents of high-density polyethylene are present in large concentrations or at temperatures above 140°F.

*The units can also be ordered with reactivated carbon providing an economical solution for wastewater applications. Reactivated carbon units are not for potable or food grade use.

How to Ensure Efficient Utilization of DISPOSORB®

Generally, pre-filtration will be necessary if the stream entering the DISPOSORB® has more than 50 ppm of suspended solids. However, depending upon the nature of the suspended solids, pre-filtration at lower suspended solids levels may be necessary. A flow of 30 gpm will provide 10 minutes contact time per 350 gallon DISPOSORB® unit. Flow in the 350 gallon DISPOSORB® unit should not exceed 30 gpm for an individual unit or create an operating pressure of >7.5 psig in single, series or parallel operation. This pressure rating may limit the maximum flow attainable in applications using multiple DISPOSORB®s in series operations. A flow of 10 gpm will provide 5 minutes contact time per 55 gallon DISPOSORB® unit. Flow in the 55 gallon DISPOSORB® unit should not exceed 10 gpm for an individual unit, or create an operating pressure of >7.5 psig in single, series or parallel operation.

ES-EB1003-0404

DISPOSORB®

Contact time and organic removal efficiency can be enhanced by using multiple DISPOSORB® units in parallel or series mode operation. Depending upon the specific application, consideration should be given to using a vacuum-break or anti-siphon loop to ensure the DISPOSORB® is flooded, and that a vacuum cannot be applied to it.

Monitoring the influent to the final DISPOSORB® in series mode is a good precaution against effluent breakthrough. 350 gallon DISPOSORB® units, 44" diameter by 67" high, may be prepared for operation using hose connections or hard pipe. Connections are male 1 $^{1}/_{2}$" NPT inlet and outlet. Calgon Carbon has available hose harnesses for this purpose as optional equipment. The white connection is the inlet for down-flow operation. The outlet is grey. The DISPOSORB® is not recommended for up-flow operation.

55 gallon DISPOSORB® units, 23" diameter by 36" high, may be prepared for operation using hose connections or hard pipe. Connections are $^{3}/_{4}$" NPT inlet and 1" NPT outlet.

DISPOSORB® units are not designed for operation under high pressure or vacuum. The units have been tested under pressure and should not be operated at a pressure above 7.5 psig.

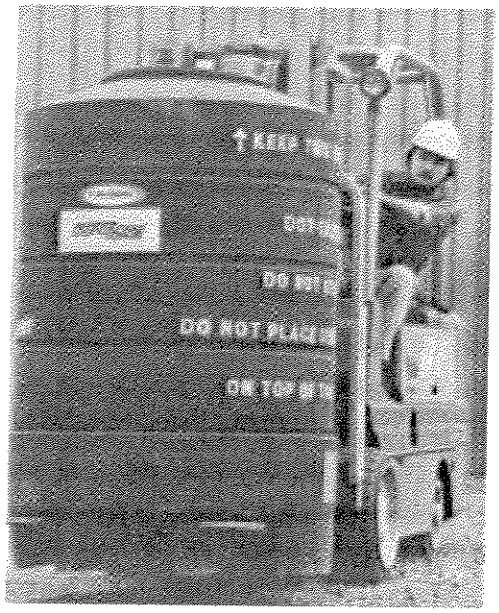
Granular activated carbon must be thoroughly wetted before use to dispel air and to assure proper contact with the influent stream. To facilitate use in the field Calgon Carbon has performed the wetting procedure prior to shipment. Before placing the DISPOSORB® unit into service, fill the unit through the effluent line. The DISPOSORB® is now ready for use in the normal operating mode.

Transporting Adsorber Materials

DISPOSORB® adsorber units may be easily moved by sling or forklift.

Shipping weight for the 350 gallon DISPOSORB® units containing granular activated carbon is approximately 2,500 pounds. Spent units can be expected to weigh about 2,500 pounds after water is drained via siphon on the effluent line or 1 psi air pressure connected to the influent line.

Shipping weight for the 55 gallon DISPOSORB® units containing granular activated carbon is approximately 350 pounds. Spent units can be expected to weigh approximately 350 pounds after water drain.



Disposal

Depending upon what materials are adsorbed on the carbon, the storage, transportation, and disposal of the spent carbon may be subject to Federal, State, and local regulations as a hazardous material.

DISPOSORB®

Safety Message

Wet activated carbon preferentially removes oxygen from air. In closed or partially closed containers and vessels, oxygen depletion may reach hazardous levels. If workers are to enter a vessel containing carbon, appropriate sampling and work procedures for potentially low oxygen spaces should be followed, including all applicable Federal and State requirements.

Limitations of Liability

The Supplier's liability and the Purchaser's exclusive remedy for any cause of action arising out of this transaction, including, but not limited to, breach of warranty, negligence and/or indemnification, is expressly limited to a maximum of the purchase price of spare parts or equipment sold hereunder. All claims of whatsoever nature shall be deemed waived unless made in writing within forty-five (45) days of the occurrence giving rise to the claim. In no event shall the Supplier, for any reason or pursuant to any provision of the warranty, be liable for incidental or consequential damages or damages in excess of the purchase price, nor shall the Supplier be liable for loss of profits or fines imposed by governmental agencies.

Warranty

There are no warranties either expressed or implied or any warranty of merchantability or fitness for a particular purpose associated with the sale of this product.

For information regarding incidents involving human and environmental exposure, call (412) 787-6700 and ask for the Regulatory and Trade Affairs Department.

Visit our website at **www.calgoncarbon.com**

CALGON

CALGON CARBON CORPORATION

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Your local office

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