WESTERN SURFACE IMPOUNDMENT (WSI) OPERATIONS PLAN

FMC MIDDLEPORT SITE
EPA ID NO. NYD002126845

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April 2016

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ACRONYMS

Acronym	Definition / Description
Agencies	NYSDEC and USEPA (when referred to collectively)
amsl	Above mean sea level
AOC	Administrative Order on Consent
Arcadis	Arcadis of New York, Inc.
ASTM	American Society of Testing and Materials
CRA	Conestoga-Rovers & Associates
Facility	Middleport, New York, FMC Facility
FMC	FMC Corporation
HASP	Health and Safety Plan
ICM	Interim corrective measure
mg/L	Milligram(s) per liter
NYCRR	New York Codes, Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SPDES	State pollution discharge elimination system
TCLP	Toxicity Characteristic Leaching Procedure
USEPA	United States Environmental Protection Agency
WSI	Western Surface Impoundment
WTP	Water treatment plant

1.0 INTRODUCTION

1.1 General

This Operations Plan sets out the operation, monitoring, and reporting requirements for the Western Surface Impoundment (WSI) at the FMC Corporation (FMC) facility in Middleport, New York (Facility) (Figure 1). The plan is required by the Administrative Order on Consent (AOC) (Docket No. II RCRA[1]-90-3008(h)-0209) entered into by FMC, the New York State Department of Environmental Conservation (NYSDEC) and the United States Environmental Protection Agency (USEPA) (1991). Hereafter, the NYSDEC and USEPA collectively are referred to as "the Agencies."

Section VI, Paragraph 6.j, of the AOC authorizes the use of the WSI as an interim corrective measure (ICM) for the control, containment, and collection for treatment of contaminated runoff. Continued use of the WSI as a nonhazardous surface water impoundment assures that runoff from the Facility meets FMC's SPDES[2]-permitted discharge criteria and enables control and containment of a potential release at the Facility. Use of the WSI for this purpose is contingent upon continued operation of the WSI underdrain system and operation of the WSI in accordance with a WSI Monitoring Work Plan and a WSI Contingency Plan.

This plan contains the WSI Monitoring Work Plan and the WSI Contingency Plan as required by AOC Section VI, Paragraphs 6.j.2 and 6.j.3, respectively. It includes a description of the program proposed to monitor inflow into and the contents of the WSI, associated protocols, and a proposed schedule for implementing the program. The WSI Contingency Plan describes activities to be implemented in the event that the WSI is found to contain hazardous waste.

This plan has been updated from the *Western Surface Impoundment (WSI) Operations Plan, Revision No. 1* (Conestoga-Rovers & Associates [CRA] 1994) and incorporates a revision to the WSI sediment sampling and analysis protocol (FMC 1995); revisions to the WSI operations, maintenance and monitoring functions as recommended in the *North Site Cover Evaluation Final Report* (Arcadis of New York, Inc. [Arcadis] 2012) and associated correspondence; construction of a WSI berm extension (2015); and proposed changes to the WSI monitoring program described herein.

1.2 Background

The WSI was constructed in 1977 as a storage and equalization basin for stormwater runoff as part of FMC's on-site water treatment plant (WTP). The impoundment was excavated below grade and lined with a Hypalon® liner. An underdrain system was installed beneath the liner to minimize the potential for hydrostatic uplift of the liner. The WSI managed hazardous waste stormwater until implementation of the first phase of closure in 1988.

After considerable communication between FMC and the Agencies regarding closure of the three existing surface water impoundments at the Facility, NYSDEC approved an FMC request to effect closure of the WSI in two phases. The first phase was to remove and dispose of soil, sediment, and the existing liner in the WSI and install a new liner in the impoundment for use of the WSI as a nonhazardous stormwater collection basin. The first phase was completed in 1988. The second phase of closure activities, including

[1] RCRA – Resource Conservation and Recovery Act
[2] SPDES – state pollution discharge elimination system

placement of backfill and cover material, was deferred because the WSI was re-purposed as a nonhazardous stormwater collection basin.

After the first phase of closure, a new liner system was installed in the impoundment so that it could be used to receive surface water runoff from the northern portion of the Facility, including the North Site Cover (installed in 1987-1988). The runoff collected in the WSI was sampled and analyzed to confirm that it no longer exhibited hazardous waste characteristics for arsenic, which in turn demonstrated that pre-closure activities in other areas of the Facility were proving effective in reducing arsenic concentrations in surface water runoff.

In a letter dated March 6, 1990, FMC further requested a closure plan modification that would allow the WSI to continue operating as a nonhazardous surface water impoundment. This modification was incorporated into the AOC (Section VI, Paragraph 6.j) as part of the ICMs provisions. Continued operation of the WSI also required continued operation of the WSI underdrain system and development and implementation of a formal WSI monitoring program.

The terms and conditions of the AOC (Section VI, Paragraph 4b) specified that the WSI would continue to be operated as an ICM pending the results of the RCRA Facility Investigation (RFI) (Arcadis 2009) and Corrective Measures Study required under the terms and conditions of the AOC. The AOC further specified that FMC may submit a closure plan modification for the WSI based on the results of those studies.

By letter dated July 2, 2009, the NYSDEC requested that FMC evaluate the overflow potential of the WSI, identify and evaluate steps to reduce the frequency of overflows and to mitigate impacts on the receiving water, and recommend corrective actions. Accordingly, FMC completed the work as described in the *Western Surface Impoundment Hydrologic Evaluation Report* (Arcadis 2010) and *North Site Cover Evaluation Final Report* (Arcadis 2012). FMC began implementation of corrective actions recommended in the *North Site Cover Evaluation Final Report* during the second half of 2012. The progress of these actions is summarized in FMC's quarterly progress reports submitted pursuant to the terms and conditions of the AOC.

1.3 Regulatory Framework

The AOC authorizes the use of the WSI as an ICM for the control, containment, and collection for treatment of contaminated runoff. Continued use of the WSI as a nonhazardous surface water impoundment assures that the Facility's runoff meets FMC's SPDES-permitted discharge criteria and enables control and containment of a potential release at the Facility.

In accordance with Section VI, Paragraph 6.j of the AOC, the continued use of the WSI is conditionally authorized as an ICM for the control, containment, and collection for treatment of contaminated and/or potentially contaminated runoff. Specifically, the continued use of the WSI is contingent upon the following:

- FMC shall continue to operate the WSI underdrain system to maintain an inward groundwater flow at the WSI.
- FMC shall develop and implement a WSI Monitoring Work Plan to monitor the influent stream to and the contents (water and sludge/sediment) of the WSI.
- FMC shall develop a contingency plan to be implemented in the event monitoring performed pursuant to the WSI Monitoring Work Plan indicates the WSI contains

hazardous waste, to identify activities to return the WSI as a nonhazardous surface impoundment, and to describe alternative methods for managing contaminated runoff and the contents of the WSI.

- FMC shall implement the approved contingency plan within 7 days of discovery that the WSI is found to contain hazardous waste.

The WSI and its underdrain and sump collection system are also part of groundwater ICMs being implemented at the Facility pursuant to the terms and conditions of the AOC. These groundwater ICMs consist of the following:

- Groundwater extraction system and bedrock groundwater migration control trenches
- WSI and underdrain system
- Overburden groundwater collection underdrains and sumps
- North Site Cover

Water collected by these ICMs is treated at the Facility's WTP prior to discharge under the terms and conditions of the Facility's SPDES permit.

1.4 Plan Organization

The following sections include the information required to continue operation of the WSI as an ICM:

- Section 2 – Facility description
- Section 3 – WSI operations
- Section 4 – WSI overflow management
- Section 5 – Monitoring
- Section 6 – WSI contingency plan
- Section 7 – Reporting requirements
- Section 8 – References cited

2.0 FACILITY DESCRIPTION

2.1 General

FMC owns and operates a pesticide formulation facility on approximately 102 acres of land located in the southeast corner of the Village of Middleport and in the Town of Royalton, Niagara County, New York (Figure 1). The Facility is bounded by residential properties to the west, agricultural lands to the east, an automobile salvage yard to the southeast, a commercial business to the southwest, and a state highway (Route 31) to the south. Properties to the north include a farm field, the Roy-Hart High School and Middle School, the southern right-of-way for Alfred Street, a vacant commercial property, and other commercial/industrial properties.

The northern part of the Facility comprises approximately 63 acres where current and historical pesticide manufacturing/formulation activities occurred. The area currently contains several large buildings used for mixing, packaging, and warehousing. The majority of the northern part of the facility is covered with a clay/asphalt cap (North Site Cover) and buildings. Stormwater runoff from the northern part of the Facility is directed primarily to asphalt-lined or grass-covered swales that drain to the WSI. Water collected in the WSI is pumped to and treated at the Facility's WTP and then discharged, in accordance with the SPDES permit, through the Facility's SPDES monitoring station to a downstream outfall (Outfall 001) at Tributary One of Jeddo Creek. Figure 2 depicts the approximate limits of the WSI watershed and the locations of the WSI, the WTP, and the SPDES monitoring station.

2.2 WSI Description

The WSI was constructed in 1977 by excavating into the underlying bedrock. An underdrain system was installed under a chlorosulfonated polyethylene synthetic rubber (Hypalon®) liner. The original WSI had a maximum storage capacity of approximately 1.5 million gallons and an approximate surface dimension of 145 feet by 175 feet. In 1988, FMC replaced the original liner as part of the first phase of closure. The removal and replacement is documented in the *Final Construction Report, Interim Closure, Western Surface Impoundment* (CRA 1989).

In 2015, FMC increased the capacity of the WSI to approximately 1.95 million gallons by raising the surrounding berm and extending the liner with a new polyurea liner. This work was completed in accordance with the *North Site Cover Evaluation Final Report* (Arcadis 2012), and is summarized in the *WSI Berm Extension Construction Report* (Arcadis 2016).

Water enters the WSI from the surface water collection system through a grit chamber located at the north side of the impoundment (Figure 3). Water is retained in the WSI until it is pumped to the WTP for treatment and discharge. The WSI includes a spillway and overflow structure located on the west side of the impoundment.

The impoundment is approximately 202 feet wide (east-west) and 235 feet long (north-south) at the top of the berm. The side is sloped at a ratio of 3:1. The bottom elevation of the impoundment is approximately 514 feet above mean sea level (amsl). The spillway elevation is 523 feet amsl, and the elevation of the top of the surrounding berm is approximately 525 feet amsl.

Liner/Anchoring

The bottom of the WSI is lined with a 40-mil thick Hypalon® liner covered with a 4-inch layer of ballast stone to prevent liner flotation. The upper part of the WSI has a polyurea liner (Roboliner®) and is secured at the top of the impoundment berm in earth-covered anchor trenches or with batten connections (metal strips attached to concrete structures at the WSI inlet and overflow weir).

A plan view and typical section through the impoundment are depicted in Figures 3 and 4, respectively.

Minor repairs (i.e., patching holes) were made to the liner following inspections and testing in 2012 and 2015.

Underdrain System and Subgrade

The WSI underdrain system depresses the local groundwater to mitigate hydraulic uplift of the liner.

The underdrain system was built on and extends approximately three feet into the bedrock underlying the impoundment. The underdrain consists of five parallel legs of 6-inch diameter perforated polyvinyl chloride pipe that are manifolded together to convey collected groundwater to a collection sump (Sump 3) located in northwest corner of the WSI (Figure 5). Groundwater collected from the sanitary sewer underdrain (Sump 1) is also pumped into Sump 3. Water from Sump 3 is pumped to groundwater storage tanks (Tanks T-1101 and T-1102) prior to treatment in the WTP.

A stone drainage layer was placed over and around the perforated pipe. A nominal 3-inch layer of fine sand was installed over the stone layer, and a filter fabric was installed over the sand layer to form the subgrade for the impoundment liner.

WSI Drainage Area

The existing WSI watershed (Figure 2) of approximately 49 acres is comprised of the northern portion of the Facility, the portion of the North Railroad Property Phase 1 ICM Area south of the mainline railroad tracks, and approximately 5% of the Phase 2 ICM Area that drains to the WSI (North Site Cover) (Arcadis 2012). The subsurface soil beneath the WSI watershed is contaminated from historical operations at the Facility and is covered with engineered cover systems installed as ICMs. Stormwater runoff from the WSI watershed area flows through a series of drainage swales and culverts to the grit chamber and into the WSI.

Capacity

The capacity of the WSI was increased in 2015. Currently, the elevation of the overflow spillway is 523.0 feet amsl. The invert elevation of the intake piping to the WTP is 514.3 feet amsl. Due to suction limitations of the intake pumps, the effective minimum elevation of water in the WSI is 515.0 feet amsl.

The operational capacity of the WSI is 1.95 million gallons, based on the minimum elevation of 515.0 feet and the maximum elevation of 523.0 feet.

Overflow

When the WSI fills beyond its capacity, untreated water overflows from the WSI through the spillway to a concrete overflow structure on the west side of the WSI. This overflow structure drains to a culvert pipe that leads to the Facility's SPDES monitoring station before being conveyed to Outfall 001 at Tributary One of Jeddo Creek.

The overflow structure includes a measurement weir and staff gauges. The measurement weir is a combination of v-notch, trapezoidal and rectangular weirs and is used to measure the amount of water that is discharging from the WSI through the overflow. The weir includes a 90 degree v-notch weir with a total height of 0.4 foot, a trapezoidal weir with a total height of 0.7 foot and a length of 5.5 feet. Above the trapezoidal weir is a rectangular weir with a total length of 24.5 feet. Staff gauges are located both upstream and downstream of the measurement weir and are used to gauge the height of water flowing over the weir. The zero point on both staff gauges is equal to the invert of the v-notch weir. Additional information regarding the weir and the manual method of calculation of flow is included in Appendix A.

In 2015, a solar-powered ultrasonic level sensor was installed upstream of the weir. This device allows for automated measurement and recording of the overflow duration and quantity, in the event of an overflow.

3.0 WSI OPERATIONS

This section includes the requirements for the day-to-day operation and maintenance of the WSI and associated equipment.

3.1 WSI Level Measurement

The WSI is equipped with two ways of measuring the level of water in the impoundment. A staff gauge is located next to the P-1500 pump intake to the WTP. The zero mark on the staff gauge is equal to the invert of the intake piping (514.3 feet amsl). This measurement is recorded manually on days when the WTP is staffed.

A pressure transducer is installed next to the intake. This pressure transducer is connected to the WTP SCADA[3] system, which records the WSI water level on a continuous basis.

The specifications and maintenance requirements for the pressure transducer are included as Appendix B.

The daily WSI water levels are reported in the quarterly progress report.

3.2 WSI Underdrain System Operation

Water collected in Sump 3 (comprised of water from the WSI underdrain and Sump 1) is automatically pumped to storage tanks (Tanks T-1101 and T-1102). Sump 3 contains a submersible pump equipped with a two-float control system and a magnetic flow meter. Also included in Sump 3 is a third float that triggers a high-high warning indicator. Additional information regarding the pumping and metering equipment for Sump 3 is included in Appendix C.

The total flow from Sump 3 is recorded each week in the WTP operating logbook. The weekly total flow is compared to the average seasonal weekly flow (based on flows from 2010 through 2015) to identify any significant increases or decreases in weekly flow (i.e., 50% higher or lower). If significant increases or decreases are identified, Sump 3 is inspected for proper operation and/or the liner is visibly inspected for leaks, as appropriate.

The weekly pumping volumes are reported in the quarterly progress reports. Section 5.2 describes the routine inspection and monitoring of Sump 3.

3.3 WSI Standard Operating Condition

In order to minimize the potential for WSI overflows, the water level in the WSI is maintained as low as practicable (515 feet AMSL), weather permitting.

The Facility Environmental Manager or their designee is notified if the WSI water level exceeds the 18 inches of freeboard below the crest of the overflow weir (521.5 feet AMSL).

3.4 Rainfall Monitoring

The ability to maintain the low water level WSI standard operating condition described above is based in part on weather forecasts, existing weather conditions (e.g., thaw conditions, existing snow cover) and existing water storage conditions (e.g., WSI water

[3] SCADA – supervisory control and data acquisition

levels described in Section 3.1 and water levels in Tanks T-1101 and T-1102). Accordingly, weather conditions and forecasts are routinely monitored. Daily rainfall amounts are monitored and recorded primarily from a weather station located at the WTP. If the WTP weather station is not functioning, rainfall amounts are monitored and recorded from local weather stations.

The daily rainfall amounts are reported in the quarterly progress report.

4.0 WSI OVERFLOW MONITORING

If the WSI storage capacity is exceeded, untreated impoundment water exits the WSI through the spillway located in the western berm of the impoundment (Figure 5) and discharges at SPDES Outfall 001 into Tributary One of Jeddo Creek. Overflow monitoring of the quantity and quality of water discharged is performed in accordance with the terms and conditions of the Facility's SPDES permit and as described in the sections below.

Routine monitoring of existing weather conditions, weather forecasts and existing water storage conditions, as described in Section 3.4, will identify potential WSI overflow conditions. An overflow event starts when water begins to flow over the WSI overflow spillway weir (523.0 feet amsl) (as detected by the ultrasonic level sensor) and ceases when water has stopped flowing over the weir for 60 minutes.

The WTP SCADA system has been programmed to send out electronic mail notifications to the plant operators when the level in the WSI reaches the high level elevation of 520.5 feet and the high-high elevation of 521.5 feet. Notifications are also made if the water level rises more than 6 inches per hour.

4.1 Overflow Volume Measurement

During an overflow event, the volume of water that overflows is measured using the measurement weir in the overflow structure. The overflow structure is equipped with mounted staff gauges both upstream and downstream of the measurement weir and an ultrasonic measuring device located upstream of the weir.

During an overflow event, the water level surface elevation upstream and downstream of the weir is visually observed on the permanent staff gauges within one hour of the start of an overflow (if possible) and every four hours thereafter (timing subject to safe working conditions). The staff gauge readings are recorded, along with the time of the observation. A copy of the log sheet used to record these readings has been included in Appendix A. Additional water level information from the ultrasonic level sensor is automatically recorded electronically.

Water level elevations recorded from the staff gauge readings and the ultrasonic level sensor are used to calculate the volume of water that has been discharged. The equations and calculation sheets are included in Appendix A.

During an overflow event, additional information is recorded in the WTP log, including the rate of discharge at the Outfall Monitoring Point (M-001), the rate of discharge from the treated water tank, and the water level in the WSI.

4.2 Water Quality Sampling

During a WSI overflow event, the overflow water is manually sampled at the overflow measurement weir using grab sample methods. Samples are collected concurrently with the water level surface elevation measurements at the weir (i.e., within one hour of observing the start of the overflow and each four hours thereafter during the overflow event). Samples are composited for each 24-hour period or part of a 24-hour period for the duration of the overflow event.

The composite samples are submitted for laboratory analysis of phenol, carbofuran, arsenic and zinc, pursuant to the terms and conditions of the Facility's SPDES permit.

The standard operating procedures for water quality monitoring during an overflow are included in Appendix D.

4.3 Overflow Reporting

In accordance with the Facility's SPDES Permit conditions, in the event of an overflow of the WSI, the Facility Environmental Manager or a designee will verbally notify the NYSDEC within 24 hours. Formal written notification will be submitted within 5 days (Report of Noncompliance Event).

Overflow volumes and analytical data will be reported as required by the Facility's SPDES Permit and in the quarterly progress report that corresponds to the overflow event.

5.0 WSI MONITORING WORK PLAN

The WSI Monitoring Work Plan has been developed in accordance with Section VI, Paragraph 6.j.2 of the AOC. The plan includes the following elements:

- Routine inspection of the WSI liner and side slopes
- Routine inspection of the underdrain sump (Sump 3)
- Sampling of inflow into the WSI during designated precipitation events (0.15 inches)
- Quarterly sampling of water in the WSI
- Annual sampling of sediment that accumulates within the impoundment

The scope of work associated with each monitoring activity is presented below. Monitoring activities, including sample collection and analysis, is performed in accordance with the requirements of the Quality Assurance Project Plan (QAPP; Parsons, 2016) and Health and Safety Plan (HASP; Parsons, 2016).

5.1 Impoundment Inspections

The WSI is inspected to ensure the integrity of the liner and appurtenances, as described below:

Weekly

Visual inspections are conducted on a weekly basis (subject to weather/ground conditions (e.g., snow/ice cover). Personnel walk the perimeter of the impoundment and visually inspect all exposed portions of the liner and side slopes. Any buildup of debris around the pump intake, influent channel, and overflow spillway are also identified during the weekly inspection.

These inspections are documented in the operators log and on a checklist. A copy of the checklist is included in Appendix E. If any items are identified that need to be corrected, the operator notifies the Facility Environmental Manager or their designee immediately. Daily WSI level staff gauge readings are recorded in the WTP operators log book as discussed in Section 3.1.

Triennial Inspection

In accordance with the recommendations made in the *North Site Cover Evaluation Final Report* (Arcadis 2012), the WSI liner is inspected for the presence of leaks every three years (the next inspection will occur in 2018).

The liner is inspected in accordance with ASTM[4]-D-7007: *Standard Practices for Electrical Methods for Locating Leaks in Geomembranes Covered with Water or Earthen Material.* Inspections are completed during the second or third calendar quarter of the year (when water levels are at their lowest). A written inspection report is included in the subsequent annual report.

Holes or tears identified during the inspections are repaired as soon as feasible, subject to weather and operating conditions. Following repair, seams and patches are evaluated in accordance with ASTM D 5641: *Standard Practice for Geomembrane Seam Evaluation by Vacuum Chamber.* The liner repair activities are documented in the WTP

[4] ASTM – American Society for Testing and Materials

operators log book and in the quarterly progress report covering the time during which the repair was made.

5.2 Underdrain Sump Inspection and Monitoring

The pumping volumes from the underdrain sump (Sump 3) are recorded weekly in the WTP operating log, as described in Section 3.2.

In addition, Sump 3 is inspected each month. The monthly inspections include removal of the manhole cover and visual inspection of the sump interior, including the condition of the discharge riser pipe, float controls, and interior surfaces. The results of each inspection are recorded on a WSI Inspection Form (see Appendix E). These completed forms are maintained at the Facility and made available to the NYSDEC upon request.

Annual Sump Cleaning

Sump 3 is inspected annually to determine if sediments have accumulated in the bottom of the manhole. If accumulated sediment is identified in the bottom, the sump is cleaned using a vacuum truck.

Any debris and sediments recovered from the sump are containerized, sampled for waste characterization and disposed of at an appropriate off-site disposal facility. Water generated during the cleaning is transferred directly into the groundwater collection system.

The sediment inspection/cleaning is documented on the WSI Inspection Form.

5.3 WSI Inflow Monitoring

As required by the AOC, during normal working hours, the influent stream to the WSI is monitored during certain precipitation events to evaluate the efficacy of corrective measures. For the purposes of this program, such precipitation events include those events that generate 0.15 inch of rainfall or more during a single continuous storm (regardless of duration), as recorded at the WTP weather station (see Section 3.4).

During a precipitation event that generates 0.15 inch of rainfall or more, one grab sample of the surface water flowing into the WSI is collected and analyzed for the presence of arsenic. Samples are only collected for precipitation events when the WTP is staffed. Samples are collected at any time during the event when a sufficient amount of runoff water is flowing through the surface ditches to the WSI.

All samples are collected at the point where water exits the WSI influent grit chamber and analyzed for total arsenic as described in the QAPP.

The analytical results are reported along with the precipitation amount in the next quarterly progress report following the event.

5.4 WSI Surface Water Monitoring

As required by the AOC, the surface water contained within the WSI is sampled and analyzed a minimum of once per quarter for waste characterization purposes. These samples may be collected at any time during the quarter; however, sampling is performed immediately in the event that:

1. Influent samples collected from the inflow into the WSI (as described above) exceed 5.0 milligrams per liter (mg/L) (parts per million) total arsenic for any two consecutive sampling events; or

2. An uncontrolled release of a hazardous substance has, or may have occurred on the Facility grounds under circumstances that make it likely the substance will reach the WSI.

Sampling triggered by one of these two conditions satisfies the minimum sampling requirements for the respective quarter in which the sampling occurred.

When sampling is performed, two discrete surface water samples are collected from within the limits of the impoundment in the vicinity of the impoundment inlet. One of the two samples is analyzed by the analytical laboratory for Toxicity Characteristic Leaching Procedure (TCLP) arsenic (5.0 mg/L is the regulatory level). The remaining sample is retained by the analytical laboratory as a “backup” sample. The “backup” sample is analyzed in the event that quality assurance/quality control validation determines that the analytical result from the primary sample does not meet the quality control requirements outlined in the QAPP.

All surface water samples are collected, handled and analyzed in accordance with the protocols presented in the QAPP.

Within 7 days of receipt of validated data from the primary sample, if the TCLP arsenic concentration in the WSI surface water exceeds the TCLP regulatory level of 5.0 mg/L, FMC will begin implementation of the WSI Contingency Plan (see Section 6.0).

Additional analyses may be performed in the event that an uncontrolled release of hazardous substances other than arsenic has or may have occurred.

5.5 WSI Sediment Sampling

As required by the AOC, once each year, FMC collects one sediment sample from the bottom of the WSI. Sampling is scheduled during the relatively dry period between June and the end of August. Before sampling, the water level in the impoundment is pumped down to a level at which the sampling team can access the WSI base on foot.

The sediment sample is a composite derived from a minimum of six sub-samples collected from within the WSI. The location of the sub-samples is distributed as evenly as practical at the time of the sampling. The composite sample is submitted for laboratory analysis of arsenic by the TCLP method.

All sediment samples are collected, handled and analyzed in accordance with the protocols presented in the QAPP.

FMC will initiate the WSI Contingency Plan within 7 days of receipt of validated data that indicates the TCLP arsenic level exceeds theTCLP regulatory level of 5.0 mg/L.

Additional analyses may be performed in the event that an uncontrolled release of hazardous substances other than arsenic has or may have occurred.

6.0 WSI CONTINGENCY PLAN

6.1 General

The WSI Contingency Plan has been developed in accordance with Section VI, Paragraphs 6.j.3 and 6.j.4 of the AOC.

If the WSI is found to contain hazardous wastes at any time during its operation as an ICM (as defined by the RCRA regulations), the approved contingency plan will be implemented within 7 days.

The following specific activities will be performed, as necessary:

- Source Identification
- Source Elimination/Isolation
- Alternative Methods for Water Management (surface water runoff and contents of the WSI)
- Impoundment Restoration
- Impoundment Replacement

The scope of each activity and its applicability to any specific incident are dependent on the event that triggered implementation of the Contingency Plan. The potential scope and applicability of each Contingency Plan activity is summarized below.

6.2 Source Identification

Source identification sampling will be performed if surface water or sediment within the WSI is determined to be hazardous (i.e., WSI surface water or sediment TCLP results are above regulatory levels) and the source of the hazardous constituents entering the WSI is unknown. Source identification sampling will be performed as described below.

1. FMC will collect surface water samples from drainage swales (at the primary surface water sampling locations illustrated on Figure 6) throughout the Facility to identify the area(s) where the hazardous constituents originated.
2. Additional surface water samples will be collected from within the areas where elevated concentrations of the hazardous constituents are detected.
3. If needed, iterative sampling will be conducted until the source or sources of hazardous constituents are identified or it is determined that the source(s) cannot be identified.

Surface water samples will be collected directly from the flow stream in the swales using the grab sample method. Actual sampling locations and timing may be adjusted in the field based on flow conditions, visual observations, and analytical results.

Samples collected will be analyzed for arsenic. Analyses performed will be for total constituent concentrations and not by the TCLP. Alternate analyses may be performed in the event that an uncontrolled release of hazardous substances other than arsenic has or may have occurred.

6.3 Source Elimination / Isolation

If the source of hazardous constituents has been identified, FMC will implement source elimination/isolation procedures, as appropriate.

Immediate action will be taken to remove, contain and control any identified release of a hazardous constituent or constituents. Runoff from such source areas will be isolated from the contaminants and/or contained and transferred to alternate on-site storage.

Specific actions to be taken to eliminate and/or isolate identified source areas include, but may not be limited to, the following:

- Removal of contaminated source materials;
- If groundwater exfiltration is a source, installation of a "French drain" type interceptor and associated collection/pumping system to mitigate groundwater exfiltration to surface water;
- Repair, replacement or installation of an asphalt, clay or composite cap over the identified source area; and/or
- Installation of surface water diversion/collection systems.

If FMC cannot begin implementing the selected source elimination/isolation alternatives, within seven days, then FMC will notify the Agencies in writing of the reasons for the delay and submit a schedule for completing the work.

Follow-up surface water sampling of the WSI inflow and from location(s) downstream of the identified source area will be performed during precipitation events (0.15-inches or greater) following completion of the source elimination/isolation activities. Samples will be collected and analyzed as described in Sections 5.3 and 6.2.

The additional actions outlined above will be taken if follow-up sampling data indicate the source area has not been effectively eliminated or contained and/or alternate source areas are identified or suspected.

The sampling results and the actions taken will be documented in the quarterly progress reports covering the period from discovery through elimination/containment.

6.4 Alternative Methods for Water Management

In the event that surface water in the impoundment is identified as hazardous waste, FMC will immediately undertake one of the following alternative methods for managing the liquid contents of the WSI.

- Treatment of surface water contained in the WSI in the on-site WTP and discharge of treated water if allowed to do so under the terms and conditions of the facility SPDES permit;
- Transfer of surface water contained in the WSI to the existing 600,000-gallon storage tanks (Tanks T-1101 and T-1102) or to other tank(s) pending treatment in the on-site WTP if allowed to do so under the terms and conditions of the Facility's SPDES permit; and/or
- Transfer of the liquid contents of the WSI to temporary storage tanks for disposal at an off-site permitted facility.

FMC will use alternative methods to manage runoff during implementation of any impoundment restoration program. These may include, but are not limited to the following:

- Isolate source area from precipitation/runoff;
- Isolate various sections of the surface drainage system to retain surface waters in the swales by closure of culvert gates and/or sandbag dikes;
- Transfer water in isolated swale sections to Tanks T-1101, T-1102 and/or T-8100 (providing they have sufficient capacity) for treatment at the WTP if allowed to do so under the terms and conditions of the Facility's SPDES permit; and/or
- Transfer water in isolated swale sections to temporary storage tanks for disposal at an off-site permitted facility.

Note that existing Tanks T-1101 and T-1102 act as feed-equilibrium tanks for, and are an integral component of FMC's on-site WTP. Surface water and groundwater collected in on-site underdrains, trenches and/or sumps are pumped into these tanks to minimize the variability of wastewater flow rates and composition prior to receipt by the WTP. Water from these tanks is fed directly into the treatment facility through an existing steel force main. A parallel line allows return of off-specification water (such as may occur during startup of the system or a changeover during system operations) to Tanks T-1101 and/or T-1102. These tanks are permanently in line with the WTP and qualify for exemption from hazardous waste tank permitting requirements (6NYCRR[5], Part 373-1.1(d)(1)(xii)).

6.5 Impoundment Restoration

Requirements for restoration of the impoundment vary depending on whether the surface water, sediments or both are characterized as hazardous waste.

Once the WSI surface water level is sufficiently low to permit sampling of the sediments, FMC will collect sediment samples from the WSI in accordance with Section 5.5 (if such sediments have not previously been characterized as hazardous).

If the sediments are found not to be hazardous waste, no further action will be taken for the sediments in the impoundment.

If the sediments within the impoundment are confirmed to be a hazardous waste, FMC will implement the following program to remove all sediments from the impoundment.

1. Pre-restoration activities will be implemented, including contractor procurement, diversion of surface water, and treatment of liquid contents in the impoundment.
2. Sediments and gravel ballast within the impoundment will be removed from the base of the impoundment using rubber-tired loaders/backhoes, hand shovels, and brooms. Extreme care will be taken when operating within the impoundment to ensure the existing liner is not punctured. Equipment used in the impoundment will not be operated directly on the exposed liner, but will only operate from the existing gravel ballast.
3. The sediments and gravel ballast will be placed in one or more stockpiles in the impoundment. The exposed portions of the liner will be washed with water to remove visible sediment. Washwater will be collected and stored prior to

[5] NYCRR – New York Codes, Rules and Regulations

treatment in the on-site WTP. This procedure will be repeated for those areas where sediment/gravel was stockpiled, once the stockpiles are relocated.

4. The existing gravel ballast will be segregated into piles in the impoundment and rinsed to remove sediments. Any collected sediments will be characterized and, if required, managed as a hazardous waste in appropriate containers that are transported off-site to a permitted treatment, storage, and disposal facility for disposal. The rinsate will be collected and transferred to the on-site WTP for treatment and discharge. The washed ballast will be placed back over the exposed liner after visual inspection/repairs as discussed in Item 5.
5. The exposed liner will be visually inspected for any signs of wear such as rips, tears, perforations, and slumps. Appropriate repairs will be made, in accordance with Section 5.1.

If sampling indicates there is a significant variation in sediment quality within each half of the impoundment (e.g., sediment in one half is hazardous, but the remaining sediment is less than half the TCLP regulatory limit), FMC may request in writing to the Agencies a modification to the limits of the sediment to be removed. The limits of sediment to be removed will be subject to Agency approval.

All activities performed during restoration of the impoundment will be fully documented and presented in the quarterly progress report covering the period of restoration.

6.6 Impoundment Replacement

The AOC provides for the continued use of the WSI as a storage unit for surface water runoff from the northern portion of the Facility. The WSI is not intended to be used as a storage unit for hazardous waste. Consequently, in the event surface water and/or sediment contained within the impoundment are determined to be hazardous on a persistent basis, the following actions may be necessary:

- Replace the WSI with a permitted hazardous waste storage unit or a system that is exempt from permitting requirements under 6NYCRR Part 373-1.1(d)(1)(xii), or
- Request a hazardous waste permit for the use of the WSI as a RCRA regulated impoundment.

In general, the WSI contents are considered hazardous on a persistent basis when one or more of the following conditions exists:

1. It is determined during three consecutive monitoring events (as described in Section 5.5) that the sediments are hazardous, provided:
    - The approved Contingency Plan was followed and the impoundment was restored (as described in Section 6.5) following the initial event in which sediments were determined to be hazardous; and
    - Each occurrence is related to routine operation of the impoundment (including the associated site cover and runoff collection system) and is not related to unique or one-time release events (e.g., spills).
2. It is determined at least three times within a one-year period that surface water contained in the impoundment is hazardous, provided that:

- Each occurrence is related to the routine operation of the impoundment (including the associated site cover and runoff collection system) and is not related to unique or one-time release events (e.g., spills); and
- None of the three occurrences relate to specific source areas that were subsequently identified and remediated as described in Sections 6.2 and 6.3.

3. It is determined at least six times within a one-year period that surface water contained in the impoundment is hazardous, provided that:
    - Each occurrence is related to the routine operation of the impoundment (including the associated site cover and runoff collection system) and is not related to unique or one-time release events (e.g., spills); and
    - Each of the six occurrences are attributable to any combination of different point-source and/or non-point-source incidents.

If one of the above persistent conditions is confirmed to exist, FMC will submit appropriate documentation and propose an appropriate corrective action (with justification) within 30 days.

7.0 REPORTING REQUIREMENTS

Data obtained during operation, monitoring, and maintenance of the WSI is reported in the quarterly progress reports submitted pursuant to the AOC. Data and elements reported include:

- Weekly pumping volumes from the WSI underdrain system (Sump 3)
- Daily precipitation records
- Daily measurement of the water level in the WSI
- Surface water and/or sediment sample analytical results
- Triennial WSI liner inspection and repair summary
- WSI overflow volume and sampling results (if any)
- Contingency Plan activities and results (e.g., sample media, dates, laboratory results, recommendations) as discussed in Sections 6.1 through 6.6 (if any)

In addition, any validated data that indicate the WSI may contain hazardous waste will be reported to the Agencies within three days of FMC's receipt.

8.0 REFERENCES

Arcadis. 2009. RCRA Facility Investigation (RFI) Report Volume I, FMC Middleport Site EPA ID No. NYD002126845. September.

Arcadis, 2010. Western Surface Impoundment Hydrologic Evaluation Report. FMC Middleport Site EPA ID No. NYD002126845.

Arcadis. 2012. North Site Cover Evaluation Final Report, FMC Middleport Site EPA ID No. NYD002126845. June 6.

Arcadis. 2016. Western Surface Impoundment (WSI) Berm Extension Construction Report.

ASTM D7007-16 Standard Practices for Electrical Methods for Locating Leaks in Geomembranes Covered with Water or Earthen Materials

CRA. 1989. Final Construction Report, Interim Closure, Western Surface Impoundment. 1989.

CRA. 1994. Western Surface Impoundment (WSI) Operations Plan Revision #1. January.

FMC. March 6, 1990. Modifications to Plan of Closure, Western Surface Impoundment, FMC Corporation, Middleport, New York.

FMC. 1995. Letter to the USEPA and NYSDEC, SUBJECT: Western Surface Impoundment Sediment Sampling. October 5, 1995.

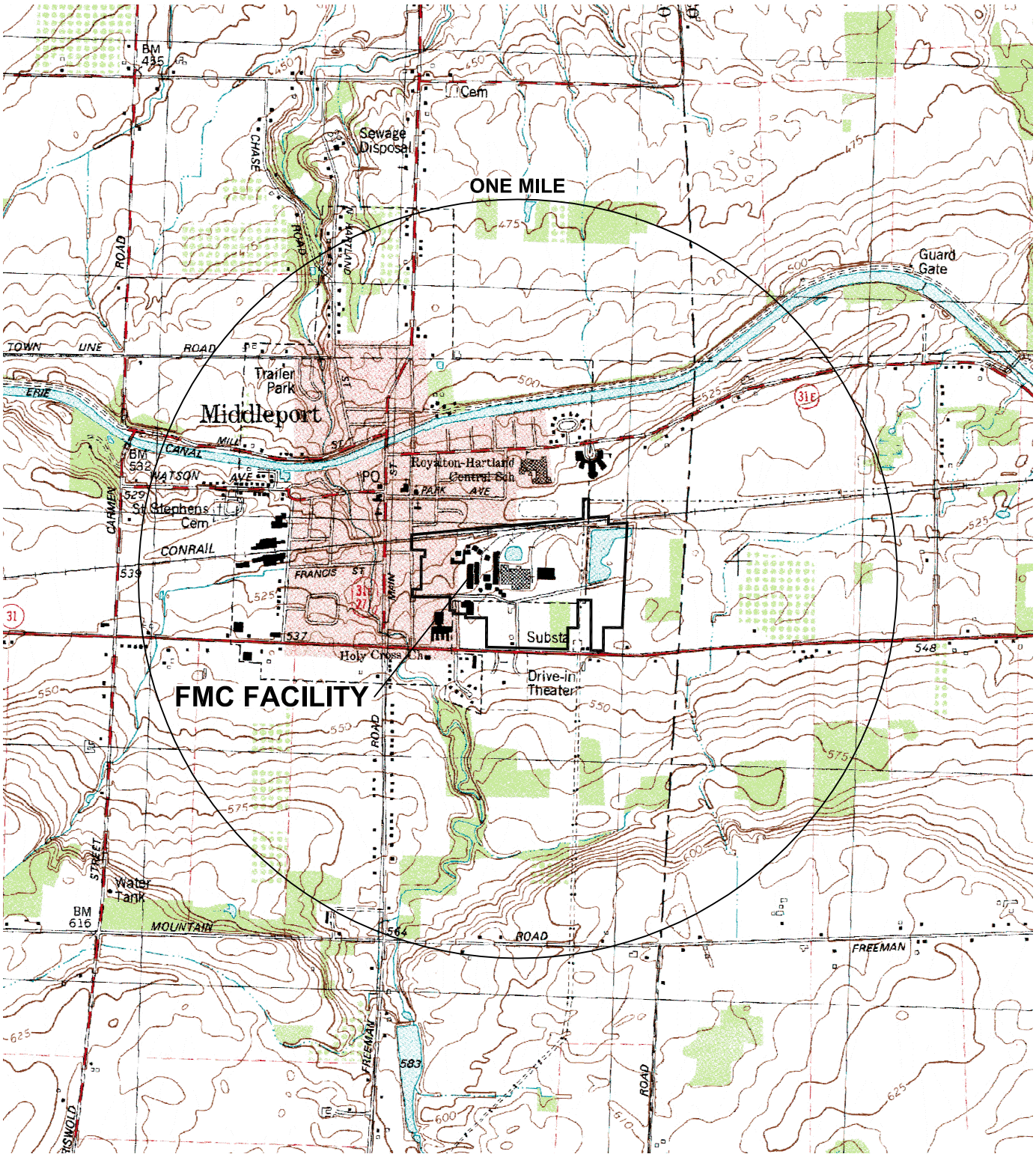
NYSDEC. 1991. Administrative Order on Consent (Docket No. II RCRA-90- 3008(h)-0209) New York State Department of Environmental Conservation, Unites States Environmental Protection Agency. July 2, 1991.

NYSDEC. 1993. Letter to FMC, Re: Western Surface Impoundment Monitoring Plan.

Parsons. 2016. Health and Safety Plan, FMC Middleport Site EPA ID No. NYD002126845. Draft 2016.

Parsons. 2016. Quality Assurance Project Plan, FMC Middleport Site EPA ID No. NYD002126845. Draft 2016.

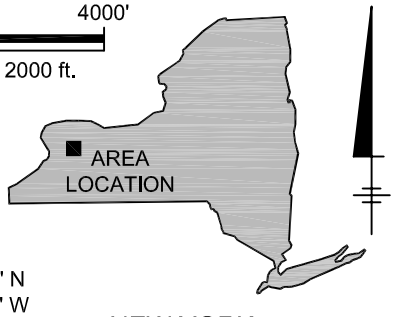
FIGURES



REFERENCE: BASE MAP USGS 7.5. MIN. TOPO. QUAD., MEDINA, NY, 2980.

0 2000' 4000'

Approximate Scale: 1 in. = 2000 ft.



FACILITY LOCATION:
LATITUDE 43° 12' 27" N
LONGITUDE 78° 28' 16" W

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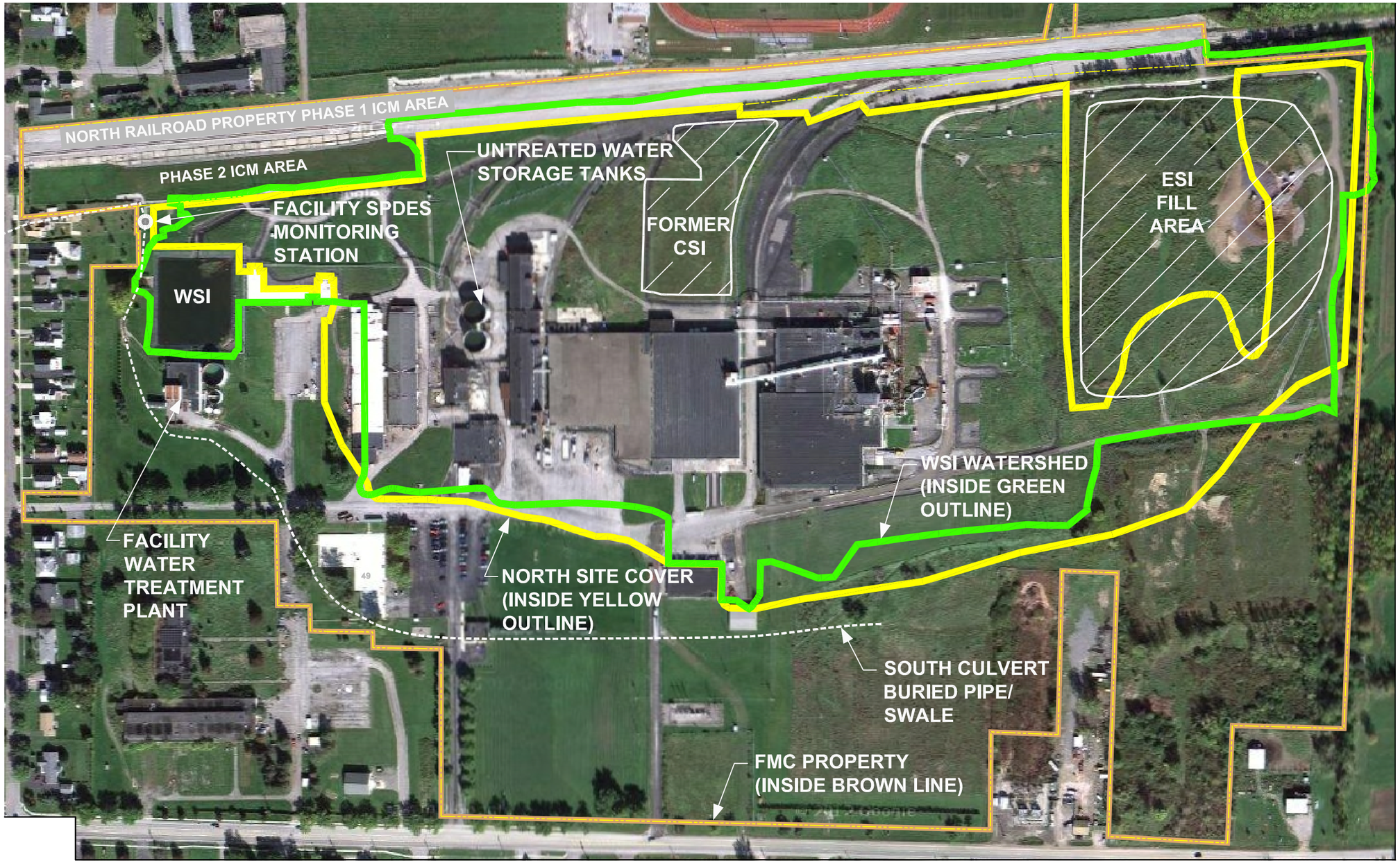
FIGURE 1

FMC CORPORATION–MIDDLEPORT, NEW YORK
WESTERN SURFACE IMPOUNDMENT

SITE LOCATION MAP

PARSONS
40 LA RIVIERE DRIVE, SUITE 350, BUFFALO, NEW YORK 14202 PHONE: 716-541-0730



NOTES:

1. THIS FIGURE WAS PREPARED FROM A DRAWING BY CRA, ENTITLED "SURFACE CHARACTERISTICS AND SURFACE WATER DRAINAGE", FIGURE 2.6, DRAWING NO. 02788-90(055)GN-NF034, DATED JAN. 27, 1999, @ A SCALE OF 1" = 300'.
2. WATERSHED LIMITS UPDATED IN 2010 AS PART OF THE WSI HYDROLOGIC EVALUATION.
3. PHOTOGRAPH TAKEN SEPTEMBER 2011.

0 240' 480'
GRAPHIC SCALE

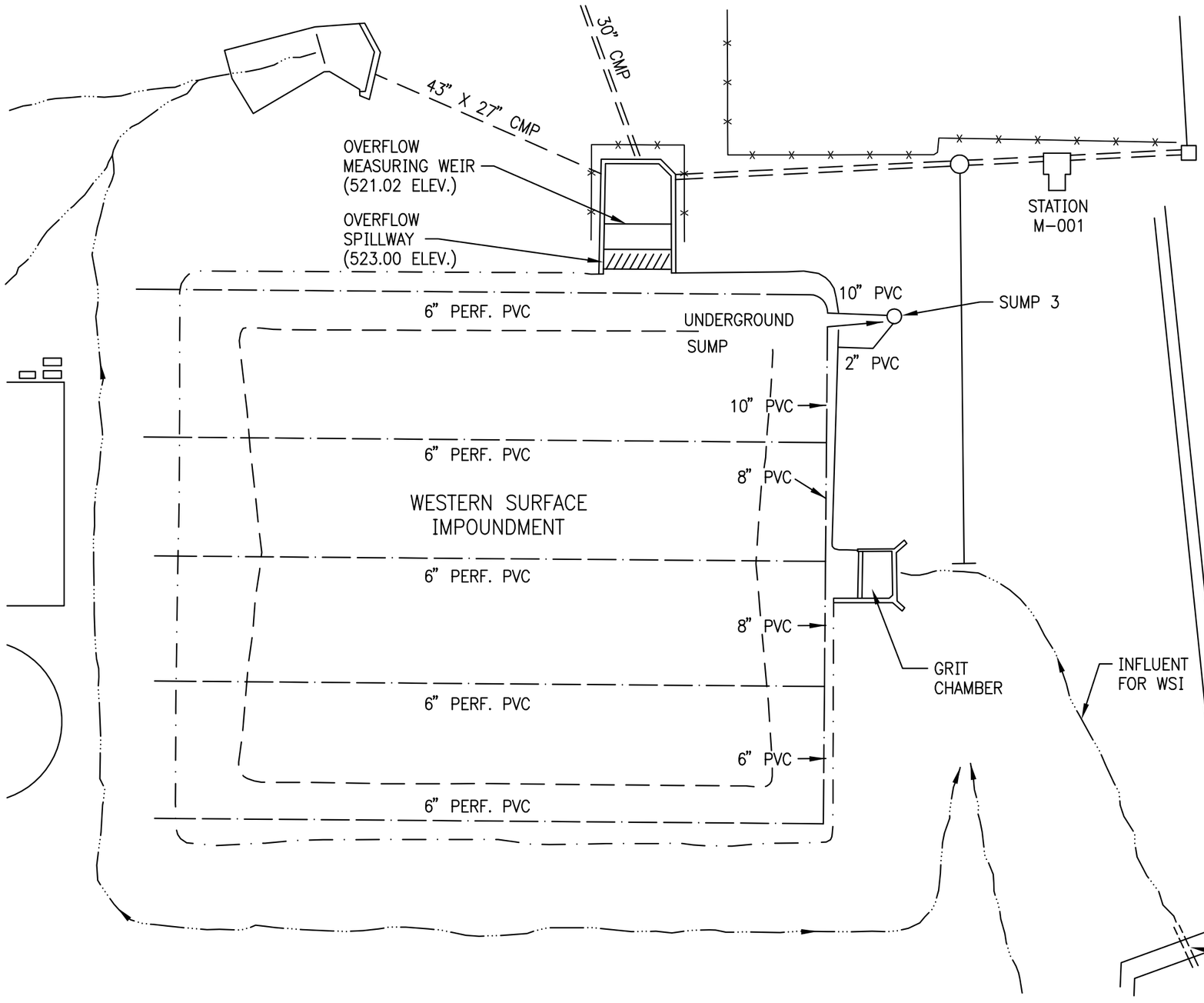
FIGURE 2

FMC CORPORATION-MIDDLEPORT, NEW YORK
WESTERN SURFACE IMPOUNDMENT

SITE PLAN

PARSONS
40 LA RIVIERE DRIVE, SUITE 350, BUFFALO. NEW YORK 14202 PHONE: 716-541-0730

P:\FMC-Middleport and Dublin Road\Middleport Plant Site\RECRA PERMIT APPLICATION FILES\FIG_2 - WSI-SITE_PLAN_041516.dwg



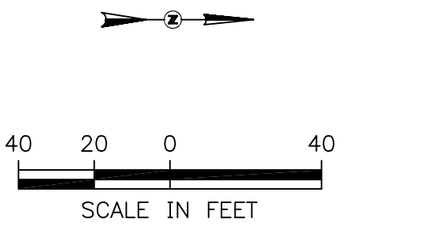


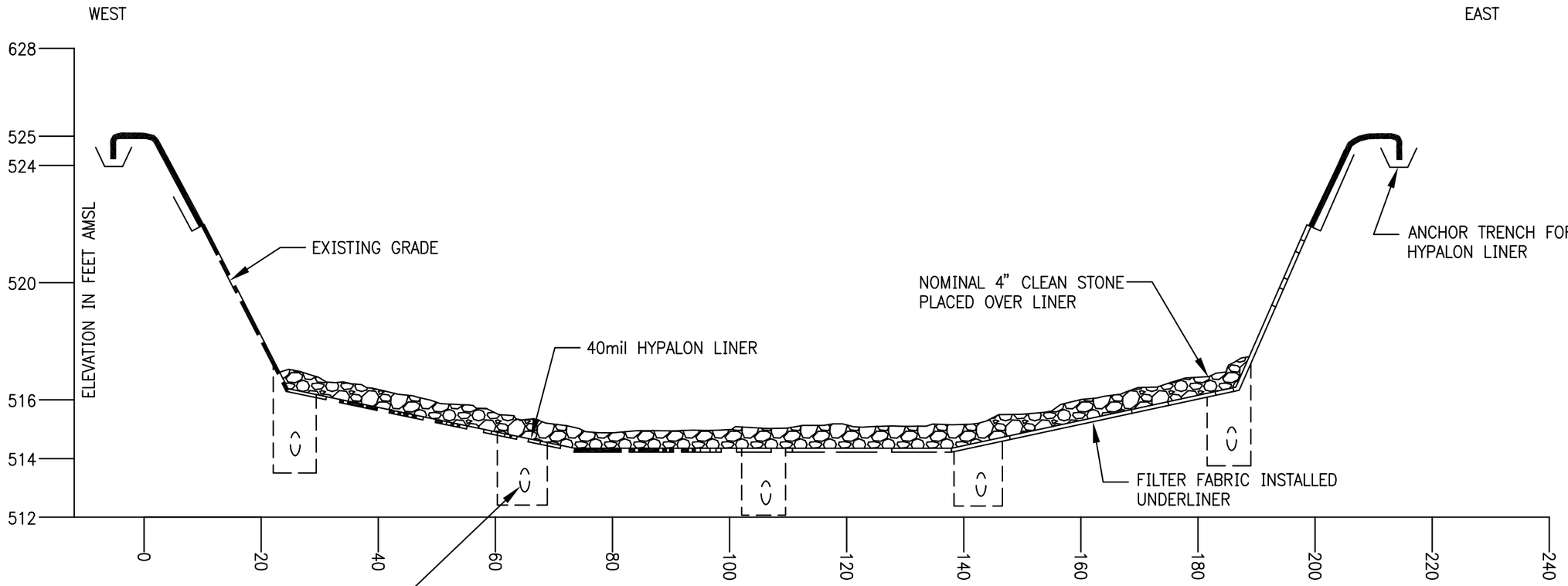
FIGURE 3

FMC CORPORATION–MIDDLEPORT, NEW YORK
WESTERN SURFACE IMPOUNDMENT

PLAN VIEW – WSI

PARSONS
40 LA RIVIERE DRIVE, SUITE 350, BUFFALO. NEW YORK 14202 PHONE: 716-541-0730

P:\FMC-Middleport and Dublin Road\Middleport Plant Site\RECRA PERMIT APPLICATION FILES\FIG_3 -WSI- PLAN_VIEW_WSI_041015.dwg



TYPICAL WEST–EAST CROSS SECTION
WESTERN SURFACE IMPOUNDMENT

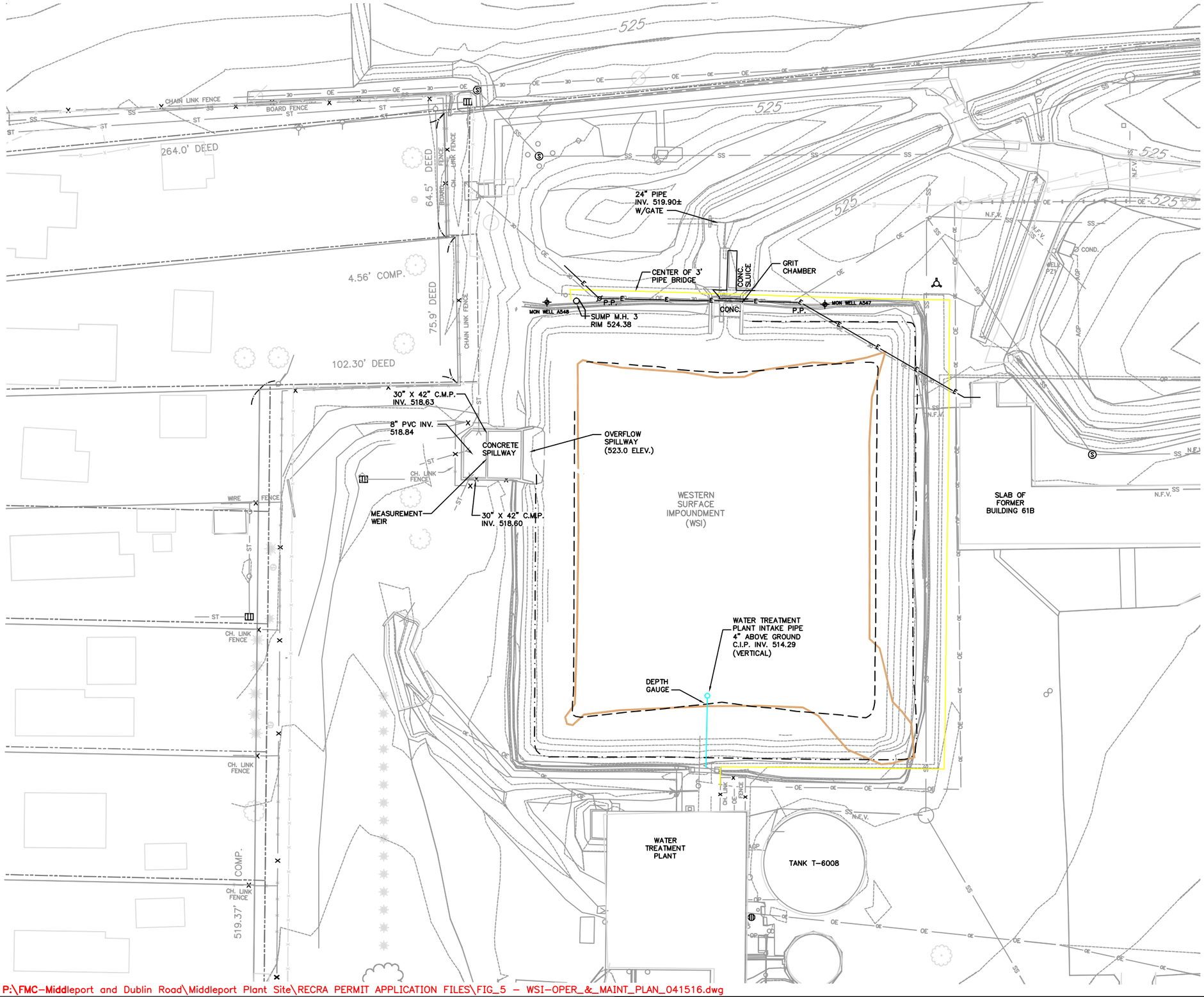
FIGURE 4

FMC CORPORATION–MIDDLEPORT, NEW YORK
WESTERN SURFACE IMPOUNDMENT

TYPICAL CROSS SECTION
WSI

PARSONS
40 LA RIVIERE DRIVE, SUITE 350, BUFFALO. NEW YORK 14202 PHONE: 716-541-0730

P:\FMC-Middleport and Dublin Road\Middleport Plant Site\RECRA PERMIT APPLICATION FILES\FIG_4 - WSI-CROSS-SECTION_041516.dwg



50 25 0 50

SCALE IN FEET

LEGEND:

- APPROXIMATE OFFSITE PROPERTY LINE
- APPROXIMATE FMC PROPERTY LINE
- APPROXIMATE LOCATION OF FENCE
- 519 EXISTING 1' CONTOUR ELEVATION
- 520 EXISTING 5' CONTOUR ELEVATION
- OVERHEAD ELECTRIC
- ST STORM SEWER PIPING
- EDGE OF BALLAST STONE

NOTES:

MAPING BASED ON MAY 11, 2015
"TOPOGRAPHIC MAP OF FMC LANDS"
McINTOSH AND McINTOSH, P.C.

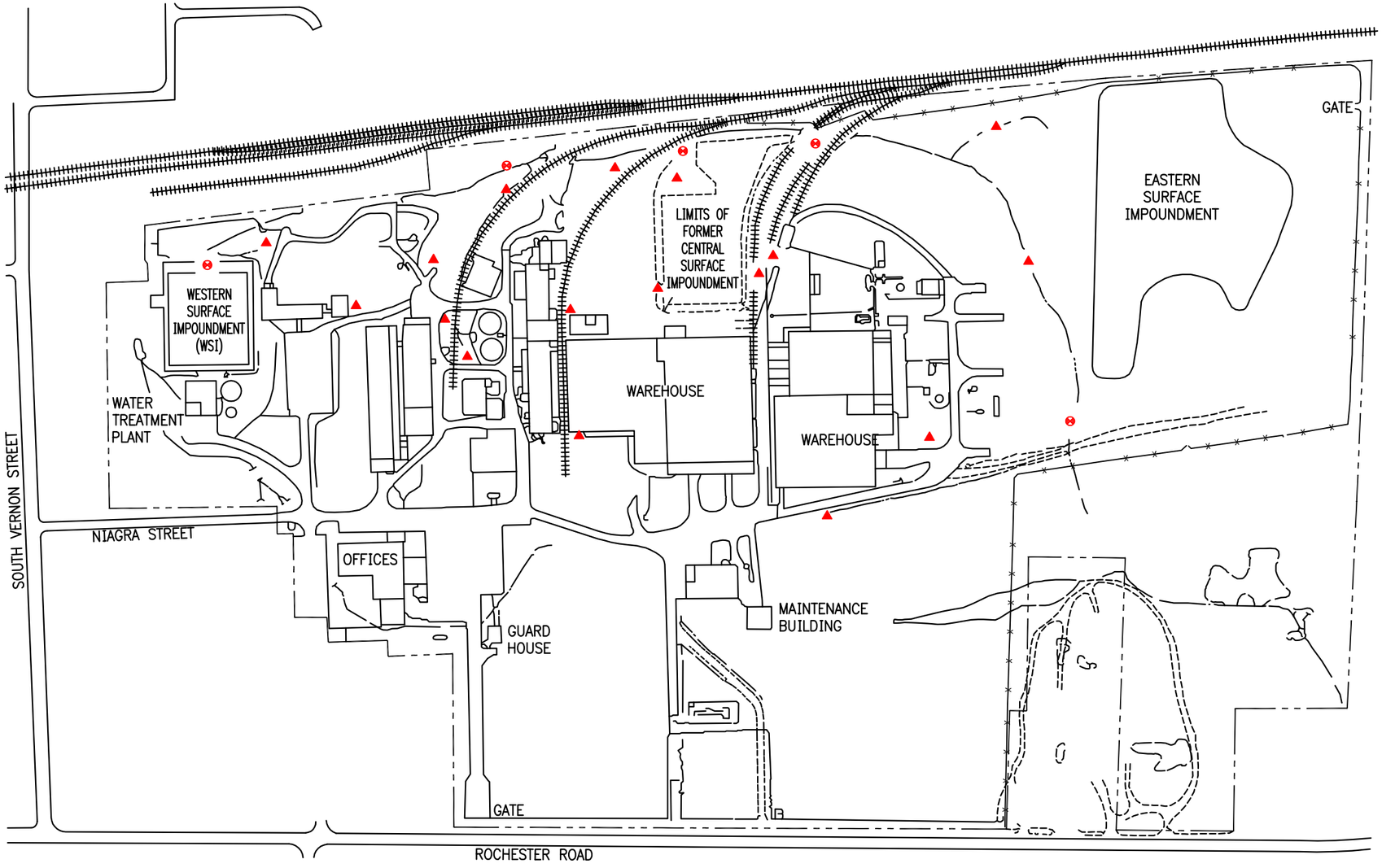
P:\FMC-Middleport and Dublin Road\Middleport Plant Site\RECRA PERMIT APPLICATION FILES\FIG_5 - WSI-OPER_&_MAINT_PLAN_041516.dwg

FIGURE 5

FMC CORPORATION-MIDDLEPORT, NEW YORK
WESTERN SURFACE IMPOUNDMENT

DETAIL-
WESTERN SURFACE IMPOUNDMENT
OPERATION AND MAINTENANCE PLAN

PARSONS
40 LA RIVIERE DRIVE, SUITE 350, BUFFALO, NEW YORK 14202 PHONE: 716-541-0730



300 150 0 300

SCALE IN FEET

LEGEND

- PROPERTY LINE
- FENCE
- PRIMARY SURFACE WATER SAMPLING LOCATION
- FOLLOW-UP SAMPLING LOCATION

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FIGURE 6

FMC CORPORATION–MIDDLEPORT, NEW YORK
WESTERN SURFACE IMPOUNDMENT

SOURCE IDENTIFICATION
SAMPLE LOCATIONS

PARSONS
40 LA RIVIERE DRIVE, SUITE 350, BUFFALO. NEW YORK 14202 PHONE: 716–541–0730

P:\FMC–Middleport and Dublin Road\Middleport Plant Site\RECRA PERMIT APPLICATION FILES\FIG_6 – WSI–SOURCE_ID_SAMPLE_MAP_041415.dwg

APPENDIX A
WEIR OVERFLOW CALCULATION

FMC Middleport
Western Surface Impoundment
Overflow Weir Flow Quantity Calculation

Definitions

Upstream Staff Gauge Reading: water level (feet) as read from the staff gauge located immediately upstream of the weir

Downstream Staff Gauge Reading: water level (feet) as read from the staff gauge located immediately downstream from the weir

Date: date that the staff gauge readings were measured.

Time: time that the staff gauge readings were measured

Time Increment: time (hours) between staff gauge readings

Flow: rate of water (cubic feet per second or gallons per minute) flowing across the weir at the time of the staff gauge readings.

Increment Flow Total: volume of water (gallons) that has passed over the weir during the time increment

Procedure

1. On Table 2, Record the ***Upstream Staff Gauge Reading*** **(BOX A)** and the ***Downstream Staff Gauge Reading*** **(BOX B)** from the two staff gauges located at the overflow weir.
2. Enter the ***Date, Time*** and ***Upstream Staff Gauge Reading*** on Table 1.
3. Complete Table 1 by entering the **Time Increment** and **Flow Values** from Table 2 onto Table 1 Columns D, E, and F.
4. The **Total Flow** for the increment period can be calculated in Column G.

TABLE 1
WESTERN SURFACE IMPOUNDMENT (WSI) WEIR FLOW MEASUREMENT

FMC CORPORATION - MIDDLEPORT, NEW YORK

Column A	Column B	Column C	Column D	Column E	Column F	Column G
Date	Time	Upstream Staff Gauge Reading (feet)	Time Increment (hours)	Flow (cubic feet per second)	Flow (gallon per minute)	Increment Flow Total (gal) (gallons)
1/1/2016	*12:00 AM*	*0.25*	*4.00*	*0.0781*	35.05	8,413
						-
	Total Gallons:					

TABLE 2
WESTERN SURFACE IMPOUNDMENT (WSI) WEIR FLOW MEASUREMENT
FMC CORPORATION - MIDDLEPORT, NEW YORK

STEP 1 - INPUT STAFF GAUGE READINGS HERE

Upstream Staff Gauge Reading (feet) =	0.50	**BOX A**
Downstream Staff Gauge Reading (feet) =	0.00	**BOX B**

STEP 2 - READ THE DISCHARGE "Q" AT THE CORRESPONDING UPSTREAM STAFF GAUGE READING

Upstream Staff Gauge Height (feet)	Water Surface Elevation at Weir (feet)	Q (cubic feet per second)	Q (gallons per minute)	
0.00	519.90	0.0000	0.00	
0.05	519.95	0.0014	0.63	
0.10	520.00	0.0079	3.55	
0.15	520.05	0.0218	9.78	
0.20	520.10	0.0447	20.07	
0.25	520.15	0.0781	35.06	
0.30	520.20	0.1232	55.31	
0.35	520.25	0.1812	81.32	
0.40	520.30	0.2530	113.55	
0.45	520.35	0.4600	206.47	<-----Transition to Trapezoidal Weir
0.50	520.40	0.8386	376.38	
0.55	520.45	1.3288	596.41	
0.60	520.50	1.9093	856.97	
0.65	520.55	2.5678	1,152.51	
0.70	520.60	3.2959	1,479.29	
0.75	520.65	4.0875	1,834.59	
0.80	520.70	4.9378	2,216.25	
0.85	520.75	5.8431	2,622.59	
0.90	520.80	6.8003	3,052.17	
0.95	520.85	7.8065	3,503.81	
1.00	520.90	8.8596	3,976.47	
1.05	520.95	9.9575	4,469.26	
1.10	521.00	11.0986	4,981.38	
1.15	521.05	12.0107	5,390.78	<-----Transition to Rectangular Weir
1.20	521.10	13.6785	6,139.34	
1.25	521.15	15.8382	7,108.69	
1.30	521.20	18.3957	8,256.59	
1.35	521.25	21.2967	9,558.62	
1.40	521.30	24.5043	10,998.32	
1.45	521.35	27.9918	12,563.58	
1.50	521.40	31.7381	14,245.06	
1.55	521.45	35.7266	16,035.19	
1.60	521.50	39.9432	17,927.76	
1.65	521.55	44.3763	19,917.49	
1.70	521.60	49.0158	21,999.84	
1.75	521.65	53.8529	24,170.87	
1.80	521.70	58.8798	26,427.09	
1.85	521.75	64.0896	28,765.40	
1.90	521.80	69.4760	31,183.01	
1.95	521.85	75.0336	33,677.41	
2.00	521.90	80.7571	36,246.29	
2.05	521.95	86.6418	38,887.55	
2.10	522.00	92.6836	41,599.27	
2.15	522.05	98.8783	44,379.66	
2.20	522.10	105.2223	47,227.07	

(Expand table as needed)
Flows are calculated in Table 3

TABLE 3. MIDDLEPORT WEIR CALCULATION TABLE

V-Notch H (feet)			Free Flow Cumulative Qf (CFS)
0.05			0.0014
0.1			0.01
0.15			0.02
0.2			0.04
0.25			0.08
0.3			0.12
0.35			0.18
0.4	**Trapezoidal H (feet)**		0.25
	0.05		0.46
	0.1		0.84
	0.15		1.33
	0.2		1.91
	0.25		2.57
	0.3		3.30
	0.35		4.09
	0.4		4.94
	0.45		5.84
	0.5		6.80
	0.55		7.81
	0.6		8.86
	0.65		9.96
	0.7	**Rectangular H (feet)**	11.10
		0.05	12.01
		0.1	13.68
		0.15	15.84
		0.2	18.40
		0.25	21.30
		0.3	24.50
		0.35	27.99
		0.4	31.74
		0.45	35.73
		0.5	39.94
		0.55	44.38
		0.6	49.02
		0.65	53.85
		0.7	58.88
		0.75	64.09
		0.8	69.48
		0.85	75.03
		0.9	80.76
		0.95	86.64
		1	92.68
		1.05	98.88
		1.1	105.22

Weir Flow Measurement Calculations

Western Surface Impoundment (WSI)

FMC Corporation

Middleport, New York

90° V-Notch Weir Flow Measurement

Total Height of Weir: 0.40 feet

Formula:

$Q_{cfs} = 2.5H_{feet}^{2.5}$

Q = Flow, Cubic Feet Per Second (CFS)

H = Height of Water Over Weir, Feet

Trapezoidal Weir Flow Measurement

Total Height of Weir: 0.70 feet

Length of Weir: 5.50 feet

Formula:

$Q_{cfs} = 3.367L_{feet} \times H_{feet}^{1.5}$

Q = Flow, Cubic Feet Per Second (CFS)

H = Height of Water Over Weir, Feet

L = Length of Weir, Feet

Rectangular Weir (Without End Contractions) Flow Measurement

Length of Weir: 24.50 feet

Formula:

$Q_{cfs} = 3.33 \times L_{feet} \times H_{feet}^{1.5}$

Q = Flow, Cubic Feet Per Second (CFS)

H = Height of Water Over Weir, Feet

L = Length of Weir, Feet

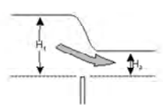
Notes:

1. Calculations for the v-notch, trapezoidal, and rectangular weirs are from ISCO Open Channel Flow Measurement Handbook, Fifth Edition, by Douglas M. Grant & Brain D. Dawson

2. Calculations for tailwater adjustment used in the 'Discharge Estimate' sheet are from Hydrocad Help Manual and are presented below.

Tailwater Adjustments for Weirs

When the tailwater of a weir exceeds the crest elevation, the crest becomes submerged, and special discharge calculations are required. HydroCAD implements two tailwater adjustment procedures, depending on whether the weir rise is specified:



If the rise is not specified, the standard weir discharge is adjusted according to the following equation from Handbook of Hydraulics by Brater & King:

$$Qs = Qf \left(1 - \left(H2 / H1 \right) \right)^{n} \quad n = 0.385$$

where:
Qf=Free discharge
Qs=Submerged discharge
H1=Upstream head above crest
H2=Downstream head above crest

n=1.5 for rectangular weirs
n=2.5 for vee/trapezoidal weirs

Although this adjustment was derived specifically for sharp-crested weirs, it is also used to estimate the submerged discharge for a broad-crested rectangular weir.

If the rise is specified, the discharge is the sum of two components:
1) Standard weir/orifice flow for the portion of the weir that lies *above* the tailwater.
2) Constant-head orifice flow for the portion of the weir that lies *below* the tailwater.

This technique is based on standard weir and orifice flow calculations, yet gives similar results to the empirical solution from Handbook of Hydraulics.

RS-33u Recording Telemetry Unit

Wireless RTU For Above Ground Remote Monitoring

RS-33u monitoring a lift station

Collecting, analyzing and understanding data from networks of recording sites is a challenging task. Telog's recording system, the RS-33u, offers you a versatile, economical and comprehensive solution to keep up with the data acquisition demands of today.

The RS-33u provides real-time monitoring and alarming of instruments and sensors in a system package so flexible it can be customized for each application to provide you with the information you need in a concise, presentable format.

The RS-33u has low power requirements and automatically monitors level, flow, pressure and water quality sensors. Data is forwarded wirelessly to a host computer operating Telog host application software, Telogers for Windows or Telog Enterprise. Data communication may be scheduled frequently (e.g. daily, hourly, every five minutes, etc.) and/or immediately in response to site alarm conditions.

The RS-33u supports multiple sensor interface options including RS-232, RS-485, analog and digital inputs. For example, when connected to an open-channel flowmeter via RS-232, the RTU can interrogate the meter for it's most recent level, flow velocity and battery voltage measurements. PLCs, flowmeters, Sondes, etc. are also supported using a generic MODBUS client. The new MODBUS interface can be configured easily within Telog's Enterprise software.

Telog also provides optional sensors that may be directly attached to the RS-33u including ultrasonic and pressure level, water quality Sondes, pH and conductivity, temperature, level switches and a rain gauge.

Wireless communication is supported via packet switched cellular (e.g. 1xRTT or GPRS).

The RTU is powered from a single, 6-volt lantern battery providing an operating life of six months to two years depending on sensor interface and call schedule.

Directly Monitor:
- Popular Open-channel Wastewater Flowmeters
- Pressure Level Sensors
- Ultrasonic Level Sensors
- Water Quality Sensors and Sondes
- MODBUS supported instruments e.g. PLCs, RTUs etc.

Communicate Via:
- Local Connection
- Cellular
- Land-line Telephone
- Ethernet

Powered by:
- 120/240 AC with battery backup
- Solar panel with battery backup
- Battery only

Alarm Notification

MODBUS Input Interface

Two Year Battery Life

Web Application Software

telog®

RS-33u Specifications

Recorder

Model	Telog RS-33u
Type	Multi- channel RTU (Recording Telemetry Unit)
Recording	
Sample rate	Programmable from 1/sec up to 8 hours; each channel
Data interval	Programmable from 1/sec up to 8 hours; each channel
Memory	
Size:	270 Kbytes
Storage method	Wrap around (first-in; first-out),
Data capacity	Dynamically allocated to active channels, any combination of:
Analog input	150,000 values
Pulse input	110,000 values
Event input	37,000 values
ComSensor input	55,000 values
Communication:	
Standard:	Standard: 4 pin circular connector rated IP-67 Auto-selected baud rate to 19.2K
Optional	Land line telephone Telog M-324 2400 baud modem Auto-dial/Auto-answer FCC and CSA approved Cellular data modem Provides both 1xRTT and GPRS packet switched.
Inputs	Limited to one ComSensor + one analog + one digital
ComSensor/meter	Selectable RS-232 or RS-485 to 19.2 Kbaud. Protocol determined by meter or sensor
Analog	
Selectable ranges	0-1 VDC, 0-5 VDC, 4-20 ma
Excitation	Pulsed +5 or +12 VDC, (selectable duration)
Resolution	0.025%; 12 bits
Accuracy	±0.1% of full range at 25° C ±50 ppm
Digital (one channel)	
Type	Selectable pulse counter or event recorder
Input	Contact closure or logic driven input
Excitation	5 VDC at 20 μAmps (max)
Pulse width	10 mS minimum
Enclosure	
Size	13"x11"x6" (LxWxH)
Rating	NEMA 4x
Environmental	
Temperature	0 to 70° C -30 to +70° C powered externally
Rating	NEMA 4x
Support Software	
S-3PC	Telogers for Windows
S-3EP	Telogers Enterprise
Data transfer unit	IP-67 rated PDA running Palm OS and Telog application program

Supported Sensors

Pressure Level Sensor	Submersible pressure sensor
Model	Telog PT-3Vu
Ranges	0-5 PSI thru 0-300 PSI
Accuracy	±0.25% of full scale
Construction	316 stainless steel
Vent	In-line dry box with user replaceable desiccant
Ultrasonic Level Sensor	Ultrasonic transmitter (ComSensor)
Model	Massa M300/95
Frequency	95 KHz
Range	one foot to 13 feet
Beam Angle	8° conical
Accuracy	±0.25% over any range segment exceeding 12 inches (homogeneous environment)
Temperature Sensor	
Model	AT-3u ambient temperature sensor
Range	-20 to +70° C
Accuracy	±0.2° C
Size	Stainless Steel probe (4" x ¼") with 10 feet of cable

Specifying an RS-33u Telog Recording Telemetry Unit

1. Select a Communication Option

T24	2400-baud telephone Modem
GPRS	GPRS General Packet Radio service
1xRTT	Cellular Packet Modem
eNET	Ethernet Communication Module
SSR	Spread spectrum radio modem

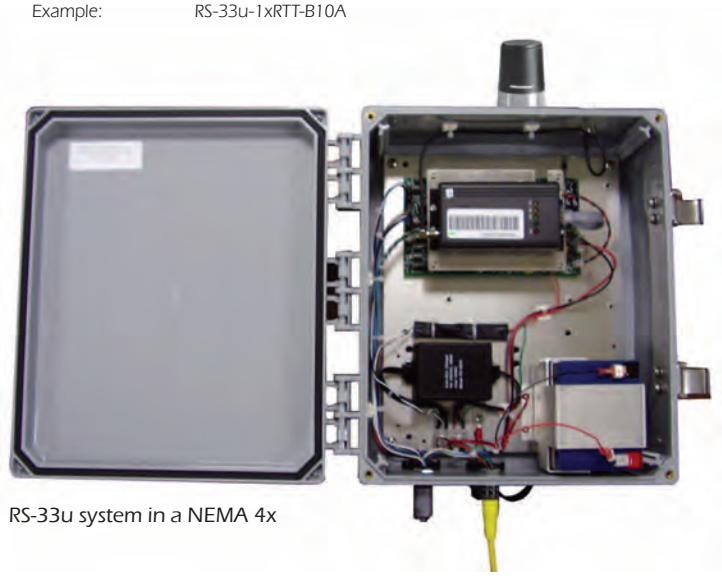
2. Specify a Power Source

B10A	10-amp-hour alkaline battery pack
B10L	10 amp-hour lithium battery pack
ACP	120 VAC-15VDC plug-in power supply
AC12	120/240 VAC to 12 VDC panel mount power supply
AC12B4	AC to 12 VDC with battery backup
AC24	120/240 VAC to 24 VDC panel mount power supply
S5/4	5 Watt solar power with 4 amp-hour rechargeable battery

3. Specify a Product Model Number

RS-33u-Communication-Power

Example: RS-33u-1xRTT-B10A



RS-33u system in a NEMA 4x

Telog Instruments, Inc.
830 Canning Parkway, Victor, NY 14564-8940, USA
Phone: 585.742.3000 • Fax: 585.742.3006
E-mail: TelogSales@telog.com • www.telog.com

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Windows is a registered trademark of Microsoft Corporation.
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11/09

APPENDIX B
WSI LEVEL TRANSDUCER INFORMATION

GE
Sensing

Features

- All-welded titanium construction backed by five-year corrosion warranty
- Accuracy:
  - 1880: < ±0.1% full scale (FS) best fit straight line (BSL)
  - 1280: < ±0.25% FS BSL
- Ideally suited for underground fuel tanks
- FM, CSA intrinsically safe, CE marked
- Flouropolymer™ cable

The PTX/PDCR 1280/1880 Series submersible/depth pressure transducers are specifically designed for depth/level measurements in the groundwater, well water, canals, rivers and other similar applications. The all-titanium construction ensures excellent life in the most hostile environments, including corrosive and hazardous chemical applications. GE backs its titanium construction with a five year corrosion warranty. standard vented cable is flouropolymer. Polyurethane cable is available on the Series 1230 or 1830.

The PTX/PDCR 1280/1880 Series sensors are ideal for use in applications where smaller size is an advantage, such as municipal water supply wells, leachate wells, irrigation projects, etc. The titanium construction also makes the devices suitable for seawater and chemical tank measurement applications.

An advanced micromachined silicon piezoresistive pressure sensor provides excellent performance and resistance to shock and vibration. A tough, flouropolymer cable is attached to the transducer body, providing a high integrity, waterproof assembly. The cable is strengthened with Kevlar® so that there is no measurable elongation when the cable is lowered into deep wells.

The fully isolated, all titanium design ensures long term reliable measurements in water and wastewater management, industrial, process and marine applications.

PTX/PDCR 1280/ 1880 Series

Druck Submersible Depth/Level Pressure Transmitters/Transducers

PTX/PDCR 1280/1880 is a Druck product. Druck has joined other GE high-technology sensing businesses under a new name—GE Industrial, Sensing.

GE
Sensing

PTX/PDCR 1280/1880 Specifications

General

Standard Operating Ranges
- 1, 2.5 psi (0.75, 1.5 mH_2O) gauge
- 5, 10, 15, 20, 30, 50, 75, 100, 150, 200, 300, 500, 900 psi (3.5, 7, 10, 15, 20, 35, 50, 70, 100, 150, 200, 350, 600 mH_2O) gauge or absolute

Other ranges and pressure units may be specified.

Overpressure
- 10X for range 1 psig (0.75 mH_2O)
- 8X for 2.5 psi (1.5 mH_2O)
- 6X for 5 psi (1.5 to 3.5mH_2O)
- 4X for ranges above 5 psi (3.5 mH_2O)
- 2000 psi (1400 mH_2O) maximum

Pressure Media
Fluids compatible with titanium and Flouropolymer

Transduction Principal
Piezoresistive micromachined silicon strain gauge

Combined Error (Non-Linearity, Hysteresis and Repeatability)
Series 1880
±0.1% FS BSL; ±0.06% FS BSL available (consult factory)

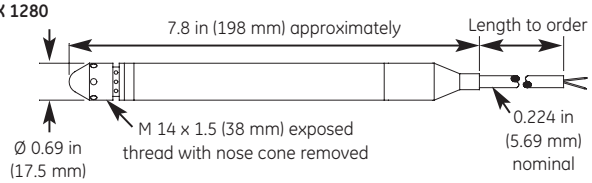
Series 1280
±0.25% FS BSL

Temperature Effects Over Compensated Range of 30°F to 86°F (-1°C to 30°C)
Series 1880
±0.3% FS TEB; ±0.6% for ranges below 5 psi (3.5 mH_2O)

Series 1280
±1% FS TEB; ±2% FS for ranges below 5 psi (3.5 mH_2O)

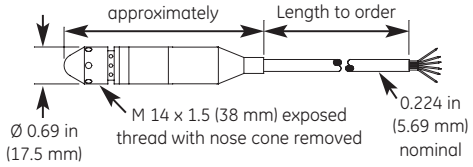
Resolution
Infinite

PTX 1280



Electrical Connection
Vented polyurethans cable
Red-Positive supply
White-Negative supply
Yellow-Positive output
Blue-Negative output
Shield-connected to case
Any other conductors not connected.
Optional monitor leads: Orange and Black.

PDCR 1280



Electrical Connection
Vented polyurethane cable
Red-Positive supply
Black-Negative supply
Shield-connected to case
Any other conductors not connected.

Installation Drawings

Insulation Resistance
100 MΩ @ 50 VDC

Relative Humidity
0 to 100%

Compensated Temperature Range
30 to 86°F (-2°C to 30°C)

Operating Temperature Range
-5°F to 140°F (-20°C to 60°C)

Electrical Characteristics

Output
PDCR 1880/1280 Series
- 2.5 mV/V for range 1 psi (0.75 mH_2O)
- 5 mV/V for range 2.5 psi (1.5 and 3.5 mH_2O)
- 10 mV/V for ranges 10 psi and above (7 mH_2O)

PTX 1880/1280 Series
Two-wire, 4 to 20 mA

Output is ratiometric to power supply (2.5 VDC minimum)

GE
Sensing

PTX/PDCR 1280/1880 Specifications

Mechanical Characteristics

Sensor Body
Titanium

Measurement Diaphragm
Titanium

Pressure Connection
Open face with protective titanium and flouropolymer

Electrical Connection
Vented flouropolymer cable (specify length)

Diameter
0.69 inches (17.5 mm)

Weight
5 oz (142 g) nominally (excluding cable)

Compatible Fluids
Any fluid compatible with titanium and flouropolymer

Safety
- FM, CSA Intrinsically safe
- Class I, Division 1, Groups A,B,C,&D
- EMC Emmissions EN50081-1
- EMC Immunity EN50082-2
- Certification CE marked

Ingress Protection
Type 6/IP68

Options

- Sink-weight (P/N: DA2608-1-01)
- Monitor leads (PDCR version only)
- FM, CSA or ATEX intrinsically safe certification
- ABS certification
- Threaded pressure port (welded)
  - 1/4 in NPT male
  - 1/8 in NPT male
  - 7/16 UNF male
  - G 1/4 male
  - G 1/8 male

Accessories

- STE 110 terminal enclosure with desiccant and waterproof vent
- SCU 220 terminal enclosure with desiccant and waterproof vent with 4-20mA signal conditioning (for all millivolt sensors)
- Cable clamp (P/N: 192-373-01)
- Two-wire lightning arrestor (P/N TAS 140-1); Four-wire lightning arrestor (P/N: TAS 140-4)
- Descaling kit (P/N: DA2906-1-01)
- DPI 280 digital indicator
- DPI 610 portable field calibrator (specify range)

Ordering Information

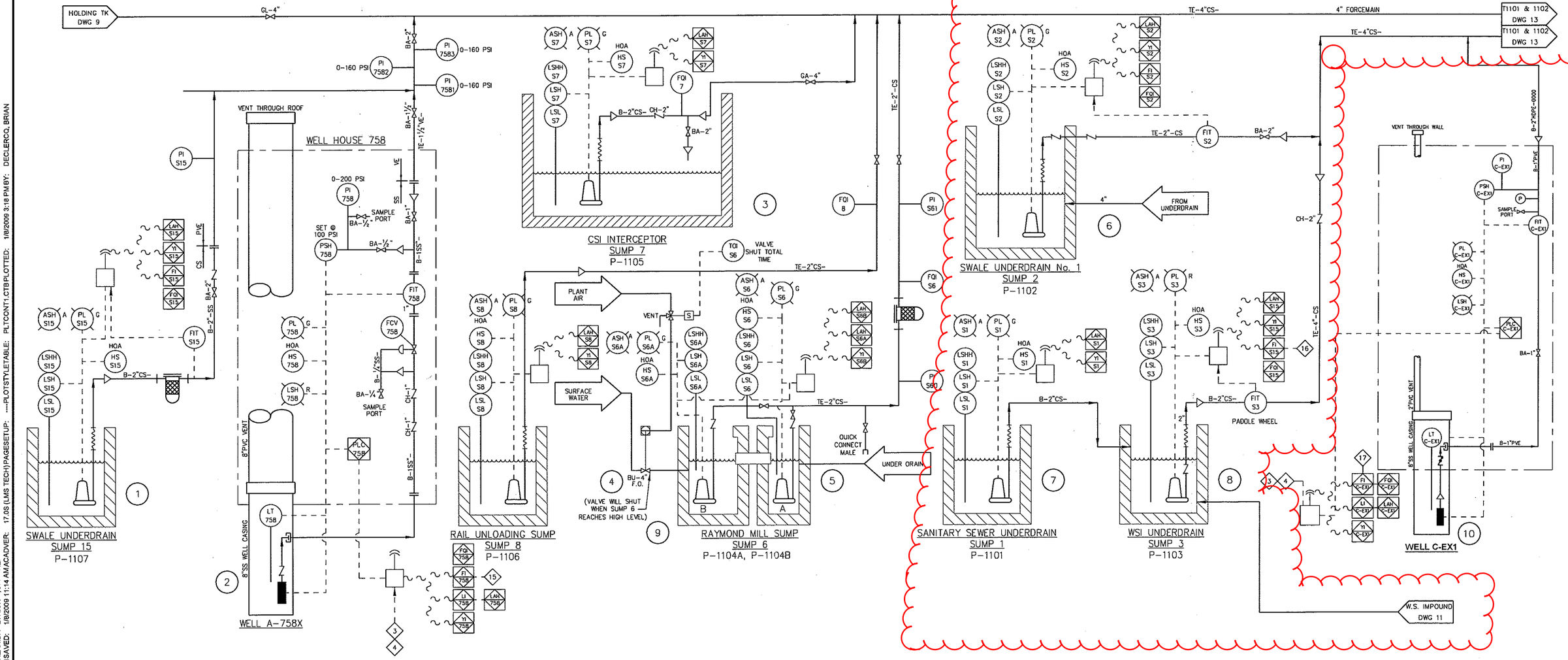
Please State the Following:

(1) Type number
(2) Pressure range
(3) Cable length
(4) Options required

For non-standard requirements please specify in detail.

Shipping, Storage and Handling
Each transmitter is purged with clean dry nitrogen and shipped with desiccant to prevent moisture ingress during transit.

APPENDIX C
SUMP 3 PUMP (P-1103) AND METERING EQUIPMENT INFORMATION



PLANT ID.	P-1015 (1)	P758 (2)	PUMP 7 (3)	PUMP 8 (4)	PUMP 6 (5)	P-1002 (6)	P-1001 (7)	P-1008 (8)	PUMP 6A (9)	(10)
NAME	SWALE UNDERDRAIN SUMP PUMP	WELL A-758X PUMP	CSI INTERCEPTOR SUMP PUMP	RAIL UNLOADING SUMP PUMP	RAYMOND MILL SUMP PUMP A	SWALE UNDERDRAIN SUMP PUMP	SANITARY SEWER SUMP PUMP	WSI UNDERDRAIN SUMP PUMP	RAYMOND MILL SUMP PUMP B	WELL C-EX1
DESCRIPTION: MATERIAL		SS						CI		SS
SIZE		4"								4"
CAPACITY		5 GPM @ 270'		20 GPM @ 50'	40 GPM @ 80'			40 GPM @ 80'	40 GPM @ 80'	5 GPM @ 150'
TEMP/PRESS										
HP/V/RPM		.5/230/3450		1.5/230/3450	1.5/230/3450			1.5/230/3450	1.5/230/3450	.5/230/3450
WEIGHT										
MANUFACTURER		RED JACKET			GOULDS			GOULDS	GOULDS	RED JACKET
MODEL		50CNSWI-CNS17AE			3885 WE1534HH			3885 WE1534HH	3885 WE1534HH	50F2116S17
VENDOR										

No.	Date	GENERAL REVISION DESCRIPTION	BAB	MADE BY
0	3/25			APPR. BY
				DATE

REVISIONS

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CONESTOGA-ROVERS & ASSOCIATES

DRAWN BY B.A. BEEBE DATE 3/25/00
DESIGNED BY M. LASCHINGER DATE 3/25/00
APPROVED BY ..... DATE .....

FMC, INC.
MIDDLEPORT, NEW YORK

DWG. 9981-EF-03 SHT.

SURFACE AND GROUNDWATER COLLECTION ENGINEERING FLOW DIAGRAM

CITY:SYRACUSE-NY DIV/GROUP: 141 DB:GMS BGP KLS LD: PIC: PM:DRG TM:JLONZANIDA LYR:ON=*;OFF=*REF*
G:\ENV\CAD\SYRACUSE\ACT\B0037706\00000020\DWG\WTP\37706D07.DWG LAYOUT: 11SAVED: 1/8/2009 11:14 AM ACADVER: 17.0S (LMS TECH) PAGESETUP: ----
XREFS: IMAGES: PROJECTNAME: ----

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd

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Professional Engineer's Name: DAVID R. GERBER
Professional Engineer's No.: 073001
State: NY | Date Signed | Project Mgr.: TEM
Designed by: MMP | Drawn by: GMS | Checked by

ARCADIS
ARCADIS OF NEW YORK, INC.

FMC CORPORATION • MIDDLEPORT, NEW YORK
WATER TREATMENT PLANT UPGRADE

EXTRACTION WELL AND SUMPS PIPING AND INSTRUMENTATION DIAGRAM

MECHANICAL

ARCADIS Project No. 37706.0000.00203
Date JULY 2008

ARCADIS
6723 TOWPATH ROAD
SYRACUSE, N.Y., 13215
TEL. 315.446.9120

11

Model:	
Horse Power:	1.5 HP
Capacity:	5 GPM
Motor Voltage:	230 V, Single Phase

Number:	Sump 3, P-1103
Name:	WSI Underdrain
Manufacturer:	Goulds
Model:	3885 WE1534HH
Horse Power:	1.5 HP
Capacity:	40 GPM @ 80'
Motor Voltage:	230 V, Single Phase

Number:	Sump 4, P-1201
Name:	Swale Underdrain #2
Manufacturer:	
Model:	
Horse Power:	1.5 HP
Capacity:	GPM
Motor Voltage:	230 V, Single Phase

Number:	Sump 5, P-1202
Name:	Building 67 Sump
Manufacturer:	
Model:	
Horse Power:	1.5 HP
Capacity:	GPM
Motor Voltage:	230 V, Single Phase

Number:	Sump 6, P-1104A and P-1104B
Name:	Raymond Mill
Manufacturer:	Goulds
Model:	3885 WE1534HH
Horse Power:	1.5 HP
Capacity:	40 GPM @ 80'
Motor Voltage:	230 V, Single Phase

Number:	Sump 7, P-1105
Name:	CSI Interceptor
Manufacturer:	
Model:	
Horse Power:	1.5 HP
Capacity:	GPM
Motor Voltage:	230 V, Single Phase

Number:	Sump 8, P-1106
Name:	Rail Unloading Sump
Manufacturer:	

GOULDS WATER TECHNOLOGY

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SPECIFICATIONS

3885SPEC

3885WE1534HH

WE Series Model 3885

SUBMERSIBLE EFFLUENT PUMPS

GENERAL

- Furnish and install ____ Goulds Water Technology, Model 3885, WE submersible effluent pump(s), 1.5 HP, 1 phase, 230 volts, 60 Hz, pump(s) rated for 40 GPM, at 80 Ft. Total Dynamic Head.
- Pump(s) shall be Goulds Water Technology, Order No: _____ .

QUALIFICATIONS

All pump manufacturers must be pre-qualified by the engineer in order to qualify as acceptable manufacturers. Pre-qualification shall be no later than two (2) weeks prior to published bid date for this project. Failure to pre-qualify will be grounds for disqualification after the bid opening date. All decisions of qualification shall reside with the engineer of record at time of bidding.

PUMP DESIGN

Pump(s) shall have 2 inch NPT integral vertical discharge and shall be capable of handling effluent containing non-abrasive ¾ inch maximum solids.

MECHANICAL SHAFT SEALS

The motor shall be protected by a mechanical shaft seal mounted on the pump shaft. The mechanical seal shall be constructed of silicon carbide vs. silicon carbide sealing faces. The mechanical seal shall be tensioned by a spring constructed of series 300 stainless steel metal components and BUNA-N elastomers.

IMPELLER

The impeller shall be semi-open with ejector (pump out) vanes on the top of the impeller for protection of the mechanical seal and hydraulic balance. Due to design, only single plane spin balancing shall be required for smooth operation.

The impeller shall be threaded to the solid series 400 stainless steel shaft. All impellers shall be secured by a thread-locking feature which will prevent the impeller from loosening during short periods of reverse rotation as might occur when rotation direction is being verified outside the installation.

CASING

The casing shall be cast from ASTM A48 class 30 gray cast iron of sufficient thickness to withstand 1.5 times the shut off pressure generated by the largest impeller available for this model in accordance with current revision of the Hydraulic Institute Standards. The discharge connection shall be a standard 2 inch NPT suitable for direct connection to the station piping, without the use of any external fittings or adapters for vertical orientation of the discharge direction. Integral feet of cast iron shall be made a part of the casing for accurately positioning the pump suction opening at the correct elevation off the sump floor for good pump down capability.

MAJOR CASTING MATERIALS

The impeller, casing, bearing/seal housing and motor cover shall be of ASTM A48 Class 30 high quality cast iron for strength and long life. Bronze impeller shall be cast iron from ASTM B584 UNS C87600 when ordered as an option.

CORROSION PROTECTION

The pump/motor shaft wetted-end shall be series 400 stainless steel, except the 2 HP shaft which is 17-4 PH. Both inner and outer surfaces of cast iron shall be electrocoat-painted with thermo-setting Acrylic Enamel baked at 400° F, after castings are completely machined.

MOTOR

The integral motor shall be completely sealed from the environment by use of circular cross section o-rings accurately fitted into machined grooves which shall provide designed compression of metal to metal fits. Designs which require a specific torque on the casing bolts or which require rectangular gaskets or sealing rings shall not be allowed. The motor shall be rated for continuous duty under full nameplate load while at full submergence in the station. The motor shall be provided at the specific site conditions of 115, 208 or 230 V, single phase or 200, 230, 460 or 575 V, three phase as required, all shall be at 60 Hz. Single phase motors shall be capacitor-start. All single phase motors shall be provided with thermal protection. Single phase motors shall have an on winding sensor with automatic reset. Three phase motors shall be protected by ambient compensated quick-trip heaters, or, adjustable motor circuit protectors provided in control. The stator winding shall be open type with class B insulation suitable for operation in clean dielectric oil for efficient heat transfer and lubrication of the ball bearings. The stator shall be a register fit into the bearing housing to ensure positive alignment, and bolted for ease of serviceability. The motor shall be provided with ball type anti-friction bearings which shall support the heavy duty rotor shaft and to handle all radial and axial loads imposed by the impeller while limiting shaft deflection at the mechanical seal faces. Sleeve type bearings shall not be considered equal and, therefore, shall not be allowed. The ball bearings shall be designed for a B-10 life of 30,000 hours minimum. The motor shall be designed and tested to withstand an 18 day locked-rotor operation without damage.

POWER CABLE

The power cable shall be sealed at the motor end as it enters the motor casing by a two part barrier to moisture intrusion. The first line of defense shall be the compression of the oil and chemical resistant grommet which shall seal the outer jacket of the power cord. In the event that the outer jacket of the power cord should become damaged, then the second line of defense shall be the epoxy poured isolated conductors within the jacketed cable itself. The insulation shall be removed from the individual conductors and the epoxy shall be allowed to form a leak-proof seal against wicking of the power cable between the outer jacket and the insulation of the individual conductors. The outer jacket of the power cord shall be oil resistant and water resistant. The power cable shall be rated for NEC severe service "S", type "SJTOW" or "STOW".

PUMP OPTIONS

1. Bronze impeller
2. Mechanical seal faces of silicon carbide/tungsten carbide material
3. Power cable of various lengths
4. Refer to the factory for items not listed.

Xylem Inc.
2881 East Bayard Street Ext., Suite A, Seneca Falls, NY 13148
Phone: (866) 325-4210 Fax: (888) 322-5877
www.xyleminc.com/brands/gouldswatertechnology

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INSTRUCTION MANUAL
IM107R06

Wastewater Pumps
Dewatering, Effluent and Sewage

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

GOULDS
WATER TECHNOLOGY
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TABLE OF CONTENTS

Owner's Information

Pump Model Number: _____

Pump Serial Number: _____

Control Model Number: _____

Dealer: _____

Dealer Phone No. _____

Date of Purchase: _____ Installation: _____

Current Readings at Startup:

1Ø	3Ø	L1-2	L2-3	L3-1
Amps: _____	Amps: _____	_____	_____	_____
Volts: _____	Volts: _____	_____	_____	_____

SAFETY INSTRUCTIONS

TO AVOID SERIOUS OR FATAL PERSONAL INJURY OR MAJOR PROPERTY DAMAGE, READ AND FOLLOW ALL SAFETY INSTRUCTIONS IN MANUAL AND ON PUMP.

THIS MANUAL IS INTENDED TO ASSIST IN THE INSTALLATION AND OPERATION OF THIS UNIT AND MUST BE KEPT WITH THE PUMP.

This is a **SAFETY ALERT SYMBOL.** When you see this symbol on the pump or in the manual, look for one of the following signal words and be alert to the potential for personal injury or property damage.

⚠ DANGER Warns of hazards that **WILL** cause serious personal injury, death or major property damage.

⚠ WARNING Warns of hazards that **CAN** cause serious personal injury, death or major property damage.

⚠ CAUTION Warns of hazards that **CAN** cause personal injury or property damage.

NOTICE: INDICATES SPECIAL INSTRUCTIONS WHICH ARE VERY IMPORTANT AND MUST BE FOLLOWED.

THOROUGHLY REVIEW ALL INSTRUCTIONS AND WARNINGS PRIOR TO PERFORMING ANY WORK ON THIS PUMP.

MAINTAIN ALL SAFETY DECALS.

⚠ WARNING All electrical work must be performed by a qualified technician. Always follow the National Electrical Code (NEC), or the Canadian Electrical Code, as well as all local, state and provincial codes. Code questions should be directed to your local electrical inspector. Failure to follow electrical codes and OSHA safety standards may result in personal injury or equipment damage. Failure to follow manufacturer's installation instructions may result in electrical shock, fire hazard, personal injury or death, damaged equipment, provide unsatisfactory performance, and may void manufacturer's warranty.

⚠ WARNING Standard units are not designed for use in swimming pools, open bodies of water, hazardous liquids, or where flammable gases exist. These fluids and gases may be present in containment areas. Tank or wetwell must be vented per local codes.

Only pumps specifically Listed for Class 1, Division 1 are allowable in hazardous liquids and where flammable gases may exist. *See specific pump catalog bulletins or pump nameplate for all agency Listings*.

⚠ WARNING Disconnect and lockout electrical power before installing or servicing any electrical equipment. Many pumps are equipped with automatic thermal overload protection which may allow an overheated pump to restart unexpectedly.

⚠ CAUTION All three phase (3Ø) control panels for submersible pumps must provide Class 10, quick-trip, overload protection.

PRE-INSTALLATION CHECKS

Open all cartons and inspect for shipping damage. Report any damage to your supplier or shipping carrier immediately.

Important: Always verify that the pump nameplate Amps, Voltage, Phase and HP ratings match your control panel and power supply.

Many of our sewage pumps are oil-filled. If there are any signs of oil leakage or if the unit has been stored for an extended period check the oil level in the motor dome and the seal housing, if so equipped.

Check the motor cover oil level through the pipe plug on top of the unit. The motor chamber oil should just cover the motor. Do not overfill, leave room for expansion!

To check the seal housing oil level, where used, lay the unit on its side with the fill plug at 12 o'clock. Remove the plug. The oil should be within ½" (13mm) of the top. If low, refill with an ASTM 150 turbine oil. Replace the plug.

You can source oil locally at motor repair shops. Typical oil brands are: Shell Turbo 32, Sunoco Sunvis 932, Texaco Regal R&O 32, Exxon Nuto 32 and Mobil DTE Light.

Check the strain relief nut on power cable strain assemblies. Power cables should be torqued to 75 in. lbs. for #16 cables and 80 in. lbs. for all other cable assemblies. Seal/heat sensor cables, where used, should be torqued to 75 in. lbs.

Warranty does not cover damage caused by connecting pumps and controls to an incorrect power source (voltage/phase supply).

Record the model numbers and serial numbers from the pumps and control panel on the front of this instruction manual for future reference. Give it to the owner or affix it to the control panel when finished with the installation.

LIFTING OF PUMP

⚠ WARNING

Hazardous voltage can shock, burn or cause death.

DO NOT LIFT, CARRY OR HANG PUMP BY THE ELECTRICAL CABLES. DAMAGE TO THE ELECTRICAL CABLES CAN CAUSE SHOCK, BURNS OR DEATH.

Lift the pump with an adequately sized chain or cable attached to the lifting eye bolt. **DO NOT** damage electrical and sensor cables while raising and lowering unit.

OPTIONAL GUIDE RAIL OR LIFT-OUT SYSTEM

In many effluent and sewage basins or lift stations it is advisable to install the pump on a guide rail system or on a lift-out adapter to facilitate installation and removal for inspection and/or service. Most codes do not allow personnel to enter a wetwell without the correct protective equipment and training. Guide rails are designed to allow easy removal of the pump without the need for entry into the wetwell or need to disturb piping. The guide rail or lift-out adapter should locate the pump opposite the influent opening preventing stagnate areas where solids can settle.

The basin or pit must be capable of supporting the weight of the pump and guide rail. The pit floor must be flat.

NOTICE: FOLLOW THE INSTRUCTIONS THAT ARE PROVIDED WITH THE GUIDE RAIL ASSEMBLY.

PIPING

Discharge piping should be no smaller than the pump discharge diameter and kept as short as possible, avoiding unnecessary fittings to minimize friction losses.

Install an adequately sized check valve matched to the solids handling capability of the pump to prevent fluid backflow. Backflow can allow the pump to spin backwards and may cause premature seal, bearing, shaft wear. If the pump is turning backwards when it is called on to start the increased torque may cause damage to the pump motor and/or motor shaft.

Install an adequately sized gate valve **AFTER** the check valve for pump, plumbing and check valve maintenance.

Important – Before pump installation. Drill a 3⁄16" (4.8mm) relief hole in the discharge pipe. It should be located within the wetwell, 2" (51mm) above the pump discharge but below the check valve. The relief hole allows any air to escape from the casing. Allowing liquid into the casing will insure that the pump can start when the liquid level rises. Unless a relief hole is provided, a bottom intake pump could "air lock" and will not pump water even though the impeller turns.

All piping must be adequately supported, so as not to impart any piping strain or loads on the pump.

The pit access cover must be of sufficient size to allow for inspection, maintenance and crane or hoist service.

WIRING AND GROUNDING

Important notice: Read Safety Instructions before proceeding with any wiring.

⚠ Use only stranded copper wire to pump/motor and ground. The ground wire must be at least as large as the power supply wires. Wires should be color coded for ease of maintenance and troubleshooting.

⚠ Install wire and ground according to the National Electrical Code (NEC), or the Canadian Electrical Code, as well as all local, state and provincial codes.

⚠ Install an all leg disconnect switch where required by code.

⚠ Disconnect and lockout electrical power before performing any service or installation.

⚠ The electrical supply voltage and phase must match all equipment requirements. Incorrect voltage or phase can cause fire, motor and control damage, and voids the warranty.

⚠ All splices must be waterproof. If using splice kits follow manufacturer's instructions.

⚠WARNING Select the correct type and NEMA grade junction box for the application and location. The junction box must insure dry, safe wiring connections.

⚠WARNING Seal all controls from gases present which may damage electrical components.

⚠WARNING Hazardous voltage

FAILURE TO PERMANENTLY GROUND THE PUMP, MOTOR AND CONTROLS BEFORE CONNECTING TO POWER CAN CAUSE SHOCK, BURNS OR DEATH.

SELECTING AND WIRING PUMP CONTROL PANELS AND SWITCHES

FLOAT SWITCH TYPES

There are two basic float switch designs; single-action and wide-angle. Single-action switches operate over a range of 15° so they open and close quickly. Wide-angle floats operate over a 90° swing with the tether length between the float body and the pivot point controlling the On-Off range. The design determines how many floats are required with different systems or controls.

Floats may be normally open (NO) for pump down applications or to empty a tank. Normally closed (NC) switches are used to pump up or to fill a tank.

A single-action control switch may be used only with a control panel, never direct connected to a pump.

The wide-angle, pump down switches may be used as direct connected pump switches or as control switches.

SETTING THE FLOAT SWITCHES

There are no absolute rules for where to set the float switches, it varies from job to job.

Suggested Rules to Follow:
All floats should be set below the Inlet pipe!

Off Float: Best: set so free hanging the water level is always above the top of the pump (motor dome). **Next Best:** set so the water level is not more than 6" below the top of the pump.

On Float: set so the volume of water between the On and Off floats allows pumps of 1½ HP and under to operate for 1 minute minimum. Two (2) HP and larger pumps should run a minimum of 2 minutes. Basin technical brochure states the gallons of storage per inch of basin height.

Lag/Alarm Float(s): should be staggered above the Off and On floats. Try to use most of the available storage provided by the basin, save some space for reserve storage capacity. Exact reserve may be called out by local codes. *See Diagrams and Charts in Float Switch Chart Section.*

PANEL WIRING DIAGRAMS

Our control panels are shipped with instructions and wiring diagrams. Use those instructions in conjunction with this IOM. Electrical installation should be performed only by qualified technicians. Any problem or questions pertaining to another brand control must be referred to that control supplier or manufacturer.

ALARMS

We recommend the installation of an alarm on all Wastewater pump installations. Many standard control panels come equipped with alarm circuits. If a control panel is not used, a stand alone high liquid level alarm is available. The alarm alerts the owner of a high liquid level in the basin so they can contact the appropriate service personnel to investigate the situation.

SINGLE PHASE PUMPS

Single phase (1Ø) pumps may be operated using a piggy-

back or in conjunction with, or a Simplex or Duplex control panel. *See Figures 1, 2 and 5*.

Most 1/3 and ½ HP, 115 or 230 volt pumps, and some ¾ and 1 HP pumps, are supplied with plug style power cords. They may be plugged into piggyback float switches for simple installations. It is allowable to remove the plugs in order to hardwire or connect to a Simplex or Duplex controller. Removing the plug neither voids the warranty nor violates the agency Listings. *See Figure 5*.

PLUG-CONNECTED UNITS MUST BE CONNECTED TO A PROPERLY GROUNDED, GROUNDING TYPE RECEPTACLE.

ON NON-PLUG UNITS, DO NOT REMOVE CORD AND STRAIN RELIEF. DO NOT CONNECT CONDUIT TO PUMP.

Pumps with bare lead power cords can be hard-wired to a float switch, wired to a 1Ø contactor, a Simplex controller or a Duplex controller. Always verify that the float switch is rated for the maximum run amperage, maximum starting amperage, and the HP rating on the pump. Single-phase wastewater pumps contain on-winding overloads, unless noted on the pump nameplate. *See Figures 1 and 2*.

THREE PHASE PUMPS:
As a Minimum a 3Ø pump requires a 3 pole circuit breaker/fused circuit, an across the line magnetic starter rated for the pump HP, and ambient compensated Quick Trip Class 10 overloads.

SINGLE AND THREE PHASE CONTROL PANELS:
Control panels are available as Simplex (controls 1 pump) or Duplex (controls 2 pumps). Our standard SES Series Panels are available with many standard features and can be built with our most popular options. We also custom build panels which offer many more design options. Custom control panels are available in many different configurations. Custom panel quote requests may be forwarded to Customer Service through any authorized distributor.

Our duplex panels feature a solid-state printed circuit board design with standard high level alarm circuits. Other standard features are: an auxiliary dry alarm contact for signaling a remote alarm and float switch position indicator lights. Our 3Ø panels have built-in, adjustable, Class 10 overloads. The adjustable overloads on all our 3Ø panels mean less labor for the installer and no need to order specific overloads. Most panels are in stock for immediate delivery without options.

Heat Sensor and Seal Failure Circuit - Some Pumps are equipped with a seal failure circuit and a Heat sensor. On standard product the seal failure circuit, if supplied without Heat sensor will have an extra lead from the motor with two conductors. These leads will be Black and White and should be connected to the seal failure terminals in a panel supplied with this option. If a seal failure circuit and Heat sensor are supplied with the pump there will be a separate lead with four conductors. For these leads the connection for seal failure will be Black and Green and the Heat sensor will be Red and White. The model 1GD/12GDS can be ordered with an optional seal failure circuit, but most dual seal pumps come with the seal failure circuit as a standard.

Models with a 4NS/4DWC/4XD/4XWS have a standard configuration with seal failure and heat sensor. The leads are in a separate jacket with 5 leads. Black (tagged P1) and White (tagged P2) should be connected to thermal protection terminals. The seal fail leads are Red (tagged W1) and Orange (tagged W2) and should be connected to the seal fail terminals. The additional lead is Green and should be connected to Ground. Panels will come equipped with a wiring diagram designating your connections. Panels must be ordered with the options for seal failure circuits and heat sensor circuits, since these panels can also be used on pumps without the option for these connections they do not come as standard on most panels.

One additional style of seal failure and heat sensor circuits is our product sold with models GA(X) / 15GDS(X) / 20GDS(X); 2, 3, 4GV(X); 2, 3, 4MV(X); 2, 3, 4, 6MK(X). These units come with a single lead for power and controls. The conductor will come with 7 leads (previous to January 2013). Leads For seal failure and heat sensor will be Orange and Blue. Since these units use a different style sensor in the pump as well as a different option in the panel the connections require only two leads. After January 2013 the lead colors on the pumps were changed to two (2) white leads for the seal failure and heat sensor.

Be careful to choose the correct options in the panel selection for each style pump. Always follow wiring schematic of the panel. Failure to wire the seal failure and heat sensor leads correctly may prevent the pump from running or cause nuisance tripping.

INSTALLATION

Connect the pump(s) to the guide rail pump adapters or to the discharge piping. Slide rail bases should be anchored to the wetwell floor.

Complete all wiring per the control panel wiring diagrams and NEC, Canadian, state, provincial and/or local codes. This a good time to check for proper rotation of the motors/impellers.

DO NOT PLACE HANDS IN PUMP SUCTION WHILE CHECKING MOTOR ROTATION. TO DO SO WILL CAUSE SEVERE PERSONAL INJURY.

Always verify correct rotation. Correct rotation is indicated on the pump casing. Three phase motors are reversible. It is allowable to bump or jog the motor for a few seconds to check impeller rotation. It is easier to check rotation before installing the pump. Switch any two power leads to reverse rotation.

Lower the pump(s) into the wetwell.

Check to insure that the floats will operate freely and not contact the piping.

OPERATION

Once the piping connections are made and checked you can run the pumps.

Piggyback Switch Operation – Plug the piggyback switch into a dedicated grounded outlet and then plug the pump into the switch. Test the pump by filling the wetwell until the pump goes On. If the pumps run but fail to pump, they are probably air locked, drill the relief holes per the instructions in the Piping Section.

Check the operating range to insure a minimum one minute run time and that the pump goes Off in the correct position.

Control Panel Operation – Fill the wetwell with clear water.

Use the pump H-O-A (Hand-Off-Automatic) switches in Hand to test the pumps. If they operate well in Hand proceed to test Automatic operation. If the pumps run but fail to pump, they are probably air locked, drill the relief holes per the instructions in the Piping Section.

Place Control Panel switch(es) in Automatic position and thoroughly test the operation of the ON, OFF, and Alarm floats by filling the wetwell with clear water. **Important:** Failure to provide a Neutral from the power supply to a 1Ø, 230 volt Control Panel will not allow the panel control circuit to operate. The Neutral is necessary to complete the 115 volt control circuit.

Check voltage and amperage and record the data on the front of this manual for future reference. Compare the amperage readings to the pump nameplate maximum amperage. If higher than nameplate amperage investigate cause.

Operating the pump off the curve, i.e. with too little head or with high or low voltage will increase amperage. The motor will operate properly with voltage not more than 10% above or below pump nameplate ratings. Performance within this range will not necessarily be the same as the published performance at the exact rated nameplate frequency and voltage. Correct the problem before proceeding. Three phase unbalance is also a possible cause. *See Three Phase Power Unbalance and follow the instructions*.

Reset the Alarm circuit, place pump switch(es) in the Automatic position and Control Switch in ON position. The system is now ready for automatic operation.

Explain the operation of the pumps, controls and alarms to the end user. Leave the paperwork with the owner or at the control panel if in a dry, secure location.

FLOAT SWITCH AND PANEL CHART

The purpose of this chart is to show the required switch quantities and the function of each switch in a typical wastewater system. The quantities required vary depending on the switch type, single-action or wide-angle. Switch quantities also vary by panel type: simplex with and without alarms, and duplex with alarms.

Duplex Panels using single-action switches:

Three Float Panel Wiring

SW1	Bottom	Pumps Off
SW2	Middle	1st Pump On
SW3	Top	2nd Pump & Alarm On

Four Float Panel Wiring ②

SW1	Bottom	Pumps Off
SW2	2nd	1st Pump On
SW3	3rd	2nd Pump On
SW4	Top	Alarm On

Duplex Panels using wide-angle switches:

Three Float Panel Wiring

SW1	Bottom	1st Pump On/Both Off
SW2	Top	2nd Pump & Alarm On

Four Float Panel Wiring

SW1	Bottom	1st Pump On/Both Off
SW2	Middle	2nd Pump On
SW3	Top	Alarm On

Simplex Panel using single-action switches:

Simplex Panel with Alarm ①

SW1	Bottom	Pump Off
SW2	Middle	Pump On
SW3	Top	Alarm On/Off

Simplex Panel with No Alarm

SW1	Bottom	Pump Off
SW2	Top	Pump On

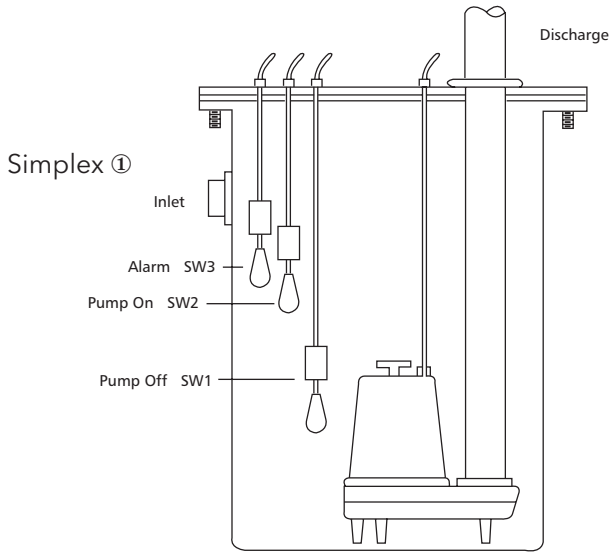
Simplex Panel using wide-angle switches:

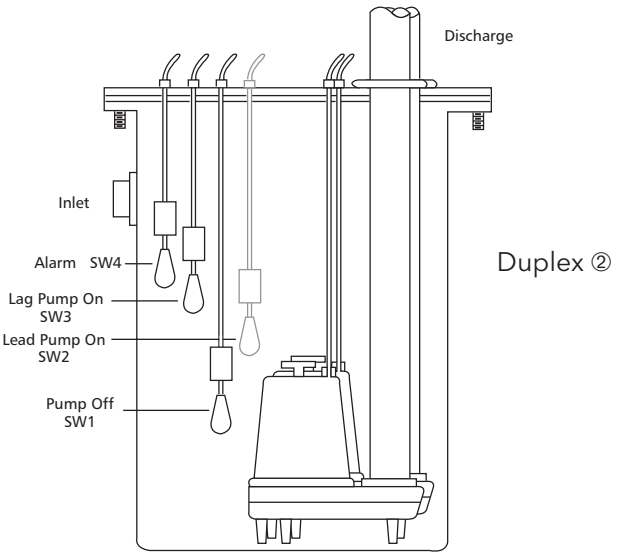
Simplex Panel with Alarm

SW1	Bottom	Pump On/Off
SW2	Top	Alarm On/Off

Simplex Panel with No Alarm

SW1	Pump On/Off





THREE PHASE POWER UNBALANCE

A full three phase supply consisting of three individual transformers or one three phase transformer is recommended. "Open" delta or wye connections using only two transformers can be used, but are more likely to cause poor performance, overload tripping or early motor failure due to current unbalance.

Check the current in each of the three motor leads and calculate the current unbalance as explained below.

If the current unbalance is 2% or less, leave the leads as connected.

If the current unbalance is more than 2%, current readings should be checked on each leg using each of the three possible hook-ups. Roll the motor leads across the starter in the same direction to prevent motor reversal.

To calculate percent of current unbalance:

A. Add the three line amp values together.

B. Divide the sum by three, yielding average current.

C. Pick the amp value which is furthest from the average current (either high or low).

D. Determine the difference between this amp value (furthest from average) and the average.

E. Divide the difference by the average. Multiply the result by 100 to determine percent of unbalance.

Current unbalance should not exceed 5% at service factor load or 10% at rated input load. If the unbalance cannot be corrected by rolling leads, the source of the unbalance must be located and corrected. If, on the three possible hookups, the leg farthest from the average stays on the same power lead, most of the unbalance is coming from the power source.

Contact your local power company to resolve the imbalance.

	Hookup 1			Hookup 2			Hookup 3		
Starter Terminals	L1	L2	L3	L1	L2	L3	L1	L2	L3
	⊥ T	⊥ T	⊥ T	⊥ T	⊥ T	⊥ T	⊥ T	⊥ T	⊥ T
Motor Leads	R	B	W	W	R	B	B	W	R
	T3	T1	T2	T2	T3	T1	T1	T2	T3

Example:

T3-R = 51 amps	T2-W = 50 amps	T1-B = 50 amps
T1-B = 46 amps	T3-R = 48 amps	T2-W = 49 amps
T2-W = 53 amps	T1-B = 52 amps	T3-R = 51 amps
Total = 150 amps	Total = 150 amps	Total = 150 amps
÷ 3 = 50 amps	÷ 3 = 50 amps	÷ 3 = 50 amps
– 46 = 4 amps	– 48 = 2 amps	– 49 = 1 amps
4 ÷ 50 = .08 or 8%	2 ÷ 50 = .04 or 4%	1 ÷ 50 = .02 or 2%

INSULATION RESISTANCE READINGS

Normal Ohm and Megohm Values between all leads and ground

Condition of Motor and Leads	Ohm Value	Megohm Value
A new motor (without drop cable).	20,000,000 (or more)	20 (or more)
A used motor which can be reinstalled in well.	10,000,000 (or more)	10 (or more)
Motor in well. Readings are for drop cable plus		
New motor.	2,000,000 (or more)	2 (or more)
Motor in good condition.	500,000 - 2,000,000	.5 - 2
Insulation damage, locate and repair.	Less than 500,000	Less than .5

Insulation resistance varies very little with rating. Motors of all HP, voltage and phase ratings have similar values of insulation resistance.

Insulation resistance values above are based on readings taken with a megohmmeter with a 500V DC output. Readings may vary using a lower voltage ohmmeter, consult factory if readings are in question.

Engineering data for specific models may be found in your catalog and on our website (address is on the cover).

Control panel wiring diagrams are shipped with the control panels. Please use the control panel drawings in conjunction with this instruction manual to complete the wiring.

PUMP OPERATION			
Minimum Submergence		**Maximum Fluid Temperature**	
Continuous Duty	Fully Submerged	Continuous Operation	104° F 40° C
Intermittent Duty	6" Below Top of Motor	Intermittent Operation	140° F 60° C

NOT RECOMMENDED
Pumpmaster and Pumpmaster Plus - Hard Wired

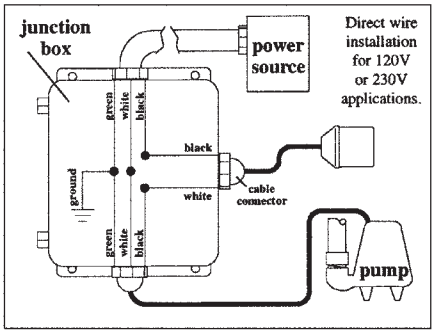


Figure 1

NOT RECOMMENDED
Double Float - Hard Wired

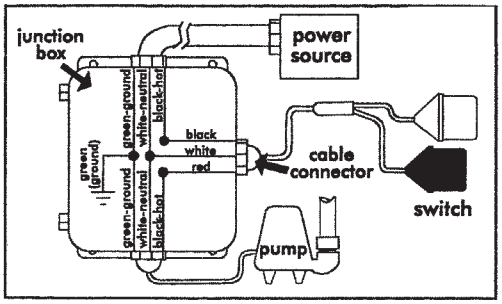


Figure 2

Determining Pumping Range

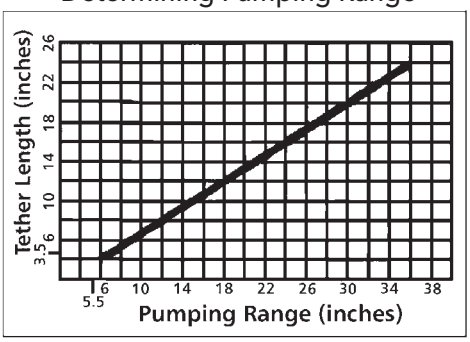


Figure 3

Single-Action Float Switch
"Typical" Installation

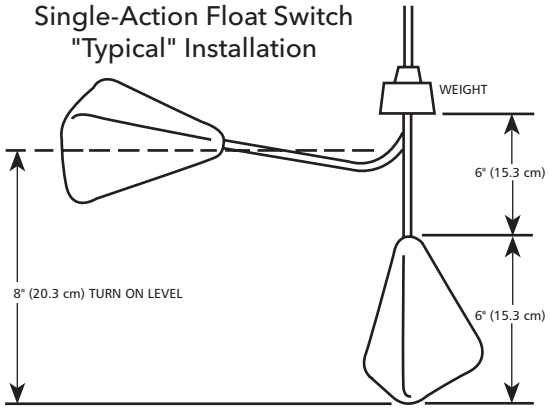


Figure 4

Wide-Angle Float Switch

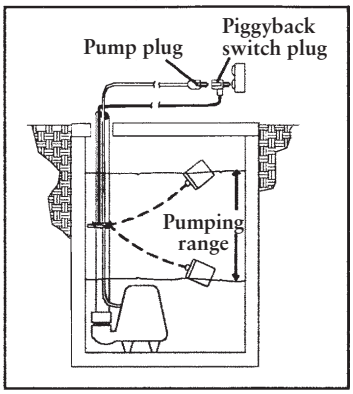


Figure 5

Three Phase Connection Diagram

Standard without seal failure and heat sensor for powering pump.

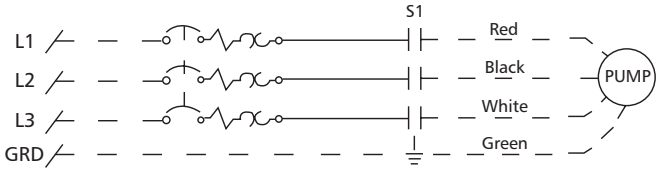
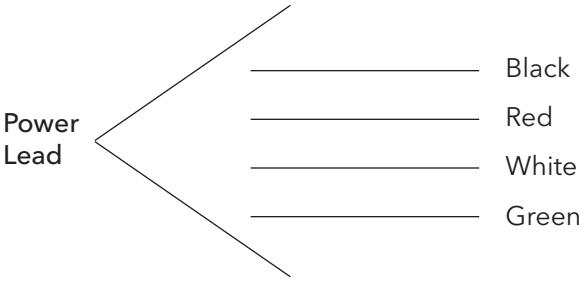
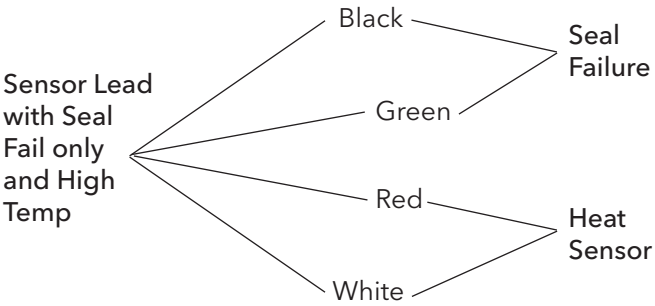


Figure 6

Three Phase Standard Product Leads





OR

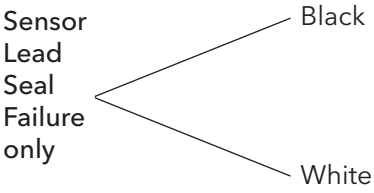
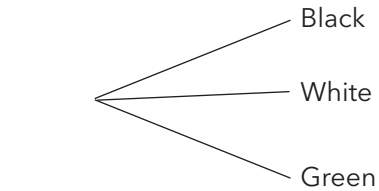
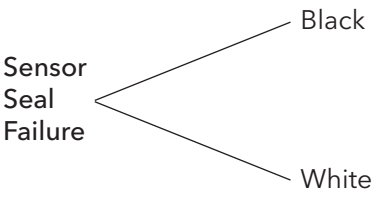


Figure 7

Single Phase

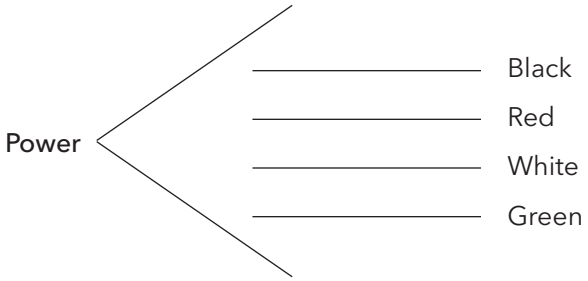




No Heat Sensor available

Figure 8

4NS/4XD/4XS/4DWC



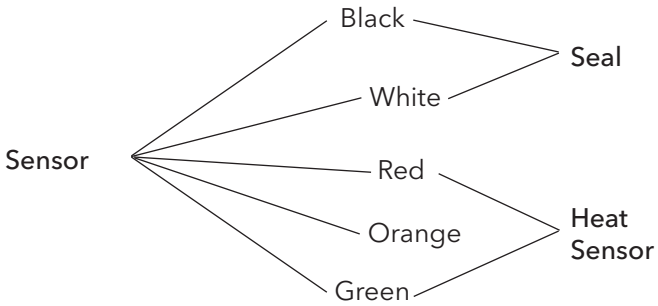
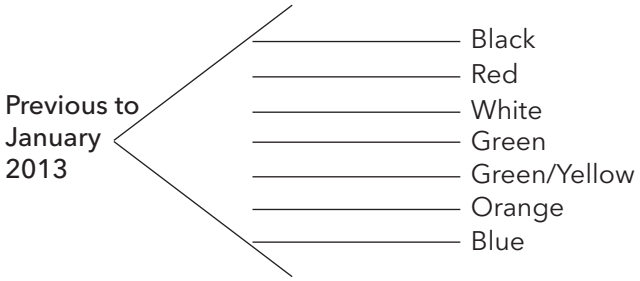


Figure 9

1/2GA(X), 15/20GDS(X)
2, 3, 4GV(X) – 2, 3, 4, 6MK(X) – 2, 3, 4MV(X)



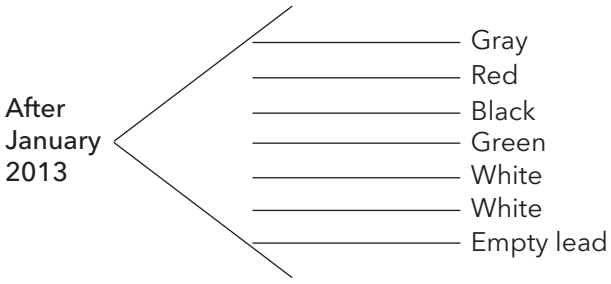


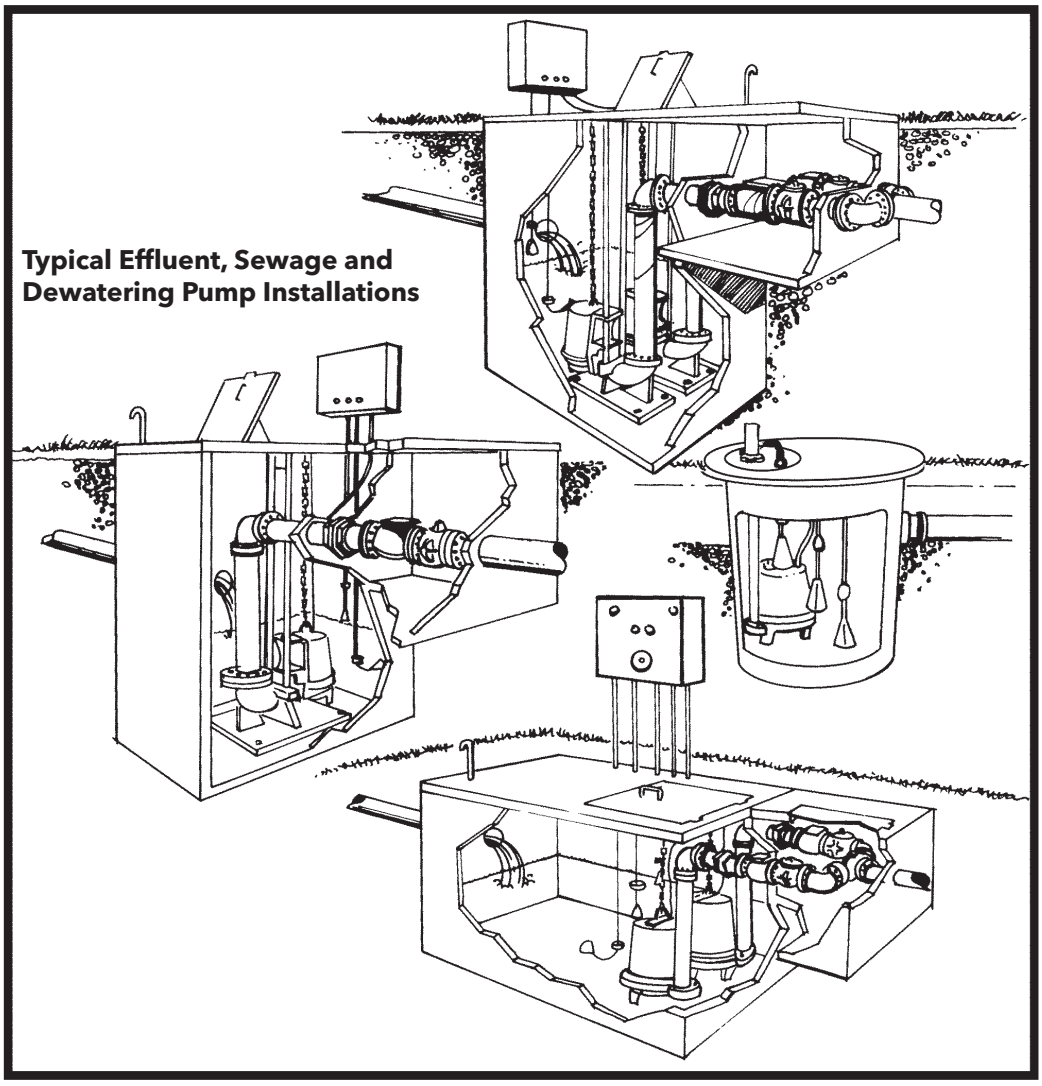
Figure 10

⚠WARNING
Hazardous voltage

FAILURE TO DISCONNECT AND LOCKOUT ELECTRICAL POWER BEFORE ATTEMPTING ANY SERVICE CAN CAUSE SHOCK, BURNS OR DEATH.

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
MOTOR NOT RUNNING	Motor thermal protector tripped.	Allow motor to cool. Insure minimum pump submergence. Clear debris from casing and impeller.
NOTE: If circuit breaker "OPENS" repeatedly, **DO NOT** reset. Call qualified electrician.	Open circuit breaker or blown fuse.	Determine cause, call a qualified electrician.
	Pump impeller binding or jammed.	Check motor amp draw. If two or more times higher than listed on pump nameplate, impeller is locked, motor bearings or shaft is damaged. Clear debris from casing and impeller, consult with dealer.
a) Manual operation	Power cable is damaged.	
	Inadequate electrical connection in control panel.	
b) Automatic operation	No neutral wire connected to control panel.	Resistance between power leads and ground should read infinity. If any reading is incorrect, call a qualified electrician.
	Inadequate electrical connection in control panel.	Inspect control panel wiring. Call a qualified electrician.
NOTE: Check the pump in manual mode first to confirm operation. If pump operates, the automatic control or wiring is at fault. If pump does not operate, see above.	Defective liquid level switch.	With switch disconnected, check continuity while activating liquid level switch. Replace switch, as required.
	Insufficient liquid level to activate controls.	Allow liquid level to rise 3" to 4" (76 mm - 101 mm) above turn-on level.
	Liquid level cords tangled.	Untangle cords and insure free operation.
PUMP WILL NOT TURN OFF	Liquid level cords tangled.	Untangle cords and insure free operation.
	Pump is air locked.	Shut off pump for approximately one minute, then restart. Repeat until air lock clears. If air locking persists in a system with a check valve, a $\frac{3}{16}$" (4.8 mm) hole may be drilled in the discharge pipe approximately 2" (51 mm) above the discharge connection.
	Influent flow is matching pump's discharge capacity.	Larger pump may be required.
LITTLE OR NO LIQUID DELIVERED BY PUMP	Check valve installed backwards, plugged or stuck closed.	Check flow arrow on valve and check valve operation.
	Excessive system head.	Consult with dealer.
	Pump inlet plugged.	Inspect and clear as required.
	Improper voltage or wired incorrectly.	Check pump rotation, voltage and wiring. Consult with qualified electrician.
	Pump is air locked.	See recommended action, above.
	Impeller is worn or damaged.	Inspect impeller, replace as required.
	Liquid level controls defective or improperly positioned.	Inspect, readjust or replace as required.
PUMP CYCLES CONSTANTLY	Discharge check valve inoperative.	Inspect, repair or replace as required.
	Sewage containment area too small.	Consult with dealer.
	Liquid level controls defective or improperly positioned.	Inspect, readjust or replace as required.
	Influent excessive for this size pump.	Consult with dealer.

TYPICAL INSTALLATIONS



GOULDS WATER TECHNOLOGY LIMITED WARRANTY

This warranty applies to all water systems pumps manufactured by Goulds Water Technology.

Any part or parts found to be defective within the warranty period shall be replaced at no charge to the dealer during the warranty period. The warranty period shall exist for a period of twelve (12) months from date of installation or eighteen (18) months from date of manufacture, whichever period is shorter.

A dealer who believes that a warranty claim exists must contact the authorized Goulds Water Technology distributor from whom the pump was purchased and furnish complete details regarding the claim. The distributor is authorized to adjust any warranty claims utilizing the Goulds Water Technology Customer Service Department.

The warranty excludes:

(a) Labor, transportation and related costs incurred by the dealer;
(b) Reinstallation costs of repaired equipment;
(c) Reinstallation costs of replacement equipment;
(d) Consequential damages of any kind; and,
(e) Reimbursement for loss caused by interruption of service.

For purposes of this warranty, the following terms have these definitions:

(1) "Distributor" means any individual, partnership, corporation, association, or other legal relationship that stands between Goulds Water Technology and the dealer in purchases, consignments or contracts for sale of the subject pumps.
(2) "Dealer" means any individual, partnership, corporation, association, or other legal relationship which engages in the business of selling or leasing pumps to customers.
(3) "Customer" means any entity who buys or leases the subject pumps from a dealer. The "customer" may mean an individual, partnership, corporation, limited liability company, association or other legal entity which may engage in any type of business.

THIS WARRANTY EXTENDS TO THE DEALER ONLY.

xylem
Let's Solve Water

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Seneca Falls, NY 13148
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www.goulds watertechnology.com

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Sump, Effluent and Sewage

REPAIR PARTS

GOULDS
WATER TECHNOLOGY
a xylem brand

INDEX

SUMP, EFFLUENT AND SEWAGE

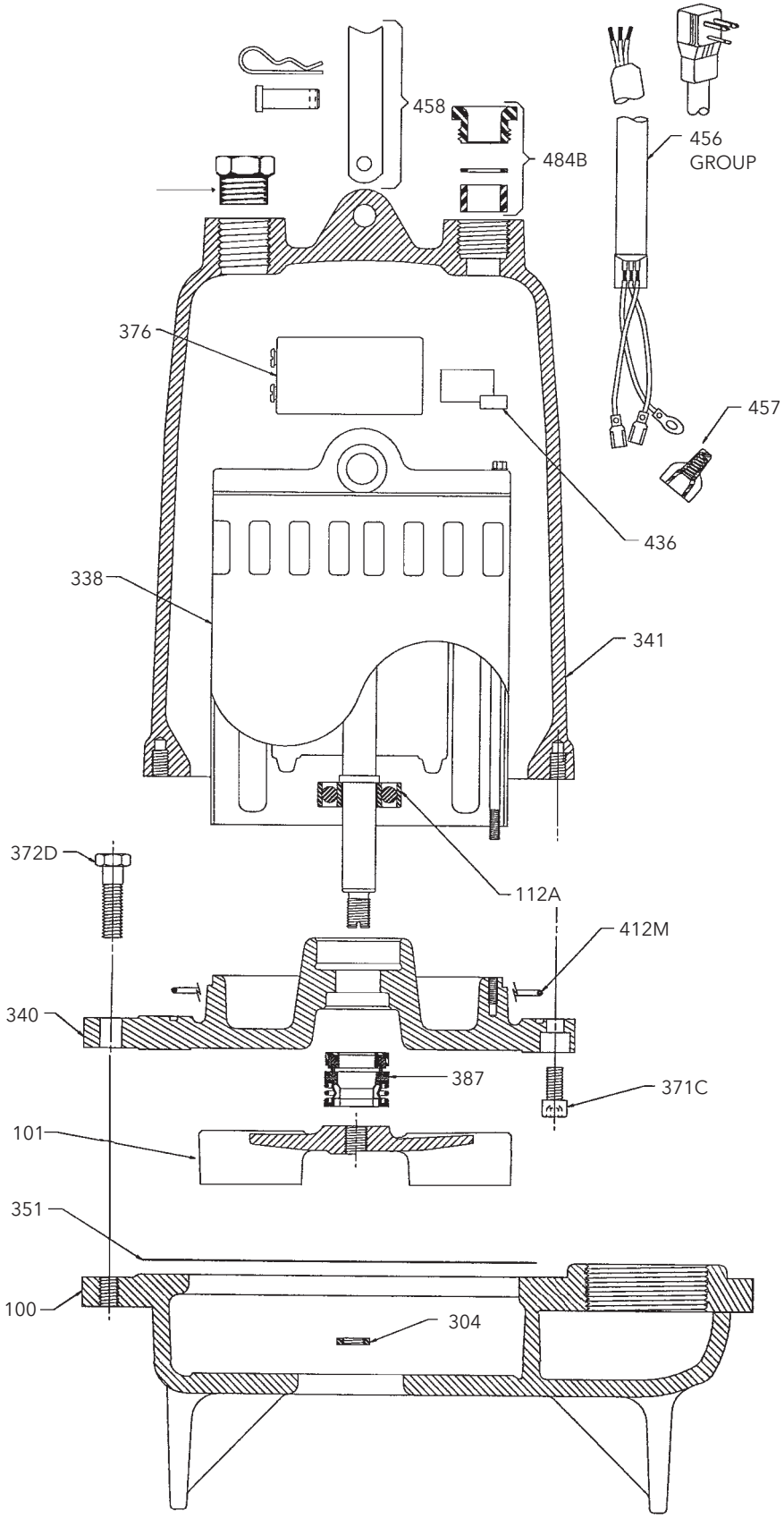
Note: Repair Motor List Prices are in the "K", "L" and Numeric Repair Part Price Book.

4K432 OIL SPECIFICATION:
5 gallon can of ASTM 150 Turbine Oil

COMPARABLE BRAND NAMES:

Sunoco	Sunvis 932
Mobil	DTE Light
Texaco	Regal R&O 32
Shell	Turbo 32
Gulf	Harmony 32
Amoco	Am. Industries Oil 32
Exxon	Nuto 32
Chevron	GST 32

MODEL 3885 - WE SERIES



CAPACITOR DATA		
"K" no.	MFD	VAC
9K197	161/193	110
9K351	30	370
9K352	200/240	220

MODEL 3885 – WE SERIES

Item No.	Part Description		Material	Qty. Reqd.	Repair Parts Order Number						Max. Wt. (lbs.)
					1725 RPM	3450 RPM					
					⅓ HP	½ HP	¾ HP	1 HP	1½ HP	2 HP	
100	Casing – ⅓ HP "L" Model Only 59115		Cast Iron	1	1K171	N/A					13.0
	Casing – All Others (M, H, HH) 59114				N/A	1K170					
101	Impeller		Cast Iron	1	2K158	2K220	2K219	2K218	2K217	2K840	2.0
	Impeller		Bronze		2K271	2K272	2K273	2K274	2K275	2K841	2½
	Impeller – High Head "HH"		Cast Iron		N/A	2K225	N/A	N/A	2K221	N/A	3½
	Impeller – High Head "HH"		Bronze		N/A	2K276	N/A	N/A	2K277	N/A	4.0
112A	Lower Ball Bearing		Steel	1	4K132					4K384	–
112B	Upper Ball Bearing		Steel	1	4K132						–
218	Insulating Turbine Oil		ASTM150		4K432 (1 gallon ⅓-1½ HP, .88 gallons 2 HP)						7½ lbs./gal.
304	Impeller Locknut - All		AISI 300 SS	1	13K286						–
338	Motor	1 Phase, 115V	Motor with Stainless Steel Shaft	1	118-121R	118-1222R	N/A	N/A	N/A	N/A	13.0 to 24.0
		1 Phase, 208V			118-1215R	118-1236R	118-1236R	118-1238R	118-1238R	N/A	
		1 Phase, 230V			118-122R	118-1223R	118-1232R	118-1233R	118-1234R	120-845R	
		3 Phase, 200 V			N/A	118-1333R	118-1334R	118-1335R	118-1336R	120-8425R	
		3 Phase, 230/460 V			N/A	118-1321R	118-1322R	118-1323R	118-1324R	120-8425R	
		3 Phase, 575 V			N/A	118-1328R	118-1330R	118-1330R	118-1331R	120-8435R	
340	Seal / Bearing Housing		Cast Iron	1	1K167					1K332	10.0
341	Motor Cover	1 Phase	Cast Iron	1	1K207				1K208		23.0
		3 Phase			N/A	1K208					
351	Casing Gasket - All Except "HH"		Composite	1	5K170						–
	Shim Set - "HH" Models Only		Plastic	1	5K169						–
358E	Plug – Motor Cover $^{3}/_{8}$" NPT		AISI 300 SS	1	6K169						–
371C	Skt. Hd. Screw – Housing to Motor Cover		AISI 300 SS	4	13K271						–
372D	Hex Cap Screw – Housing to Casing		AISI 300 SS	4	13K186						–
376	Capacitor (1 Phase Only)	Start	Varies	1	9K197					9K352	–
		Run			N/A					9K351	
387	Mechanical Seal – Standard		Silicon Carbide	1	10K120					10K119	–
	Mechanical Seal – Optional		Tungsten Carbide	1	10K122					10K123	–
412M	O-ring – Motor Cover		BUNA-N, AS 568A-166	1	4K252						–
436	Motor Start Switch (1 Phase Only)			1	629002-2					9K356	
457	Wire Nut (Power Cable)	1 Phase	Special Nylon Housing	2	N/A					9K145	–
		3 Phase		up to 6	N/A	9K145					–
458	Handle Assembly		AISI 300 SS	1	4K243						–
484B	Strain Relief Assembly (Power Cable)	1 Phase	Varies	1	5K113				5K111		–
		3 Phase		1	N/A	5K111					–
	Loctite #271 - Impeller / Nut			1	AL27121						–

Item No. 456, Power Cables	Type and AWG Size	Standard length	Optional Lengths			Wt. (lbs./5 ft.)
		20'	30'	50'	100'	
1 PH: ⅓ HP, 115 V; standard with plug, optional length cords have bare leads.	SJTOW – 16/3	9K165	9K214	9K215	N/A	0.5
1 PH: ½ HP, 115 V; standard with plug, optional length cords have bare leads.	STOW – 14/3	9K385 - SJTOW	9K216*	9K161*	9K217*	0.9
1 PH: ⅓ & ½ HP, 208 & 230 V; standard with plug, opt. length cords have bare leads.	SJTOW – 16/3	9K164	9K214	9K215	N/A	0.5
1 PH: ¾ & 1 HP, 208 & 230 V; standard with plug, opt. length cords have bare leads.	STOW – 14/3	9K444 - SJTOW	9K216*	9K161*	9K217*	0.9
1 PH: 1½ HP, 208 & 230 V with bare leads.	STOW – 14/3	9K163	9K216*	9K161*	9K217*	0.9
1 PH: 2 HP, 230 V with bare leads.	STOW – 14/3	9K266	9K267	9K268	9K269	0.9
3 PH: ½ – 2 HP, 200–230/460/575 V with bare leads.	STOW – 14/4	9K153	9K218	9K154	9K219	1.1

* Requires 5K111 Strain Relief Assembly and 1K208 Motor Cover.

"P" option –9K445 1PH, 208/230 V, 14/3 SJTOW Cord with Plug, 30 ft.

APPENDIX D
OVERFLOW WATER QUALITY MONITORING STANDARD OPERATING PROCEDURE

PARSONS

PARSONS

40 La Riviere Drive, Suite 350 • Buffalo, New York 14202 • (716) 541-0730 • Fax (716) 541-0760 • www.parsons.com

To: Middleport WTP Staff Date: April 6, 2016

From: Jeffrey Poulsen (Parsons) Phone: (716) 432-7685

Subject: WSI OVERFLOW STANDARD OPERATING PROCEEDURE

If the water level in the WSI increases to the point where maximum capacity is reached and untreated water begins to pass through the overflow spillway, the following procedures must be followed.

NOTIFICATIONS

Notification will be made to the Site Project Manager (Jeff Poulsen) via call, email, or text message that the WSI is approaching an overflow condition. The Site Project Manager will make notification to FMC and the NYSDEC in accordance with the SPDES permit conditions.

DATA RECORDING

If there is an overflow condition the following data needs to be recorded in the plant log at 4-hour intervals.

- Rate of discharge at M-001 monitoring point
- Rate of discharge from the treated water tank
- Rate of discharge from the south ditch
- Water level in the WSI
- Time a which water began to overflow the weir
- The water level on the overflow staff gauge (east of the weir)
- The water level on the south ditch staff gauge (west of the weir)

SAMPLING

When an overflow of the weir occurs a number of samples need to be collected.

- M-001 – install a container and start the composite sampler. 24-hour composite samples need to be collected for the duration of the overflow event. If the WSI is overflowing for more than 24-hours a second sample will be needed. This sample will be analyzed for the standard weekly SPDES parameters.
- Weir – every four hours collect a 1 liter sample from the water overflowing the WSI. Samples will be composited into a labeled clean sampling jug and stored in the sample refrigerator. For every 24 hours that the WSI is overflowing a composite sample will be taken from the sampling jug and tested for carbofurans, phenols, arsenic and zinc.

FMC - Middleport

WSI Overflow Field Form

If there is an overflow condition the following data needs to be recorded in the plant log at 4-hour intervals

- Time at which water began going over the weir
- Time at which water stopped going over the weir

	Flow Rates (GPM)						
Time	M-001	TWT	South	Jeddo	WSI Level	Upstream	Downstream
			Ditch		(SCADA)	Weir Staff	Weir Staff
						(cm)	(cm)

APPENDIX E
WSI WEEKLY INSPECTION CHECKLIST

FMC - Middleport
Water Treatment Plant
Western Surface Impoundment
Weekly Inspection Form

Inspector Name	Date	Time	WSI Water Level (feet)	Liner/Slope Inspection		WSI Underdrain Sump			Notes
				Tears/Holes	Buckles/Bulges	Pump/Float Operational	Flow Totalizer Reading	Flow Since Last Inspection	