CITY OF ROCHESTER HILLS
SALT STORAGE FACILITY STUDY
FEBRUARY 23, 2011

BACKGROUND

OHM was retained by the City of Rochester Hills to conduct a facilities study of the Salt Storage facilities at the existing Department of Public Services site at 511 E Auburn Road, Rochester Hills, Michigan. The Study is intended to concentrate on determining the most appropriate building and location for a new Salt Storage Facility. Multiple criteria were used to evaluate the location of the salt storage facility including: vehicular traffic circulation, increase in efficiency, impact on underground utilities, impact on the existing buildings on site, and future opportunities for site development. It was agreed that OHM would prepare four design concepts depicting possible layouts for site utilization and then, after discussion with City staff and input, those four schemes would be refined into three preliminary designs. OHM was also to prepare an associated Preliminary Opinion of Probable Building and Site Budget for each of the preliminary designs. The following is a summary of our study, schematic alternative site plans, and our Opinion of a Probable Building Budget.

SITE

The entire site currently consists of approximately 18.5 acres and is located on the north side of Auburn Road between Rochester Road and John R. in Rochester Hills, Michigan. There is one primary entrance located off of Auburn Road that leads to the west side of the Administration/Garage Building, and provides access to the cold storage building, the storage sheds and the yard. This entry is used primarily by service vehicles. There is a second site access along Auburn Road that serves as the public entry on the east side of the Administration/Garage Building and provides access to employee and visitor parking. Our study has concentrated on the areas served by the primary service entry.

The site is serviced by public utilities including water, sanitary and storm. The site is also serviced by franchise utilities including power, gas and telecommunications.

The three existing buildings on the site include: the Administration/Garage Building, the cold storage facility and the storage sheds. There is also an existing fuel station and a truck scale.

The primary service entrance leads to a drive that bisects the property. There is a grade change of approximately 3 to 4 feet on the east side of this drive. The remainder of the site is relatively flat.

34000 Plymouth Road | Livonia, Michigan 48150
p. (734) 522-6711 | f. (734) 522-6427
www.ohm-advisors.com

EXISTING BUILDINGS

Cold Storage

The existing cold storage building is currently underutilized. The entire south portion of the building has been vacated for several years. There is a cost to maintain this portion of the building. It is felt that this portion of the building should be demolished. However, the north end of this same structure is used for cold storage. Because it serves a useful purpose, the north portion of the building should be retained.

Fueling Station and Truck Scales

The existing fueling station was recently installed. Because of the cost of relocating the underground tanks this facility should remain in its current location. In addition, the existing truck scales should remain in their current location due to the cost of relocation.

Administration/Garage Building

The existing Administration/Garage Building is a new facility. No upgrades are required on this building at this time. Access into this building for truck storage and utilization of the wash bays must be preserved.

Salt Storage

The existing sheds are used primarily to store salt. The City currently needs to maintain the salt piles by repeatedly pushing the salt into the shed and covering the piles with tarps. When the City receives more salt than can be stored in the sheds, the city must maintain a pile in the center of the open yard. This pile must be covered with tarps and must be repeatedly pushed upward to prevent spreading. Recently, the City has been cited by the MDEQ for allowing salt water to drain untreated into the storm system.

The City has determined that an enclosed Salt Storage facility is needed. By placing the salt within an enclosed salt storage facility, the City should be able to control the salinized runoff. Such a facility

would also allow the City to reduce the time needed to maintain the salt pile and would eliminate the need for utilizing tarps. With proper layout on the site, the use of a new Salt Storage Facility should also allow for greater efficiency for the truck drivers in loading of the salt, treatment with brine, re-fueling, and weighing. Greater efficiencies in handling the salt should result in an improved level of service for City residents. Also, eliminating the use of outdoor tarps should result in safer working conditions for employees.

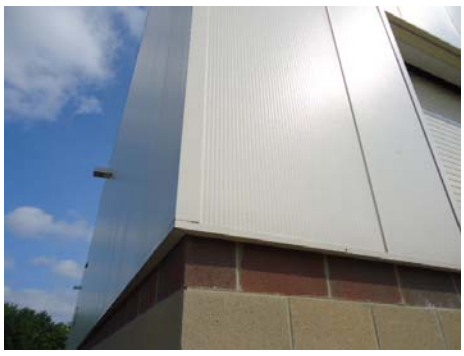
The Design Process

Initial Objectives

An initial committee comprised of Allan Schneck, Paul Davis, Tracey Balint, Bud Leafdale, Roger Moore, Jean Farris (all from the City of Rochester Hills), Rhett Gronevelt, OHM and Wayde Hoppe, OHM, met to discuss the project background and goals. The committee determined the following as primary objectives to be achieved in the construction of a new salt storage facility:

- The salt storage facility should have an exterior appearance and height that resembles the Administration/Garage Building.
- The new facility should be permanent in nature.
- The new facility must be an improvement over what the City currently uses, and meet the MDEQ requirements for Salt Storage

Early in the design process the committee discussed various methods for constructing a new salt storage facility. Some of these methods included a storage dome, a tensile barrel vault, a metal building, a Barn-like facility (gambrel roof profile), and a shed. Each of these options posed conflicts in achieving the project objectives. If the building is to have a similar appearance to the existing Administration/Garage Building, then the dome, vault, barn and shed are not appropriate. In addition, the City does not have a conveyor and does not plan to invest in one. Therefore, the dome is not an option. The barrel vault is made of a more temporary material, using stacked concrete barriers at the base to support a fabric and space frame roof. The City determined that they were interested in building something more permanent. The use of a metal building poses serious issues related to corrosion. Finally, the City already utilizes a shed system: the very system that needs to be improved.



Based upon the above assumptions as well as design recommendations from OHM, the committee then discussed various ways to construct a salt storage facility. The following design issues were identified.

- The base of the facility should be constructed of reinforced concrete, and act as a retaining wall to accommodate the lateral forces of the salt pile. This concrete wall should be anywhere from eight to twelve feet tall, based upon the expected height of the building and salt pile. This allows for the front loader to push the salt against the wall, maximizing storage capacity.
- The upper walls of the facility will rest on the reinforced concrete walls. Because of the corrosive nature of salt, metal should be avoided on the interior of the facility. Therefore, the upper walls will be wood frame construction.
- It was decided early on that the roof of the building is to resemble the Administration/Garage Building, which has a thirty-foot high, low slope (flat) roof. In order to build a flat roof with wood, the roof framing will need to be constructed of a flat truss. These trusses are usually able to economically span approximately 40-50 feet. Spans larger than that become considerably more expensive. Therefore the width of the building should be between 40 and 50 feet, or have multiple spans/bays.
- It was also decided early on that the exterior of the building should resemble the Administration/Garage Building which has a split faced block at the base and panels above. Therefore, the reinforced concrete walls will receive a split faced block veneer. The wood frame wall will receive panels on the exterior.
- A door should be provided on the opening into the facility. The opening will measure a minimum of 12' high for vehicle access, and ideally face east, away from the predominant direction of inclement weather.
- Site improvements may include the relocation of water and storm lines, adjustments to paving and grading and accommodation of the brine tank including a secondary containment.

The committee concluded that the new construction will utilize a wood frame roof and walls on reinforced concrete walls with a split faced block veneer and panel veneer. The footprint will be rectangular.

DESIRED IMPROVEMENTS

After the definition of the initial objectives and an appropriate building profile, the following criteria were identified as additional preferences for the development of a new salt storage facility.

- The new salt storage facility must improve truck driver efficiency.
- The new building should include an outdoor brine facility located conveniently to the truck drivers.
- The salt loading area must be paved and sloped to capture any salinized stormwater runoff, and discharge appropriately to a sanitary sewer, meeting MDEQ requirements.
- The new site layout should preserve the large open yard west of the cold storage facility.
- The south portion of the cold storage facility should be demolished.

INITIAL CONCEPTS

After the above objectives and desired improvements were identified, OHM met with members of the Committee to explore possible site utilization. This exploration led to a definition of four initial design concepts. The following is a description of each of the four initial concepts that OHM developed.

Concept 1: The south portion of the existing cold storage building should be demolished. The new salt storage building should be located just south of the remaining cold storage bays, leaving four to eight cold storage bays. A drive should be provided to allow trucks to maneuver between the two buildings.

Concept 2: The new salt storage building should be located on the existing DPS asphalt parking area per the original RFP. The opening to the new facility should face east.

Concept 3: The new salt storage building should be located immediately east of, and joined to, the existing cold storage building. The south portion of the cold storage building should be demolished and four to eight cold storage bays should be retained.

Concept 4: The entire cold storage building should be demolished and rebuilt along with a new cold storage building and a new salt storage building. The entire DPS yard should be taken into consideration when locating the new facilities.

The four concepts were developed and reviewed with the City helping to further define the City's preferred method of utilizing the existing site. The following is a list of design imperatives that were developed from that review meeting.

- The north end of the existing cold storage facility should remain. There is no need to contemplate a replacement for this facility at this time.
- The south end of the existing cold storage facility should be demolished.
- The operators should be able to work through the loading process by always working from the driver's side of the vehicle.
- The traffic circulation of the trucks should be similar to typical road traffic, with oncoming traffic passing on the driver's side. This is more important than shorter routes within the facility.
- The salt storage facility should be designed to accommodate 3,500 tons of salt.
- There is no need to try to screen the entire yard.
- The location of future facilities on the site should be considered.
- Restricting vehicular access to the yard by providing one drive to this area is unnecessary.
- Maintained green space on site should be held to a minimum.
- The salt delivery truck will dump the salt in front of the opening of the facility. The DPS staff will push the salt into the facility with a front loader. The salt will not be stacked any higher than twenty feet. Therefore, the building will have a clear height of at least 20 feet.
- The Brine operation will have a maximum capacity of 3,000 gallons (three 1,000 gal tanks) and will require a containment storage area. This tank should be conveniently located for use by

the truck drivers. The brine containment area will require a non-automatic pump that will discharge to the sanitary line.

- The design of the site should allow for sufficient turning radius for the vehicles that are leaving the area.
- The empty brine storage tanks will be utilized to collect rainwater for use during the summer months. With an average rainfall of 19.5 inches from April through September, and a roof tributary area of approximately 6,000 square feet, it is projected that approximately 70,000 gallons of rainwater could be captured. Of course, only 3,000 gallons could be captured at any given rain event.
- Any bulk storage of salt in the state of Michigan requires a Pollution Incidence Prevention Plan per the State of Michigan Part 5 Rules.
- In order to avoid corrosion, the roof will be comprised of wood framing.
- The perimeter walls will be reinforced concrete to a height of between 8-12 feet and the interior of the concrete (walls and floor slab) will be coated with silane. The concrete in the walls and floor should have an admixture to resist moisture penetration.
- The exterior of the building will have masonry to a height of 8-12 feet to match the adjacent facility and above the masonry will be a panel to match the adjacent facility.
- All exposed hardware will receive a G-185 zinc coating.
- The floor of the building will be a non-reinforced concrete slab with admixtures to resist moisture penetration.
- The roof will provide an overhang to shield the interior.
- The door openings will measure a minimum of 12 feet high.
- Exterior and interior lighting will be provided.
- All storm water drainage at and around the loading area will need to be contained and diverted to a sanitary line.
- The salt storage building should not have an opening on the west end to prevent wind blown rain from entering.
- A rectangular footprint is preferred. The salt will be loaded into the building from the end and will be removed from the building and loaded into the trucks from the same opening.
- All openings into the salt storage building will have automatic overhead coiling doors.
- A new salt storage facility would be serviced by delivery trucks utilizing a double bed (gravel train) measuring approximately sixty-five feet long. Such trucks require a forty-five foot turning radius for maneuvering that must be taken into consideration.
- The new site layout should allow at least two means of vehicular access to the open yard.
- It is preferable that the drive through bays at the cold storage facility be left accessible.
- It is preferable that the existing cold storage facility be screened by the new salt storage facility
- The site circulation for salt trucks should incorporate the following sequence: load the truck with salt at the storage facility, stop at the brine tanks, stop at the fuel station and then travel to the scale.

PROPOSED DEVELOPMENT OPTIONS

The following three schematic design options were developed as a result of the committee's input. A sketch of each site plan is attached and each option is evaluated below. A corresponding construction budget has also been included.

Option 1

This design includes the demolition of the south end of the existing cold storage facility and the erection of a new 5,875 square foot salt storage facility. The building has one entrance which is located on the east end of the building and is equipped with an automatic overhead door. The location of the building allows for trucks to pull up to the northeast corner, load up with the front loader, pull up to the brine tank which is accessed from the driver's side, pull up to the fueling station, circle back to the weigh station and exit through the drive to Auburn Road.

This layout also allows the delivery truck ample space for backing up to the opening of the building, unloading one bed, unhitching and then unloading the second bed.

There remains plenty of maneuvering space for other trucks to still access the yard, the sheds and the west side doors on the cold storage building.

By locating the new salt storage building as shown on Option 1, the new building will visually screen the existing cold storage facility from the road, enhancing the appearance of the DPS yard.

This option utilizes a building layout measuring approximately 47' wide by 125' long. This long rectangle offers several advantages. First, when salt is pushed into the facility it will fill the bottom portion of the building (that portion that has concrete walls). The remainder of salt will be piled up, forming a conical shape. Since the building footprint is a rectangle, the upper portion has a conical shape at each end and a wedge shape down the center. The smaller the cones are at the ends of the building, the more efficient the storage of salt. Therefore, a long rectangular footprint allows for a more efficient structure.

Second, by keeping the width of the building under fifty feet, the cost of constructing the trusses will be reduced compared to a wider layout.

This layout poses the difficulty of rotating unused salt at the end of the winter season since this salt will be at the back of the facility.

By placing the new building in this location on the site, the truck traffic circulation is very efficient. Vehicle loading occurs in an area that will have little impact on the surrounding traffic. The path to the brine tank, fueling station, weigh station and exit is direct and short.

This layout can be adjusted to not impact the existing on-site water lines and storm lines. It does however, require the complete removal of the foundations and utilities surrounding the demolition of the south end of the existing cold storage facility. The existing sanitary lead will need to be extended to the 6 bays that are proposed to remain. A new sanitary lead is required for the proposed storage facility, totaling approximately 360' of sanitary sewer.

Option 2

Similar to Option 1 this design includes the demolition of the south end of the existing cold storage building and constructs a new 5,978 square foot salt storage facility immediately to the south. However, this design differs from Option 1in the layout of the building. The new building is designed with two storage bins separated by a permanent concrete wall. The dimensions of the building are approximately 61' by 98'. Each bin has a separate opening facing the east. Each opening has an automatic overhead door. This design offers several advantages.

First this layout allows the City to more easily access all of the salt. Loading the salt into the bins and then loading the salt into the trucks will require a shorter route for the front loader into the bins. This layout will also allow for easier rotation of the unused salt at the end of the winter season.

This layout will also allow the City to utilize the empty bin for storage until delivery of the next load of salt.

This layout will be slightly more expensive to construct than Option 1 since it requires a more complex construction process.

By placing the new building in this location, the truck traffic circulation is very efficient. Vehicle loading occurs in an area that will have little impact on the surrounding traffic. The path to the brine tank, fueling station, weigh station and exit is direct and short. In addition, the site plan offers an alternate location for the brine station.

This layout will require the relocation of both an existing water and storm line. It will also require the complete removal of foundations and utilities surrounding the demolition of the south end of the existing cold storage facility. The existing sanitary lead will need to be extended to the 6 bays that are proposed to remain. A new sanitary lead is required for the proposed storage facility, totaling to approximately 380' of sanitary sewer.

Option 3

This option locates the new 5,865 square foot salt storage facility west of the Administration/Garage Building, on the existing asphalt area.

The vehicles are required to travel a greater distance with this layout than with Options 1 and 2. The trucks must also cross the path of incoming traffic to complete the fueling and weighing operations. However, while the trucks are on the pavement west of the Administration/Garage Building, the path utilized for loading and brine treatment is direct and has little impact on the operations of the Administration/Garage Building. Unfortunately, the same cannot be said for the delivery truck which must use all of the Administration/Building west paved area for maneuvering, though the deliveries are relatively infrequent.

Option 3 uses a building layout that measures approximately 51' by 115' permitting the operation to fit on the existing paved area without disruption to the existing drive way to the north. This option will be more expensive than options 1 and 2 due to the length of the trusses. The new building will have one opening which will be located on the north end and which will have an automatic overhead door.

This location on the site will require the relocation of the wood chip bin. This location will also require the greatest amount of relocating existing on-site storm sewer and water main. A 160' sanitary lead is proposed for the storage facility. However, this location does not necessitate the complete removal of the foundations and utilities surrounding the demolition of the south end of the existing cold storage facility.

This location will require some re-grading adjacent to the west side of the new facility allowing the trucks to turn west onto the main north-south drive near the southwest corner of the new facility.

DESIGN EVALUATION MATRIX

	OPTION 1	OPTION 2	OPTION 3
Circulation Efficiency	Has the most direct route for truck loading and for deliveries. This option offers the shortest length of the trip on site.	Has a direct route for brine treatment, fuel and weighing. However, the salt loading function from the south bin is not ideal.	This option has the longest and most circuitous route. It requires the trucks to cross over traffic to complete fueling and weighing. This option also requires the delivery truck to utilize the paved area west of the Administration/Garage building.
Grade Differential	There are no apparent grading issues with this option.	There are no apparent grading issues with this option.	The pavement west of the Administration/Garage building is several feet higher than the west entry road, requiring regarding and some sort of retaining wall to allow truck access.
Maintenance Costs	There should be no exceptional maintenance costs with this option.	There should be no exceptional maintenance costs with this option.	This option can be accomplished without demolishing any portion of the cold storage building. Therefore, if the cold storage building is not demolished maintenance and repair costs for that building will continue.
Operational Costs	Because this option provides the most efficient traffic pattern, this option should offer the greatest savings in labor. However, in comparison to options 2 and 3, the savings should be minimal. In comparison to the current arrangement utilizing the sheds and the pile in the yard, the	This option is nearly as efficient as option 1 and there should be minimal difference. The materials on the new building should be maintenance free. This option provides the advantage of minimizing the work required to turn over the salt pile.	Although this option has the least efficient traffic pattern, the increased time in operations should be minimal. The materials on the new building should be maintenance free. The cost of electricity for the interior and exterior light should be minimal. The drain at the brine

	savings should be considerable.		containment and the drain at the catch basin at the loading area should not require maintenance.
Future Expansion	Demolition of the south portion of the cold storage building presents new opportunities for a revised utilization of the site. However, placement of the new salt storage facility in this location may interfere with future use.	Demolition of the south portion of the cold storage building presents new opportunities for a revised utilization of the site. However, placement of the new salt storage facility in this location may interfere with future use.	Placement of the salt storage building west of the Administration/Garage Building will allow maximum flexibility for the future utilization of the west side of the DPS site.
Aesthetic Improvements	This option will provide the greatest amount of screening of the old cold storage facility and will therefore offer the greatest aesthetic enhancement for the site.	Although the new salt storage facility will be handsome and will resemble the existing Administration/Garage building, it will not entirely screen the existing cold storage building.	This option will not screen any part of the existing DPS yard or the cold storage building. However, this option will be placing the new salt storage facility behind an existing vegetative screen, thereby hiding most of the salt storage operation from view.
Utility Relocation	It appears to be possible to place this building just north of the existing underground utilities thereby eliminating the need for utility relocation. Utilities to the cold storage facility will need to be revised.	This option will require the relocation of an existing storm line. Utilities to the cold storage facility will need to be revised.	This option requires the relocation of both a water line and a storm line.
Parking	Because this option places the new salt storage facility in the same location as the south end of the existing cold storage building, there should be little impact on parking.	Because this option places the new salt storage facility in the same location as the south end of the existing cold storage building, there should be little impact on parking.	This option will occupy a portion of the paved area west of the Administration/Garage building, restricting use for parking. However, space has been allocated to the east of the new building for parking of the front loader.

OPINION OF PROBABLE CONSTRUCTION BUDGET

The likely cost of each option is indicated on the following attachments. The cost reflects OHM's opinion of the probable cost for each of the labeled work items based upon our experience with what could reasonably be anticipated for similar projects. Since the overall design concepts are broad in the level of detail, so is the corresponding extent of detail for each major line item identified below.

The City would consider providing some amount of in-house labor in an effort to reduce project costs. This has not been factored into the following estimates.

It is also believed that the construction of a new Salt Storage Facility will provide a return on the investment. A new enclosed facility will save the city the cost of having personnel spend time maintaining an outdoor pile. No longer will time be needed to keep the pile from sprawling. Time spent draping and un-draping tarps will be eliminated. In addition, removal of the south portion of the existing cold storage facility will reduce maintenance costs. Finally, the efficiencies built into the loading, fueling and weighing process will reduce time spent on site by drivers who need to spend their time on the road.

City of Rochester Hills
Salt Storage Facility
Conceptual Construction Budget
2/23/2012

DRAFT

	COMMENTS				OPTION 1
COLD STORAGE BUILDING DEMOLITION		UNIT	QUANTITY	UNIT COST	SUBTOTAL
COLD STORAGE BUILDING	APPROX. 13000 SF X AVE 16' TALL, BRICK ON BLOCK WITH CONCRETE FOOTINGS; ABANDON FOOTINGS AT COLD STORAGE FACILITY OPTION 3	CF	200000	$0.38	$76,000
COLD STORAGE BUILDING REPAIR					
REPAIR OF SOUTH FACE	NEW 4" BRICK VENEER ON 8" CMU WALL, PATCH ROOFING	SF	1100	$35.41	$38,951
STEM WALL	12" CMU FILLED SOLID	SF	168	$11.27	$1,893
FOOTINGS	12" X 24" REINF STRIP FOOTING	LF	56	$40.37	$2,261
BRINE TREATMENT AREA					
TANK	3 POLYETHELENE VERTICAL 1000 GAL TANKS, SINGLE WALL, HIGH DENSITY, PVC FITTINGS, VITON GASKET, SHIPPING	EA	3	$985	$2,955
CONTAINMENT	CONCRETE CURB WITH WATERPROOFING	LS			$1,500
PLUMBING, ELECTRICAL		LS			$2,000
PUMP	3.5 HP, ELECTRIC, STAINLESS STEEL, 2"	EA	3	$1,100	$3,300
SALT STORAGE BUILDING					
NEW BUILDING	12" CONCRETE WALLS, 12' H, WITH SILANE COATING AND XYPEX ADMIXTURE, WITH WOOD FRAMING, WOOD TRUSSES WITH G185 CONNECTORS, EPDM ROOF, 4" NON-REINF CONC SLAB	SF	5875	$69	$405,375
BLOCK VENEER	8" X 16" X 4" THICK, SPLIT FACED VENEER, 12' HIGH	SF	3728	$10.34	$38,548
PANEL VENEER	TEXTURED ALUMINUM, PLYWOOD BACKING, FINISHED ONE SIDE, 12' HIGH	SF	3728	$7.27	$27,103
TRUSS PREMIUM	FLAT, WOOD, G185 CONNECTORS, IN EXCESS OF 50'	SF			
COILING OVERHEAD DOOR	12' X 12', 18GA STEEL, MOTORIZED, ENAMEL FINISH, SAFETY BAR, WEATHERSTRIP, HOOD, SILL	EA	1	$2,870	$2,870
ELECTRICAL	POWER TO BUILDING, PANEL, LIGHTING, POWER TO DOOR	LS			$10,000
CIVIL					
Erosion Control		LS	1	$2,000	$2,000
Tree Removal		EA	2	$650	$1,300
Drainage Structure Remove		EA			
Pavement Removal		SYD	345	$3	$1,040
Storm Sewer Removal		FT	120	$12	$1,440
Water Main Removal		FT			
Grading		CYD			
Aggregate Base, 21AA		SYD	1,566	$13	$20,360
Drainage Structure		EA	1	$1,000	$1,000
Utility Structure		EA	2	$1,500	$3,000
Water Main		FT			
Water Main Tap		EA			
Gate Valve & Well		EA			
Storm Sewer		FT	50	$50	$2,500
Sanitary Sewer		FT	360	$30	$10,800
Sanitary Sewer Tap		EA	1	$250	$250
Relocate Hydrant		EA	1	$2,500	$2,500
Franchise Utilities, relocate/extend services		LS	1	$5,000	$5,000
Drainage Structure		EA	2	$350	$700
Drainage Structure Adjust		EA			
Concrete Curb and Gutter, Type F4		FT	200	$15	$3,000
Pavement		TON	685	$60	$41,100
Power		LS			
Restoration		LS			
SUBTOTAL					$708,745
CONTINGENCY 10%					$70,875
SUBTOTAL					$779,620
PROFESSIONAL FEES FOR CIVIL 10%	INCL CONTINUOUS ON-SITE INSPECTION BY A CONSTRUCTION ENGINEER DURING UNDERGROUND CONSTRUCTION				$9,599
PROFESSIONAL FEES FOR ARCHITECTURAL 9%	INCL PROJECT INITIATION THROUGH PROJECT CLOSEOUT				$55,148
TOTAL ESTIMATED PROJECT COST					**$844,000**

City of Rochester Hills
Salt Storage Facility
Conceptual Construction Budget
2/23/2012

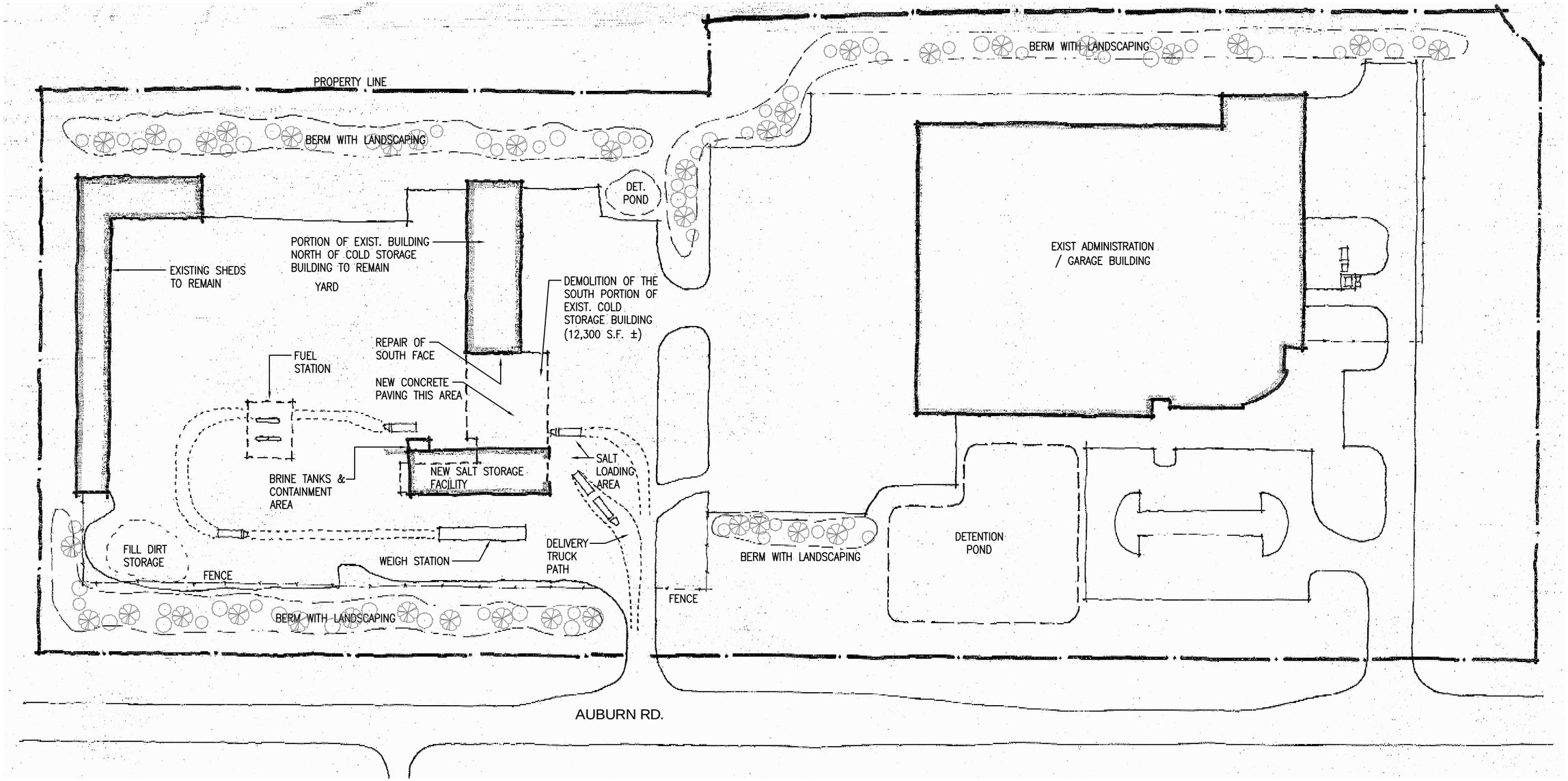
DRAFT

	COMMENTS				OPTION 2
COLD STORAGE BUILDING DEMOLITION		UNIT	QUANTITY	UNIT COST	SUBTOTAL
COLD STORAGE BUILDING	APPROX. 13000 SF X AVE 16' TALL, BRICK ON BLOCK WITH CONCRETE FOOTINGS; ABANDON FOOTINGS AT COLD STORAGE FACILITY OPTION 3	CF	200000	$0.38	$76,000
COLD STORAGE BUILDING REPAIR					
REPAIR OF SOUTH FACE	NEW 4" BRICK VENEER ON 8" CMU WALL, PATCH ROOFING	SF	1100	$35.41	$38,951
STEM WALL	12" CMU FILLED SOLID	SF	168	$11.27	$1,893
FOOTINGS	12" X 24" REINF STRIP FOOTING	LF	56	$40.37	$2,261
BRINE TREATMENT AREA					
TANK	3 POLYETHELENE VERTICAL 1000 GAL TANKS, SINGLE WALL, HIGH DENSITY, PVC FITTINGS, VITON GASKET, SHIPPING	EA	3	$985	$2,955
CONTAINMENT	CONCRETE CURB WITH WATERPROOFING	LS			$1,500
PLUMBING, ELECTRICAL		LS			$2,000
PUMP	3.5 HP, ELECTRIC, STAINLESS STEEL, 2"	EA	3	$1,100	$3,300
SALT STORAGE BUILDING					
NEW BUILDING	12" CONCRETE WALLS, 12' H, WITH SILANE COATING AND XYPEX ADMIXTURE, WITH WOOD FRAMING, WOOD TRUSSES WITH G185 CONNECTORS, EPDM ROOF, 4" NON-REINF CONC SLAB	SF	5978	$69	$412,482
BLOCK VENEER	8" X 16" X 4" THICK, SPLIT FACED VENEER, 12' HIGH	SF	3016	$10.34	$31,185
PANEL VENEER	TEXTURED ALUMINUM, PLYWOOD BACKING, FINISHED ONE SIDE, 12' HIGH	SF	3016	$7.27	$21,926
TRUSS PREMIUM	FLAT, WOOD, G185 CONNECTORS, IN EXCESS OF 50'	SF			
COILING OVERHEAD DOOR	12' X 12', 18GA STEEL, MOTORIZED, ENAMEL FINISH, SAFETY BAR, WEATHERSTRIP, HOOD, SILL	EA	2	$2,870	$5,740
ELECTRICAL	POWER TO BUILDING, PANEL, LIGHTING, POWER TO DOOR	LS			$10,000
CIVIL					
Erosion Control		LS	1	$2,000	$2,000
Tree Removal		EA	2	$650	$1,300
Drainage Structure Remove		EA	2	$10	$20
Pavement Removal		SYD	345	$3	$1,040
Storm Sewer Removal		FT	150	$12	$1,800
Water Main Removal		FT			
Grading		CYD			
Aggregate Base, 21AA		SYD	1,530	$13	$19,890
Drainage Structure		EA	1	$1,000	$1,000
Utility Structure		EA	2	$1,500	$3,000
Water Main		FT			
Water Main Tap		EA			
Gate Valve & Well		EA			
Storm Sewer		FT	120	$50	$6,000
Sanitary Sewer		FT	380	$30	$11,400
Sanitary Sewer Tap		EA	1	$250	$250
Relocate Hydrant		EA	1	$2,500	$2,500
Franchise Utilities, relocate/extend services		LS	1	$5,000	$5,000
Drainage Structure		EA	3	$350	$1,050
Drainage Structure Adjust		EA			
Concrete Curb and Gutter, Type F4		FT	200	$15	$3,000
Pavement		TON	670	$60	$40,200
Power		LS			
Restoration		LS			
SUBTOTAL					$709,644
CONTINGENCY 10%					$70,964
SUBTOTAL					$780,608
PROFESSIONAL FEES FOR CIVIL 10%	INCL CONTINUOUS ON-SITE INSPECTION BY A CONSTRUCTION ENGINEER DURING UNDERGROUND CONSTRUCTION				$9,945
PROFESSIONAL FEES FOR ARCHITECTURAL 9%	INCL PROJECT INITIATION THROUGH PROJECT CLOSEOUT				$54,917
TOTAL ESTIMATED PROJECT COST					**$845,000**

City of Rochester Hills
Salt Storage Facility
Conceptual Construction Budget
2/23/2012

DRAFT

	COMMENTS				OPTION 3
COLD STORAGE BUILDING DEMOLITION		UNIT	QUANTITY	UNIT COST	SUBTOTAL
COLD STORAGE BUILDING	APPROX. 13000 SF X AVE 16' TALL, BRICK ON BLOCK WITH CONCRETE FOOTINGS; ABANDON FOOTINGS AT COLD STORAGE FACILITY OPTION 3	CF	200000	$0.34	$68,000
COLD STORAGE BUILDING REPAIR					
REPAIR OF SOUTH FACE	NEW 4" BRICK VENEER ON 8" CMU WALL, PATCH ROOFING	SF	1100	$35.41	$38,951
STEM WALL	12" CMU FILLED SOLID	SF	168	$11.27	$1,893
FOOTINGS	12" X 24" REINF STRIP FOOTING	LF	56	$40.37	$2,261
BRINE TREATMENT AREA					
TANK	3 POLYETHELENE VERTICAL 1000 GAL TANKS, SINGLE WALL, HIGH DENSITY, PVC FITTINGS, VITON GASKET, SHIPPING	EA	3	$985	$2,955
CONTAINMENT	CONCRETE CURB WITH WATERPROOFING	LS			$1,500
PLUMBING, ELECTRICAL		LS			$2,000
PUMP	3.5 HP, ELECTRIC, STAINLESS STEEL, 2"	EA	3	$1,100	$3,300
SALT STORAGE BUILDING					
NEW BUILDING	12" CONCRETE WALLS, 12' H, WITH SILANE COATING AND XYPEX ADMIXTURE, WITH WOOD FRAMING, WOOD TRUSSES WITH G185 CONNECTORS, EPDM ROOF, 4" NON-REINF CONC SLAB	SF	5865	$69	$404,685
BLOCK VENEER	8" X 16" X 4" THICK, SPLIT FACED VENEER, 12' HIGH	SF	3584	$10.34	$37,059
PANEL VENEER	TEXTURED ALUMINUM, PLYWOOD BACKING, FINISHED ONE SIDE, 12' HIGH	SF	3584	$7.27	$26,056
TRUSS PREMIUM	FLAT, WOOD, G185 CONNECTORS, IN EXCESS OF 50'	SF			$0
COILING OVERHEAD DOOR	12' X 12', 18GA STEEL, MOTORIZED, ENAMEL FINISH, SAFETY BAR, WEATHERSTRIP, HOOD, SILL	EA	1	$2,870	$2,870
ELECTRICAL	POWER TO BUILDING, PANEL, LIGHTING, POWER TO DOOR	LS			$10,000
CIVIL					
Erosion Control		LS	1	$2,000	$2,000
Tree Removal		EA	2	$650	$1,300
Drainage Structure Remove		EA			
Pavement Removal		SYD	1,000	$3	$3,000
Storm Sewer Removal		FT	210	$12	$2,520
Water Main Removal		FT	180	$10	$1,800
Grading		CYD	1,000	$10	$10,000
Aggregate Base, 21AA		SYD	2,520	$13	$32,760
Drainage Structure		EA	1	$1,000	$1,000
Utility Structure		EA	2	$1,500	$3,000
Water Main		FT	250	$50	$12,500
Water Main Tap		EA	1	$4,500	$4,500
Gate Valve & Well		EA	1	$1,000	$1,000
Storm Sewer		FT	270	$50	$13,500
Sanitary Sewer		FT	160	$30	$4,800
Sanitary Sewer Tap		EA	1	$250	$250
Relocate Hydrant		EA	1	$2,000	$2,000
Franchise Utilities, relocate/extend services		LS	1	$5,000	$5,000
Drainage Structure		EA	1	$1,500	$1,500
Drainage Structure Adjust		EA	1	$350	$350
Concrete Curb and Gutter, Type F4		FT	350	$15	$5,250
Pavement		TON	1,100	$60	$66,000
Power		LS	1	$7,000	$7,000
Restoration		LS	1	$2,500	$2,500
SUBTOTAL					$785,059
CONTINGENCY 10%					$78,506
SUBTOTAL					$863,565
PROFESSIONAL FEES FOR CIVIL 10%	INCL CONTINUOUS ON-SITE INSPECTION BY A CONSTRUCTION ENGINEER DURING UNDERGROUND CONSTRUCTION				$18,353
PROFESSIONAL FEES FOR ARCHITECTURAL 9%	INCL PROJECT INITIATION THROUGH PROJECT CLOSEOUT				$54,138
TOTAL ESTIMATED PROJECT COST					**$936,000**



NEW SALT STORAGE FACILITY
OPTION 1

N

PLOTTED: Feb 23, 2012 - 12:08pm

Legend of New Dps Storage

- (A) Fire Hydrant Storage
- (B) Parks/ Forestry
- (C) Anti-Ice Unit
- (D) Anti-Ice Unit
- (E) 22x Slag
- (F) 5g Slag
- (G) 22D Gravel
- (H) 22D Gravel
- (I) Solve X
- (F) Storage
- (G) Topsoil
- (H) Sand Chloride
- (I) Street Sweeping Material

Legend of New Dps Facility

- (1) Wash Bays
- (2) Water & Sewer Room
- (3) Meter Room
- (4) Roads Room
- (5) Traffic Signs Room
- (6) Men's Locker Room
- (7) Women's Locker Room
- (8) Lunch Room
- (9) Administration Area
- (10) Conference Room

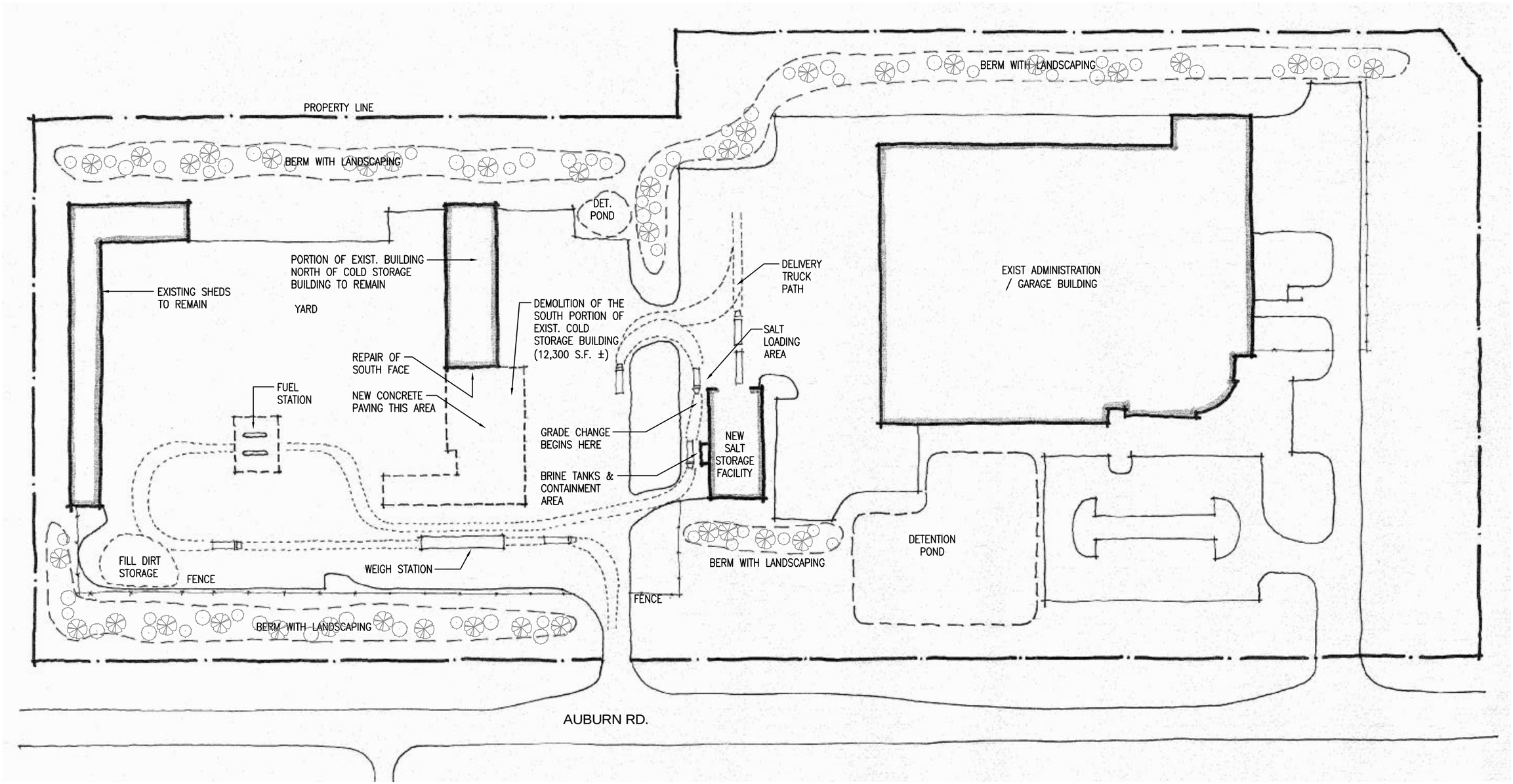
OHM
WWW.OHM-ADVISORS.COM

POURED BRICK FACED CONCRETE WALL
PROPERTY LINE
PORTION OF EXIST. BUILDING NORTH OF COLD STORAGE BUILDING TO REMAIN
BERM WITH LANDSCAPING
BERM WITH LANDSCAPING
30 YD DUMP
DET. POND
EXISTING SHEDS TO REMAIN
J K L M
I H G F E D C B A
ASPHALT MILLINGS
CULVERTS
DEBRIS CONTAINERS
22D GRAVEL
YARD
5G Slag
22X SLAG
ROADS
ROADS
SIGNS
SIGNS
W/S
W/S
W/S
DEMOLITION OF THE SOUTH PORTION OF EXIST. COLD STORAGE BUILDING (12,300 S.F. ±)
REPAIR OF SOUTH FACE
NEW CONCRETE PAVING THIS AREA
SALT LOADING AREA
WOOD CHIP STORAGE
DELIVERY TRUCK PATH
FUELING STATION
NEW (2) COMPARTMENT SALT STORAGE FACILITY
98'-0"
61'-0"
LOCATION OF BRINE TANK & CONTAINMENT AREA
FILL DIRT STORAGE
TRUCK SCALE
FENCE
FENCE
BERM WITH LANDSCAPING
BERM WITH LANDSCAPING
DETENTION POND
EXIST ADMINISTRATION / GARAGE BUILDING
Storage of Vehicles and Equipment
1 2 3 4 5 6 7 8 9 10
MECHANIC BAYS
GENERATOR
DELIVERIES
GUEST PARKING
EMPLOYEE PARKING
RAIN GARDEN
EMPLOYEE PARKING
POND
AUBURN RD.

NEW SALT STORAGE FACILITY
OPTION 2

N

PLOTTED: FEB 25, 2019 - 7:19P



NEW SALT STORAGE FACILITY
OPTION 3

N

PLOTTED: Feb 23, 2012 - 12:09pm