Appendix B
Sikament 686 Plasticizer Information

Concrete

Sikament® 686

High Range Water Reducing Admixture

Description

Sikament® 686 is a high range water reducing admixture utilizing Sika's ViscoCrete® Technology. It's unique formulation is based on polycarboxylate technology. Sikament® 686 meets the requirements for ASTM C-494 Types A and F admixture.

Applications

Sikament® 686 is recommended for use in the production of all high strength concrete products, whenever high plasticity and increased early and ultimate strengths are desired. The superplasticizing action of Sikament® 686 provides excellent workability at low water cementitious ratios.

Benefits

High Range Water Reducing Applications: When used as a high range water reducing admixture, water reduction up to 30% can be obtained. The superplasticizing action allows for the production of high slump flowing concrete with excellent workability that can be placed with minimum vibration even at a low water/cementitious ratio. The dispersing action of Sikament® 686 maximizes cement hydration efficiency and improves concrete's early and long term compressive strengths.

Mid Range Water Reducing Applications: At a lower dosage, Sikament® 686 can be used as a cost effective mid range water reducing admixture or simply as a water reducing admixture for production of conventional slump concrete. When used as a mid range water reducing admixture, water reduction up to 15% can be obtained. This application is ideal for use with lean, harsh concrete mixes or concrete containing fly ash. Sikament® 686 will improve workability and finishability.

The combined water reducing and superplasticizing action provide the following benefits:

- Higher early and ultimate strengths for cost effective high strength concrete and earlier structural use of concrete.
- Higher early strengths allow faster demolding and more efficient use of forms to precast producers.
- Increased slump improves workability and reduces labor costs.
- Full flow action aids in pumping and reduces need for vibration.
- Greater concrete density reduces permeability and increases durability.

Sikament® 686 does not contain calcium chloride or any other intentionally added chlorides and will not initiate or contribute to corrosion on steel reinforcement present in the concrete.

How to Use

Dosage

Dosage rates will vary depending on the material used, ambient conditions and the requirements of a specific project. For general concreting applications, Sika recommends a dosage rate between 3-12 fl.oz. /100 lbs. (195-780 ml/100 kg) cementitious materials. If maximum water reduction is required, dosage up to 18 fl.oz./100 lbs. (1170 ml/100 kg) of cementitious materials may be used. In this case, delayed setting times may occur. Dosage rates outside the recommended range may be used where specialized materials such as microsilica are specified, extreme ambient conditions are encountered or unusual project conditions require special consideration.

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Concrete

In this case please contact your local regional Sika office or Sika technical service department at 1-800-933-7452 for further information.

Mixing

For best plasticizing results, Sikament® 686 should be added directly to freshly mixed concrete in the concrete mixer at the end of the batching cycle. Sikament® 686 may also be dispensed as an integral material during the regular admixture batching cycle, or into freshly mixed concrete in a Ready-Mix truck at the concrete plant or job site. To optimize the superplasticizing effect, Sika recommends that the combined materials be mixed for 80-100 revolutions, either in the concrete mixer or in the Ready-Mix truck.

Combination with other Admixtures: Sikament® 686 is highly effective as a single admixture or in combination with other admixtures in the Sika System. If used in combination with certain Sikament® high range water reducers, it may affect the plastic properties of fresh concrete. Please contact your local regional office or technical service department at 1-800-933-7452 for further information.

Combination with Microsilica: Sikament® 686 is particularly well suited for use with Microsilica because of its water reduction capability.

Packaging

Sikament® 686 is available in 55 gallon drums (208 liter), 275 gallon totes (1040 liters) and bulk delivery.

Storage and Shelf Life

Sikament® 686 should be stored at above 40°F (5°C). If frozen, thaw and agitate thoroughly to return to normal state. Protect from direct sunlight.

Shelf life when stored in dry warehouse conditions between 40°F and 80°F (5°C - 27°C) is 1 year.

Typical Data

Appearance	Brown Liquid
Specific Gravity	Approx. 1.05

KEEP CONTAINER TIGHTLY CLOSED • KEEP OUT OF REACH OF CHILDREN • NOT FOR INTERNAL CONSUMPTION • FOR INDUSTRIAL USE ONLY • FOR PROFESSIONAL USE ONLY

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Sika Corporation
201 Polito Avenue
Lyndhurst, NJ 07071
Phone: (201) 933-8800
Fax: (201) 933-6225
usa.sika.com

Sika Canada Inc.
601, Delmar Avenue
Pointe-Claire, QC H9R 4A9
Phone: (514) 697-2610
Fax: (514) 697-3087
can.sika.com

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U.S. : **Northeast:** Fairless Hills, PA, Phone: (215) 295-6600
South East: Conyers, GA, Phone: (770) 760-1300
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North Central: Ottawa, IL 61350, Phone: (815) 431-1080
South Central: Mesquite, TX, Phone: (972) 289-6480

Canada: **Ontario:** Mississauga, ON, Phone: (905) 795-3177
Alberta: Edmonton, AB, Phone: (780) 486-6111

Quality Certification Numbers: Lyndhurst: FM 69711 (ISO 9000), FM 70421 (QS 9000), Marion: FM 69715, Kansas City: FM 69107, Santa Fe Springs: FM 69408

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Sika Canada Inc.

MATERIAL SAFETY DATA SHEET

SECTION I: PRODUCT INFORMATION

PRODUCT: **SIKAMENT® 686** REVISION DATE: January 15th, 2015

USAGE: Water reducing admixture

MANUFACTURER/SUPPLIER: SIKA CANADA INC.
601, avenue Delmar
Pointe Claire, QC
H9R 4A9

EMERGENCY TELEPHONE NUMBER: CANUTEC (collect) (613) 996-6666

TDG CLASSIFICATION: Not Regulated
UN NUMBER: Not Established
Packaging Group: Not Applicable

WHMIS Classification: D2B
Class: Not Applicable

SECTION II: HAZARDOUS INGREDIENTS

Hazardous ingredients	%	T.L.V.	# CAS	LD_{50} (mg/kg) (species, route)	LC_{50} (species, route)
Triethanolamine	1-5	5 mg/m^3	102-71-6	9 110 (rat, oral)	Not available

SECTION III: PHYSICAL CHARACTERISTICS

Physical State:	Liquid	Boiling Point:	> 100°C
Appearance and Odor:	Dark brown liquid, characteristic odor	Freezing Point:	< 0°C
		Density:	1.05 g/ml
Odor Threshold:	Not Established	Water Solubility:	Yes
Evaporation Rate:	< 1 (water)	pH:	Not Established
Vapor Density:	< 1 (water)	% volatility:	< 80
Vapor Pressure:	17 mm (20°C)	Water/Oil Distribution:	Not Established

Sika Canada Inc.

MATERIAL SAFETY DATA SHEET

PRODUCT: **SIKAMENT® 686**

SECTION IV: FIRE AND EXPLOSION HAZARDS

Flammability:	No
If Yes, under what conditions:	
Extinguishing methods:	Foam, dry chemical product, CO_2, water hose.
Special Methods:	Firefighters must wear their usual protection equipment and respiratory equipment. The water hose could be used to cool down the containers and to dissipate the vapors over the spill.

TDG flammability Class:	Not Regulated
Flammable upper limits (% vol.):	Not Established
Flammable lower limits (% vol.):	Not Established
Flash Point (method used):	Not Established
Auto-ignition temperature:	Not Established
Dangerous Combustion Products:	Nitrogen and Carbon Oxides.
Protect from mechanical impact:	No
Protect from static discharge:	No

SECTION V: REACTIVITY DATA

Chemical stability:	Yes
If not, under what conditions:	
Incompatibility with other material:	No
If Yes, which ones:	

Dangerous decomposition products:	Nitrogen and Carbon Oxides.
Polymerization Risks:	No

PRODUCT: **SIKAMENT® 686**

SECTION VI: TOXIC PROPERTIES

ROUTE OF ENTRY / CONTACT

Eyes:	May cause eye irritation.
Skin:	May cause skin irritation.
Inhalation:	May cause irritation to the lungs.
Ingestion:	May cause irritation to the G.I. System.

Carcinogenicity:	Not Established
Toxic effects on reproduction:	Not Established
Teratogenicity:	Not Established
Mutagenicity:	Not Established
Product with synergistic Effects:	Not Established

An acute or chronic exposure will increase the toxic effects mentioned in this section and may aggravate respiratory problems.

PRODUCT: **SIKAMENT® 686**

SECTION VII: PREVENTIVE MEASURES

PERSONAL PROTECTIVE EQUIPMENT

Gloves:	Chemical products resistant gloves.
Respiratory equipment:	NIOSH approved mask with organic vapor cartridge, if vapor can exceed the TLV.
Eyes:	Safety glasses
Shoes:	Ordinary
Clothing:	Rubber Apron
Other:	No

OTHERS

Ventilation:	Sufficient ventilation required.
Procedure in case of leaks:	Absorb with sand and other absorbent material.
Handling and Equipment methods:	Avoid skin, eye and clothing contact.
Warehouse Requirements:	Keep all containers closed in a cool, dry area. Protect from freezing.
Special Shipping Instructions:	Protect from freezing.
Waste Disposal:	Dispose of sand and water according to municipal, provincial and federal laws on chemical waste.

Sika Canada Inc. **MATERIAL SAFETY DATA SHEET**

PRODUCT: **SIKAMENT® 686**

SECTION VIII: FIRST AID

Skin: Remove and clean all contaminated clothing.
Wash with plenty of soap and water the exposed areas.
Consult a physician if necessary.

Eyes: Clean with water for at least 15 minutes.
Consult a physician if necessary.

Inhalation: In the case of overexposure, evacuate to fresh air.
Consult a physician if needed.

Ingestion: Do not induce vomiting. Drink plenty of water.
Do not give anything by mouth to an unconscious person.
Consult a physician.

SECTION IX: PREPARATION INFORMATION

Prepared By: R & D of Sika Canada Inc.
Telephone #: (514) 697-2610
Fax #: (514) 694-2792

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Appendix C
Groundwater Monitoring Well Condition Assessment and Elevation Field Sheet

Monitoring Well

Field Data Sheet

Well Number: Field Crew: Purpose of Sampling:

Site: Field Conditions:

WELL CONDITION

Well Pad	Acceptable	Not Acceptable	Explain:
Flushmount	Acceptable	Not Acceptable	Explain:
Well Casing	Acceptable	Not Acceptable	Explain:
Locking Cap	Acceptable	Not Acceptable	Explain:

PURGE METHOD

Date: Time: Method: *N*-flow Bailed Volume Calculations:

Total Well Depth (DTB) (ft) = Pump Type: (DTB - DTW x Vol./ft. = Gals./well volume)

Depth to Water (DTW) (ft) = Bailer Type:

Water Column (ft) =

Comments:

Diameter	Vol./ft.
1"	0.04
1.25"	0.06
2"	0.16
4"	0.65

OBSERVATIONS

Odor: None , Low , High , H_2S , Fuel Like , Other:

Turbidity: None , Low , Medium , High , Heavy Silts

Comments:

Hnu/PPM	LEL%	O2%	H2S/PPM	CO/PPM

FIELD PARAMETERS

Time	Volume Removed (Gals.)	DTW (ft)	pH (SU)	Temp. (C)	Sp. Cond (umho/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Comments

SAMPLING

Date: Time:

Sample ID: Method of Sample Collection:

Analytical Parameters:

Q.C. Sample Type: MS/MSD Duplicate Duplicate Sample ID: Dup. Time:

NOTE: Desginate if a Field Blank is taken.

Trash picked up? Well locked?

SIGNED/SAMPLER:

Appendix D

March 23, 2015 Technical Memorandum: *Responses to February 23, 2015 EPA Comments on "Tyco Fire Products Outfall Arsenic Investigation Technical Memorandum,"* dated February 3, 2015

Responses to February 23, 2015 EPA Comments on "Tyco Fire Products Outfall Arsenic Investigation Technical Memorandum" dated February 3, 2015

PREPARED FOR:	Tyco Fire Products LP
PREPARED BY:	CH2M HILL
COPIES:	Tyco USEPA WDNR Others
DATE:	March 23, 2015
DOCUMENT CONTROL NO.:	473274.223

On behalf of Tyco Fire Products LP (Tyco), CH2M HILL has prepared this technical memorandum in response to the U.S. Environmental Protection Agency (EPA) comments on the "Tyco Fire Products Outfall Arsenic Investigation Technical Memorandum" as received on February 23, 2015.

For ease of review, the EPA comment is presented in italics followed by the Tyco response in plain text.

Investigation – Sewer Sample Locations

1. Generally, the Agencies are in agreement with the suggested sampling locations. Tyco should consider conducting a video inspection or other evaluation of the storm sewer lines tributary to at least Outfalls # 1 and #4 to assess the condition of the lines and to determine if infiltration from groundwater is currently occurring or is possible. The lines tributary to Outfalls #3 and #5 are also candidates for future televising or other evaluation. Tyco should also consider use of Electro Scan© to further evaluate pipe conditions and groundwater impacts to the system; see http://www.electroscan.com/technology/.

The sampling effort will investigate the sewer lines tributary to the outfalls noted above. It is expected that if/when sampling results indicate arsenic concentrations from excessive infiltration warrant action for a particular sewer, further investigative actions, which could include the mentioned techniques, will be taken before any corrective work is performed. Past survey efforts, such as CCTV investigation, will be reviewed first. If necessary, additional CCTV inspection could be completed to systematically identify specific locations where arsenic from excessive infiltration may be occurring. In doing so, a sound basis for addressing groundwater sources of arsenic can be established. Our understanding at this time is that there are conditions that may limit the use of Electro Scan© in evaluating pipe conditions and groundwater impacts to the system. Moving forward Tyco will consider use of the Electro Scan© technology and consult the vendor for potential benefits and limitations.

2. Is the entire line for Outfall #1A at Building 86 outside the containment area? That is unclear from Figure 1. If any of the line is inside the containment area, it should be investigated. If Outfall #lA is located outside the containment area, consideration should be given to sampling this outfall as a reference site.

The entire line for Outfall #1A at Building 86 is outside the containment area. Building 86 is the fire protection water building for the site. The only pipeline leading to the Menominee River is that which outlets at Outfall #1A, and it serves the purposes of this building. The goal of this evaluation will be to identify sewers with arsenic within the containment area. Consequently, no reference site is needed.

Sewer Sampling and Schedule

3. Tyco has proposed a single sampling event in late spring/early summer to take advantage of the snow melt and seasonably higher precipitation rates. The proposed one-time sampling event is only a snapshot in time and likely does not represent seasonal groundwater impacts to the system. The single sampling event Tyco proposes may result in highly diluted samples. EPA advises multiple sampling events to assess both high water and dryer conditions. Additional sampling seasonally will also inform us if there is flow during non-storm water events and whether the pump down program impacts groundwater flow to the storm sewer system.

Additional sampling event(s) will be proposed in the final sampling plan. A second sampling event during a typically drier season would be appropriate to identify seasonal changes in groundwater infiltration. A potential dry weather sampling event could occur in August and would inform if there is flow during a typically drier season. Groundwater levels are tracked as part of the groundwater monitoring program and can be compared to pipe depths. Table 2 in *Arsenic Outfall Investigation* compares nearby groundwater levels and pipe depths.

4. It is understood that this outfall investigation is a preliminary investigation of the outfalls to isolate problem areas and that a long-term sampling plan will follow based on the results of this initial investigation. More than one round of sampling may be necessary to complete the investigation.

Additional sampling event(s) will be proposed in the final sampling plan in order to characterize both wet weather and dry weather flows; however, it is Tyco's intent to address excessive infiltration in a timely manner. For this reason, it is expected that a long-term, sampling plan on an annual basis will not be necessary. Tyco proposes a less frequent sampling plan (e.g., every five years) after sewer rehabilitation efforts on a given sewer line/network have occurred to verify sewer infiltration is not excessive.

5. The proposal states the Tyco lab, which is Wisconsin certified for arsenic, will be used to analyze the samples. The Agencies are in agreement with Tyco's recommendation to analyze the samples for arsenic only during the initial sampling event. However, if/when an impacted outfall is identified, sampling for other parameters (VOCs, PAHs, metals, etc.) will be required and should be incorporated.

If/when an impacted outfall is identified, the action to reduce the impact will likely be to control excessive infiltration. The same would be true for other parameters. Consequently,

the focus will be upon addressing excessive infiltration rather than sampling for additional parameters.

6. The proposal focuses on collecting samples within the outfalls. Tyco may also want to inspect the integrity of the "seals" where the outfalls penetrate the barrier wall. It would seem appropriate to add an underwater inspection requirement to the barrier wall monitoring plan to address this concern.

Refer to Specific Comment #6 in EPA's October 10, 2014 letter to Tyco for additional information.

Referencing the *Vertical Barrier Wall Installation Project Summary,* dated 2010 and produced by JF Brennan Co., sewer pipes are either steel pipe or were transitioned to steel pipe before extending through openings in the sheet pile wall. For transitions from PVC to steel pipe, Fernco RC couplings were used. At the point of wall penetration, all outfall pipes were seal-welded on both sides of the sheet pile wall to ensure a watertight seal. Outfall #4 is a corrugated metal pipe and is encased in concrete along its length for watertight capacity. Similarly, Outfall #10 had concrete collars poured at the sheet wall penetration for a watertight seal. Because of these techniques, no underwater inspection is needed at this time.

7. During the sampling event, every effort should be made to sample the most downstream point of the line that is not surcharged. These sample locations may change for each sampling event depending on river elevations. If it is only possible to sample towards the most upstream end of the line, the condition of the line downstream of this point is unknown. Other methods should be utilized to determine if groundwater contaminated with arsenic is infiltrating downstream of the sampling point.

One option to consider would be to sample in the outfall line from the River using a sampling tube installed a sufficient distance into the line and pulling a sample through that tube. It is recognized that some river dilution would be reflected in the results but at least there would be an indication of whether the discharge is impacting surface water, and allow an assessment of the potential for recontamination from this source.

During a sampling event, efforts will be made to collect a sample at the most downstream point of the line that is not surcharged. As stated, these sample locations may change for each sampling event depending on the river elevations. Evidence of arsenic from excessive infiltration, if present, would be expected to be observed at an easily accessible sampling location (e.g., manhole or catch basin). Sampling at the outfall itself, when submerged, would not further inform the techniques or actions necessary to reduce excessive infiltration.

8. In Table 2, groundwater levels are reported in elevations and sample locations are reported in depths.

Some groundwater levels have been converted to depths so that a comparison can be made to the depths of the sampling points. Groundwater levels should be shown as elevations and depths throughout Table 2 in order to assess whether the sample location is below groundwater levels.

We have obtained approximate elevations from manual field measurements for pipe inverts and manholes at each sampling location. These elevations are approximate because they are based on assumed grade/rim elevations, and would be more accurately captured through a site survey. We have been planning to verify these elevations in coordination with site

survey efforts for the *Infiltration Reduction and Stormwater Plan*. Table 2 of *Outfall Arsenic Investigation* will be adjusted so that pipe inverts are reported as approximate depth from grade/rim.

9. To the extent the information is not known, Tyco should sample the depth to each invert sampled and later survey the points in so the actual sewer elevations are known and can be compared to groundwater elevation data. Please add this item to the bullet points on page 4.

Tyco will verify these elevations in coordination with site survey efforts for the *Infiltration Reduction and Stormwater Plan*. Table 2 of *Outfall Arsenic Investigation* will be modified so that pipe inverts are reported as approximate depth from grade/rim.

10. For Outfall #5, Tyco states that ChemDesign does not use the drop pipe, DP408, connected to Outfall #5. Instead, ChemDesign pumps the collected stormwater to the Menominee River using hoses. Is the drop pipe sealed preventing any discharge to the Menominee River? Even though ChemDesign does not use it to discharge stormwater, groundwater has the potential to infiltrate the line and continue to discharge arsenic into the Menominee River. If this drop pipe is not sealed from the Menominee River, samples should be collected from the pipe if possible or a video inspection of the pipe should be conducted.

Upon revisiting ChemDesign's stormwater control strategy for Outfall #5, it was determined that Outfall #5 was not accurately described in the draft *Arsenic Outfall Investigation*. Drop pipe DP 408 (Outfall #5) is, in fact, used. The suction line of a portable pump is placed in CB 406. The discharge line is connected to DP 408. Therefore, stormwater is pumped through DP 408 and discharges to the Menominee River through Outfall #5. A similar stormwater control strategy is used for ponded stormwater southwest of Building 69 and west of Building 52. The drop pipe was reconstructed in 2013, during vertical wall stabilization activities, reducing the likelihood that this outfall would be a source of impacted groundwater discharge to the river. In addition, because Outfall #5 is currently submerged, sampling between DP 408 and Outfall #5 is not be feasible. The feasibility of using CCTV inspection would be considered when evaluating the condition of this short segment. The description for DP 408 and Outfall #5 has been corrected in the technical memorandum.

11. To further evaluate the small storm sewer network west of Building 70 managed by ChemDesign, please explain how the water recharges groundwater. Is there an underground pipe system that allows for infiltration or is it strictly downspout water allowed discharge on the ground surface? EPA would recommend consideration of off-site discharge of storm water rather than allowing ground water recharge as discussed for the small storm sewer network west of Building 70.

Similar to CB 406 (see previous response), ChemDesign manages stormwater collected west of Building 70 at CB 409 and pumps to DP 408, which discharges through Outfall #5. CB 409 could be added as another sampling location.

General visual observations at the time of outfall sampling

12. Tyco currently holds a Tier 2 Industrial Storm Water Discharge WPDES Permit WI-S067857-3 (attached permit link below), FIN # 7245. Perhaps following the Tier 2 Industrial Storm Water Discharge Permit for Non-Storm Water Discharge Evaluations would be helpful and consistent.

Since we want to know if there is groundwater influence to the system, samples should be collected during dry weather flow to evaluate stains, sludge, color and odor. These parameters are in addition to the bulleted items listed on page 4 of CH2M Hill's February 3, 2015 proposal. The Tier 2 Industrial Storm Water Discharge WPDES Permit sampling method/effort would better represent groundwater impacts to the water quality in the outfalls. Non-storm water discharge evaluation guidance can be found in the Storm Water Pollution Prevention Planning Manual at: http://dnr.wi.gov/topic/StormWater/documents/swpp-man-all-vl.l.pdf

While these parameters are implied in the list of the bulleted items listed on page 4, specific reference to the dry weather visual observations listed in Section 4.2.1.2 of the Tier 2 Industrial Storm Water Discharge Permit for Non-Storm Water Discharge Evaluations will be added to the technical memorandum.

Addressing Sample Results

13. While not stated specifically, it appears Tyco may want to compare the sampling data to the WPDES wastewater permit effluent limits. The Department believes wastewater, storm water and/or surface water standards may be applicable. The applicable standards will be determined after review of actual data.

Yes, Tyco has been referencing the WPDES wastewater permit effluent limits as an initial point of comparison. We agree the applicable standard is yet to be determined.

14. Tyco states that it will evaluate options for additional investigation and corrective measures but do not go into any detail. Some possible options to consider would be conducting video inspections of the lines, performing smoke tests of the line, Electro Scan, and additional sampling. If repairs to lines are necessary, the lines could selectively be replaced or liners could be installed in the existing pipes.

While not stated explicitly in detail in the draft *Arsenic Outfall Investigation*, these options will be considered by Tyco for sewer pipe investigation, based upon sampling results. Specific location conditions at the time of sampling will determine the most appropriate investigative option for a given pipe/network.

15. Eventually, once the extent of the problem is determined, EPA's expectation is that a plan and schedule to deal with the identified problems will be developed and submitted for approval, and upon approval, implemented as an amendment to the existing order.

Tyco is committed to investigating, confirming, and addressing groundwater infiltration into the stormwater conveyance system as determined necessary. A plan for further assessment, remedial actions, and long-term monitoring, if they are necessary, will be prepared as an addendum to the Barrier Wall Groundwater Monitoring Plan Update.

Link: WDNR Tier 2 Industrial Storm Water Discharge General Permit & Forms: http://dnr.wi.gov/topic/stormwater/industrial/forms.html

Outfall Arsenic Investigation

PREPARED FOR: Tyco

PREPARED BY: CH2M HILL

DATE: March 23, 2015

Background

The Tyco facility, located in Marinette, WI, has eight storm sewer outfalls and one industrial waste water outfall, all of which discharge to the Menominee River. The site is surrounded on all sides by slurry and sheet pile walls, which contain the arsenic contaminated groundwater on the Tyco site. The arsenic is present as a result of the previous manufacturing of arsenic-based agricultural herbicides at this location from 1957 to 1977. The walls effectively prevent further spread of arsenic in the groundwater to both the river and to surrounding properties.

There is an on-site groundwater treatment plant and several phyto-pumping plots to extract groundwater to prevent flooding of the facility. The groundwater treatment plant removes arsenic from groundwater to meet WPDES permit requirements. Treated groundwater is then discharged to the Menominee River. Arsenic has been detected in the industrial waste water line discharging at Outfall #4 (WPDES Outfall 001). The detected arsenic concentration ranged from 5 to 364 µg/L, which is below the daily maximum discharge limit for WPDES Outfall 003 of 680 µg/L and below the proposed variance limit of 500 µg/L. Since arsenic is not used in the current manufacturing processes used at the site, infiltration of groundwater into the industrial waste line may be a potential source. In a letter dated October 10, 2014, EPA has asked Tyco to investigate the outfalls discharging to the Menominee River. Based upon the arsenic sampling results, if corrective measures are determined to be necessary, which may include additional evaluation, a corrective action plan will be submitted to the EPA as an addendum to the *Barrier Wall Groundwater Monitoring Plan Update*.

Sewer System Sampling Strategy and Investigation

EPA Region 5 requested in its October 10, 2014 letter *EPA Comments and Request for Revision* to Tyco Fire Products and the Wisconsin Department of Natural Resources (WDNR) that an outfall investigation program be developed for all outfalls on the Tyco site that discharge directly to the Menominee River. EPA desires to know whether arsenic in the shallow groundwater is leaking into sewer pipes and being conveyed to the Menominee River through these outfalls that are submerged below the river level for the preponderance of time. This investigation will obtain information on the sewers and the results will then be used to develop a path forward.

Available information on the existing storm sewer, Menominee River and Lake Michigan water levels, and groundwater levels were reviewed to develop an appropriate sampling strategy. The information on the current layout and condition of the sewer networks was used to identify potential sampling locations.

Sampling Location Criteria

Potential sampling locations were identified within the Tyco facility groundwater containment area. Factors that affect where samples can be collected include:

- Accessibility of the sampling location
- Locations which isolate branches of the sewer system
- Environmental factors (e.g., river stage) which may affect the ability to collect a sample, as well as the quality of the sample

Efforts were taken to consider these factors where information was available. Some aspects of this investigation resulted from informed judgment based on the information available.

TABLE 1
Menominee River Water Levels
Water surface elevations taken near the Tyco site [a]

	Elevation (ft)
Minimum	579.86
Maximum	581.06
Average	580.42
Median	580.36

[a] October 8, 2014, through November 12, 2014

Sewer sampling locations and sample quality will be affected by the fluctuations in Menominee River water levels, which in turn will be influenced by changing Lake Michigan water levels. Higher river stage may result in surcharging of sections of the sewer system.

For comparison, water surface elevations were also collected more recently adjacent to the Tyco site during dredging operations in Fall of 2014. A summary of these water surface elevations obtained during 2014 dredging operations is provided in Table 1. These measured elevations indicate that a number of the outfalls are currently submerged, including Outfalls #1 through #5, and #10. The surcharging of sewers prevent collection of water samples at the sewer outfalls that are representative of typical sewer flows and potential arsenic loads. It should be noted that the maximum monthly average Lake Michigan water surface elevation is 1.9 feet higher than the average in Fall of 2014 and that the minimum monthly average is 4.4 feet lower. Therefore the outfalls that are surcharged could vary over time. To provide a representative sample, changes in the sampling location could occur to achieve free flow in the pipes.

Investigation

Sewer Sampling Locations

Proposed sampling locations were identified for specific outfalls discharging directly to the Menominee River. These outfalls include Outfalls #1-6 and #10. Figure 1 shows the proposed storm sewer sampling locations. The proposed locations and the rationale for choosing these locations are summarized in Table 2. Multiple sampling locations are proposed for the industrial waste line discharging at Outfall #4 (WPDES Outfall 001).

Outfall #1A at Building 86 is located outside the containment area. The goal of this evaluation will be to identify sewers with arsenic within the containment area; therefore, Outfall #1A will not be investigated. Outfall #7 is entirely surface runoff directly to the river; therefore, there is no outfall structure from which a sample can be obtained. The Groundwater Collection and Treatment System (GWCTS) outfall is regulated under a WPDES permit (Permit No. WI-0001040-07-0) and is routinely sampled once per month through a 24-hour composite. Consequently, sampling of Outfall #1A, Outfall #7, and the GWCTS outfall will not occur under this investigation. Samples from submerged outfalls will not be representative of any infiltration flow since the flow would be mixed with river water. Outfalls that are currently submerged are noted within Table 2[1]. Sampling will move to an upstream location if the intended sampling location is submerged by the river unless there are no upstream locations to sample.

[1] It is important to note that outfall sheet pile wall penetrations were all constructed in 2010 during sheet pile wall installation. Sewer pipes are either steel pipe or were transitioned to steel pipe before extending through openings in the sheet pile wall. For transitions from PVC to steel pipe, Fernco RC couplings were used. At the point of wall penetration, all outfall pipes were seal-welded on both sides of the sheet pile wall to ensure a watertight seal. Outfall #4 is a corrugated metal pipe and is encased in concrete along its length for watertight capacity. Similarly, Outfall #10 had concrete collars poured at the sheet wall penetration for a watertight seal. Because of these techniques, no underwater inspection is needed at this time.

TABLE 2
Sewer System Sampling
Proposed sampling locations and rationale

Sewer System Outfall No.	Sampling Location	Rationale for Sampling Location
#1	CB 231	Outfall #1 is submerged. CB 231 is the farthest downstream and accessible sampling location on Tyco property. City storm sewer as-built shows Marinette Marine CB 234 is surcharged from river (EL 578.97). Nearby monitoring wells MW009S and MW009M measured groundwater elevations are 580.93 and 580.85, approximately 2.9 feet below ground surface in each location. CB 231 inverts are approximately 3.0 feet below grade at EL 580.77.
		Catch basin 228 was not included as a sampling location for the storm sewer discharging to Outfall #1. Catch basin 228 is the farthest upstream catch basin on Tyco property that is connected to Outfall #1. Nearby monitoring wells MW105S, MW105M, MW105D measured groundwater elevations are 580.23, 578.27, and 578.13, respectively. The depth of the invert for CB 228 is unknown. Sampling at CB 228 would result in limited useful information because it is at the far upstream end of the sewer and is relatively shallow. Little groundwater flow is expected directly to the catch basin. If arsenic is measured when sampling CB 231, additional review of the groundwater levels at CB 228 could be completed.
#2	CB 401	Outfall #2 is submerged and operated by ChemDesign. CB 401 is the farthest downstream and accessible sampling location. However, ChemDesign operates the outfall by holding back all stormwater. Stormwater collects on the surface and within the storm sewer at CB 401. ChemDesign pumps the ponded surface water and the stormwater collected in CB 401 through drop pipe DP 400, which discharges at Outfall #2. Samples of both ponded stormwater and during discharge will be collected. ChemDesign does not sample for arsenic because it is not required under their WPDES permit. Nearby monitoring wells MW045S and MW045M measured groundwater elevations are 580.06 and 580.14, approximately 2.7 and 2.6 feet below the ground surface respectively. CB 401 invert depths are unknown because water collected in the manhole was frozen at the time of measurement, but the catch basin is approximately 3.2 feet deep (bottom EL 579.57).
#3	CB 298	Outfall #3 is submerged. CB 298 is the farthest downstream and accessible sampling location on Tyco property. Nearby monitoring wells MW045S and MW045M measured groundwater elevations are 580.06 and 580.14, approximately 2.7 and 2.6 feet below the ground surface respectively. The CB 298 invert is approximately 1.3 feet below grade at EL 581.44.
#4	Building 43	Outfall #4 is submerged. Sampling is currently completed within Building 43 for WPDES permit compliance (Permit No. WI-0001040-07-0) and occurs once per month through a 24-hour composite. The compliance sampling point will be sampled together with the other sampling points.
	MH 323	Outfall #4 is submerged. MH 323 was selected to characterize conditions upstream of the connected sewer system. Nearby monitoring wells MW108S, MW108M, and MW108D measured groundwater elevations are 580.63, 580.71, and 579.44, or approximately 4.2, 4.4, and 5.8 ft below ground surface respectively. MH 323 inverts are approximately 2.2 feet below grade at EL 587.19.
	MH 318	Outfall #4 is submerged. MH 318 was selected to characterize conditions upstream of the connected sewer system. Nearby monitoring well MW008S measured groundwater elevation is 580.70, approximately 2.8 ft below the ground surface. MH 318 inverts are approximately 7.8 feet below grade at EL 575.67.
	MH 311	Outfall #4 is submerged. MH 311 was selected to characterize conditions upstream of the connected sewer system. There are no nearby groundwater monitoring wells. MH 312 and MH 313 are sealed for spill prevention precaution and not easily accessible. MH 311 inverts are approximately 3.3 feet below grade. The manhole rim elevation is unknown.
	MH 305	Outfall #4 is submerged. MH 305 was selected to characterize conditions upstream of the connected sewer system. Nearby monitoring wells MW106S, MW106M, and MW106D measured groundwater elevations are 580.57, 580.07, and 578.70, or approximately 3.1, 3.7, and 4.9 feet deep. MH 305 inverts are approximately 4.3 feet below grade at EL 579.35.

TABLE 2
Sewer System Sampling
Proposed sampling locations and rationale

Sewer System Outfall No.	Sampling Location	Rationale for Sampling Location
#5	CB 406	Outfall #5 is submerged and operated by ChemDesign. CB 407 is the farthest downstream catch basin, but it is inaccessible. ChemDesign places the suction line of a portable pump in CB 406. The discharge line is connected to drop pipe DP 408, and stormwater is pumped through DP 408 and discharged to the Menominee River through Outfall #5. The same method is used for ponded stormwater southwest of Building 69 and west of Building 52. Samples of any ponded surface water are collected. ChemDesign does not sample for arsenic because it is not required under their WPDES permit. Nearby monitoring well MW052S and MW053S measured groundwater elevations are 583.20 and 583.18, or approximately 1.7 and 1.9 feet below the ground surface respectively. The CB 406 invert depth is unknown because water collected in the manhole was frozen at the time of measurement, but the catch basin is approximately 2.5 feet deep (bottom EL 580.68).
#6	Outfall #6	Outfall #6 is visible and above the river level. Outfall #6 is the farthest downstream and accessible sampling location. Discharge is controlled by a knife valve, draining the paved Former Salt Vault area. Nearby monitoring wells MW032S and MW032M measured groundwater elevations are 583.77 and 583.14. The outfall invert elevation is 583.8.
#10	Not yet named	Outfall #10 is submerged, and all manholes and catch basins are also submerged. Any sample will likely be influenced by river water. Sampling point was selected to characterize conditions upstream of the connected sewer system and minimize depth of sewer submerged by river. Groundwater elevations were not reviewed because sewer is typically submerged, and during recent dredging activities the nearest monitoring well could not be accessed due to equipment staging. Record documents indicate the manhole inverts are at 579.25, and the rim elevation is 583.8. Therefore, the depth to the inverts is about 4.6 ft.

Note: Reference river elevation based on Fall 2014 measured river elevations. Average measured elevation was 580.42.

There is also a small storm sewer network west of Building 70 managed by ChemDesign. This storm sewer collects stormwater at ground level in CB 409 and from Building 70 roof drains, but it does not connect to any outfall and instead recharges the groundwater. If stormwater collected in this system is either piped or pumped to the Menominee River in the future, the storm water would be analyzed prior to discharge following the ChemDesign protocol.

Sewer Sampling and Schedule

Any sampling during winter months will be avoided, at which time the ground (and groundwater) may be frozen and infiltration into the sewer systems would be minimal. As a result, two sampling events are proposed. The first sampling event is proposed during late spring/early summer after winter snow melt and when seasonally higher precipitation rates typically occur. This is recommended as the likelihood of sewer infiltration from additional snow melt and precipitation is greatest at this time. The second sampling event is proposed in late summer. Sampling during summer months would inform if there is flow during dry weather conditions.

During sampling event, the following information will be gathered by Tyco staff to identify the conditions under which the sample was collected and to provide some indication of the physical condition of the sewer systems:

- Sample name and location
- Date and time of sample collection
- Menominee River or Lake Michigan water elevation
- Time, in hours, since last rainfall event (goal of a minimum of 72 hours since the last rainfall to characterize groundwater seepage conditions)

- Measured rainfall amount and air temperature during last rainfall event
- Depth of water in pipe at location of sampling
- Laboratory results for collected grab samples
- General visual observations at time of sampling, including reasons a sample was not collected (e.g., no flow, flooded catch basin or manhole) and visible signs of degraded sewer condition (e.g., cracking, presence of tree roots, accumulation of debris, stormwater discoloration, leaks, etc.)
- Visual observation specific to dry weather conditions, such as stains, sludge, color and odor, in accordance with Section 4.2.1.2 of the Tier 2 Industrial Storm Water Discharge Permit for Non-Storm Water Discharge Evaluations

Lake Michigan water levels can be obtained from the United States Army Corps of Engineers Detroit District website. Local weather conditions and Lake Michigan water levels near Menominee, MI, can be obtained from the National Oceanic and Atmospheric Administration (NOAA) website (Station 9087088).

Samples will be collected from each sampling location during sampling events and analyzed in the Tyco lab. Collecting samples at each location will establish a broad dataset and potentially isolate the source of arsenic (should positive samples be obtained) and inform mitigation planning if needed. As most catch basins and manholes to be sampled are relatively shallow (i.e., less than 8 feet deep), sample bottles on extension poles will be sufficient to collect grab samples. Samples could include sediment from the sewer system. Samples should be filtered prior to testing to remove sediment. Arsenic testing procedures on groundwater should be consistent with current WPDES permit testing and reporting requirements.

Addressing Sampling Results

A response will be developed based upon sampling results. To prioritize actions in the Tyco sewer system, multiple sample locations in longer sewer lines have been chosen such that the sources of positive arsenic samples, if any, can be localized to focus next steps. In the event there is a positive detection of arsenic above applicable criteria sufficient to potentially re-contaminate the river sediment, Tyco will evaluate the options for additional investigation and corrective measures in a report submitted to EPA and WDNR. In general, past survey efforts, such as CCTV investigation, will be reviewed first. If necessary, additional CCTV, smoke testing, or Electro Scan© investigations will be completed to systematically identify specific locations where arsenic from excessive infiltration may be occurring. In doing so, a sound basis for addressing groundwater sources of arsenic can be established.

GENERAL SHEET NOTES

1. BUILDING 86 OUTFALL #1A LOCATED OUTSIDE GROUNDWATER CONTAINMENT AREA.
2. NO SAMPLE TO BE COLLECTED FROM GWCTS OUTFALL UNDER ARSENIC INVESTIGATION.

UTILITIES LEGEND & ABBREVIATIONS

- SD — STORM WATER
- SD — ABANDONED STORM WATER
- IW — INDUSTRIAL WASTE
- IW — ABANDONED IND. WASTE
- SHEET PILE WALL
- SLURRY WALL
- RAILROAD
- SD — SHUT OFF VALVE
- APPROXIMATE PROPERTY BOUNDARY
- MH — MANHOLE
- CB — CATCH BASIN
- OF — OUTFALL
- DP — DROP PIPE
- LS — LIFT STATION
- SAMPLING POINT

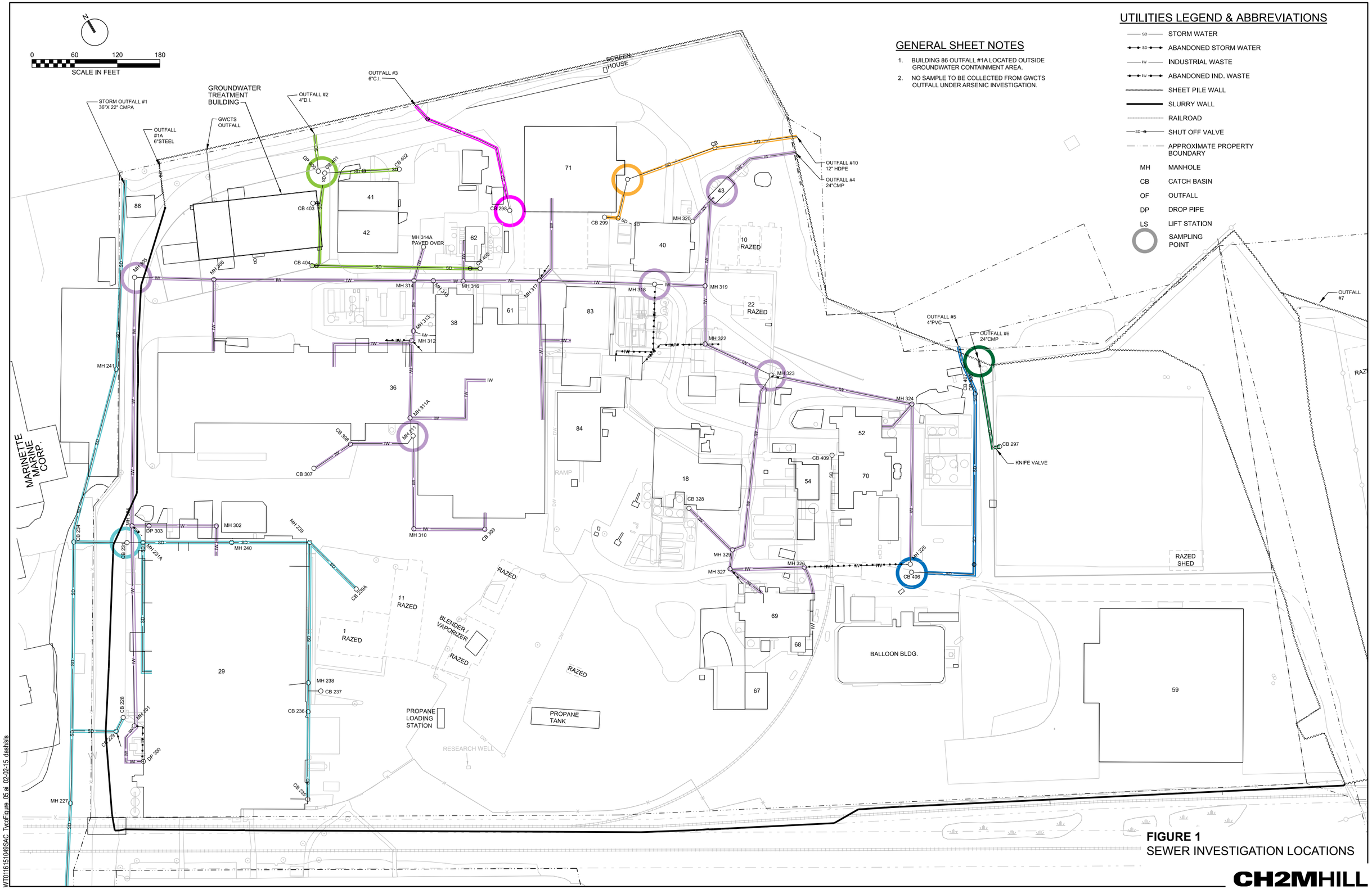


FIGURE 1
SEWER INVESTIGATION LOCATIONS

CH2MHILL

WT0116151049SAC_TycoFigure_05.ai 02-02-15 dashbis

FILENAME: TycoBase_473274.dgn PLOT DATE: 2015\01\19 PLOT TIME: 12:23:37 PM

Appendix E
Rhodamine WT Vendor Information

Keystone™
Innovation in Color Solutions

INDUSTRIAL COLOR COMPOUND SOLUTIONS

LIQUID DYES FOR WATER TRACING & LEAK DETECTION

GLOBAL COLOR INTELLIGENCE

Keystone™ offers some of the most widely accepted dyes for tracing and leak detection. Keystone Uranine K Liquid and Keystone Rhodamine WT Liquid can be used for water tracing and leak detection. Fluorescent Yellow 131SC™ Liquid is suitable for tracing of leaks in most petroleum or organic solvent systems.

WATER TRACING

Photo Credit: U.S. Geological Survey, Department of the Interior/USGS

One of the properties that make some water-soluble fluorescent dyes ideal for water tracing is the fact that the fluorescence can be seen, when irradiated with UV light, at concentrations too low to be seen with the naked eye. Additionally, the low concentration does not greatly affect the natural color of the water.

Keystone offers two dyes specifically for tracing the flow of water in lakes, rivers, underground streams, springs, estuaries, tidal basins and other natural bodies of water. They may also be used in water lines, storage tanks and cooling towers, and to gauge the infiltration of soil with waste water from industrial sources. Because these dyes are in liquid form they are easy to measure and use.

KEYSTONE URANINE K LIQUID

Product Code:	801-073-42

Typical Properties:
(These do not constitute specifications)

Appearance:	Dark brown aqueous solution
Specific Gravity:	Approx. 1.28 (10.66 lb/gal)
pH:	8.6 - 9.0 (Diluted 1:1 H2O)
pH Sensitivity:	Precipitates below pH 3
Freezing Point:	Approx. 32°F

KEYSTONE RHODAMINE WT LIQUID

Product Code:	703-010-27

Typical Properties:
(These do not constitute specifications)

Appearance:	Dark red aqueous solution
Specific Gravity:	Approx. 1.13 (9.41 lb/gal)
pH:	10.8 ± 0.7
pH Sensitivity:	No significant change in fluorescence between 5.5 and 11.0
Dispersability:	Shows complete dispersion when dropped in sea water
Bleachability:	Bleachable with sodium hypochlorite
Freezing Point:	Approx. 32°F
Viscosity:	Less than 25 cps @ 77°F

Keystone Rhodamine WT Liquid is a bright fluorescent red dye with exceptionally high tinctorial strength. It has a low tendency to staining silt, dirt, organic plants and other suspended matter in fresh and salt waters. It is designed for water tracing by fluorometry or visual methods and is detectable as low as 10 parts per trillion under ideal conditions using state-of-the-art fluorometers. Detectability in very polluted water is in the 0.1 parts per billion range.

DYES AND PIGMENTS since 1920

ISO CERTIFIED
EAGLE Registrations Inc.
SERVICE • INTEGRITY • VALUE

LIQUID DYES FOR WATER TRACING & LEAK DETECTION

GLOBAL COLOR INTELLIGENCE

WATER TRACING (continued)

Among support for the use of Rhodamine WT Liquid is a study conducted by *SRI International* of Menlo Park, CA. The study evaluated the risk level involved in exposure to trace levels of diethylnitrosamine (DENA) in streams in which a Rhodamine WT tracer dye was used. The study determined that the ability of Rhodamine WT to form DENA in nitrite rich waters presented a negligible risk and was well below the standard set by the EPA for drinking water. Rhodamine WT was granted clearance for use as a tracer dye in potable water applications.[1]

The Department of National Health and Welfare, Ottowa, Canada published a study of the mutagenic activity of Rhodamine WT in vitro and vivo mammalian assays.[2] The in vitro mammalian tests resulted in negligible or low levels of chromosomal anomalies and certain types of DNA damage even at very high concentrations of the dye. Furthermore, no evidence of in vivo genetic activity was observed either in terms of bone marrow micronuclei or sperm abnormalities.

According to Environmental/Water Quality Operational studies by the *U.S. Army Corps of Engineers*, "Rhodamine WT has been chosen as the dye most suitable for use in inflow studies…" and "…poses no known environmental or health hazards when used in unpolluted water."[3]

The National Sanitation Foundation International states that, per ANSI/NSF Standard 60, "Concentrations of Rhodamine WT Liquid in drinking water are not to exceed 0.1 parts per billion (ppb) and the exposure is to be infrequent."[4]

The suitability of any dye for a specific water tracing application should be evaluated by a qualified hydrologist. A manufacturer of fluorometers can be consulted for detailed application information.[5] For precise scientific work, the user should carry out his own measurements on the starting material since there may be some variation from lot to lot.

Recommended Concentration

Keystone Uranine K Liquid and Keystone Rhodamine WT Liquid can be detected by the eye in open lakes or sea water as a marker buoy in concentrations as little as 1 part per million (ppm). In actual practice we suggest starting points of 30 to 40 ppm to allow for dilution factors and other optical impediments. However, Keystone strongly recommends consulting all state, municipal, and federal regulations governing the area to be tested.

[1] *Rhodamine WT & B, Memo to F.J. Traina. April 10, 1980. Cotruvo, J.A.*

[2] *Comparative Mammalian In Vitro and In Vivo Studies on the Mutagenic Activity of Rhodamine WT. Mutation Research, Vol. 118, (1983), pp. 117-125. Douglas, George R, et al.*

[3] *Chief of Engineers, U.S. Army, Washington, DC 20314*

[4] *National Sanitation Foundation International, 789 N. Dixboro Road, Ann Arbor, MI 48113*

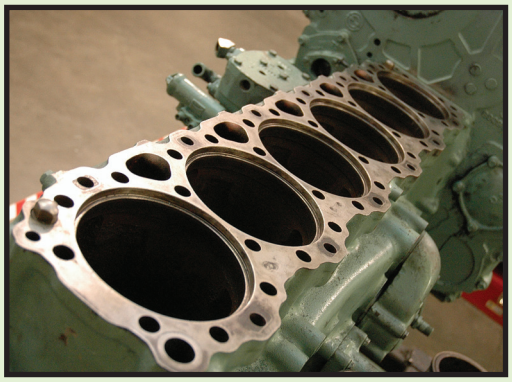
[5] *Turner Designs, 845 W. Maude Avenue, Sunnydale, CA 94085*

LIQUID DYES FOR WATER TRACING & LEAK DETECTION

GLOBAL COLOR INTELLIGENCE

LEAK DETECTION

In the world of manufacturing, building, and transportation, there is often the need to trace the source of leaks of lubricating oils and other petroleum based fluids. Fluorescent Yellow 131SC Liquid is the ideal tracer dye for most applications. It can be used in hydraulic systems, internal combustion engines or other power equipment where petroleum based fluid is used. Sand holes in castings, improperly seated gaskets, leaks in oil filled heat exchangers are just a few examples where Fluorescent Yellow 131SC can be used.



FLUORESCENT YELLOW 131SC™ LIQUID

Product Code:	606-175-50

Typical Properties:
(These do not constitute specifications)

Appearance:	Dark Red Amber Liquid
Specific Gravity:	0.88
Flash Point:	>200F

Fluorescent Yellow 131SC Liquid is miscible in petroleum based fluids or organic solvent systems. When illuminated by Ultra-Violet light, the resulting fluorescence is extremely bright and distinctive; easily identified by its white-yellow fluorescence.

Recommended Concentration

A good starting point is 600 ppm. More may be required depending on the color of the base material it is being added to.

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LIQUID DYES FOR WATER TRACING & LEAK DETECTION

GLOBAL COLOR INTELLIGENCE

For more information on Keystone Liquid Dyes for Water Tracing & Leak Detection contact your Keystone representative.

www.dyes.com

> **As a Keystone customer, you will have direct access to professionals who can answer technical questions and provide timely assistance, as well as samples of our dyes, technical specifications, and formulating assistance.**

> **In addition to supplying a complete and comprehensive line of colorants, we are committed to providing you with the best technical information available.**

DISCLAIMER: These data were obtained by testing according to our methods, with any necessary test deviations. Other test methods may give different results. Incoming evaluations, by the customer is therefore unconditionally recommended. The use and application of our colorants and information included is without any warranty, whether expressed or implied, verbal or written. No statements of recommendation contained in this product literature is to be construed as inducement to infringe on any relevant patent now or hereafter in existence. © Copyright 2012 Keystone Aniline Corporation

U.S. CORPORATE OFFICE 2501 West Fulton Street, Chicago, IL 60612 (800) 522-4393 ***T*** (312) 666-2015 ***F*** (312) 666-8530
U.S. SOUTH CAROLINA PLANT Inman, SC (864) 473-1601 **EUROPEAN OFFICE** Huddersfield, UK +44 1484 341466
www.dyes.com

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Safety Data Sheet

Issuing Date 26-Mar-2015 **Revision Date** 05-May-2014 **Version** 5

1. Identification of the Substance/Preparation and of the Company/Undertaking

Product Identifier

Product Code 70301027
Product name KEYACID™ RHODAMINE WT LIQUID

Recommended use of the chemical and restrictions on use

Synonyms N/A

Supplier's details

Recommended use Industrial Use Only.
Uses advised against No information available

Details of the Supplier of the Safety Data Sheet

Keystone Corporate Office
2501 W Fulton Street
Chicago, IL 60612

Ph 312-666-2015
Ph 1-800-522-4393

Keystone Liquid Manufacturing and Technical Facility
2165 Highway 292
Inman, SC 29349
Ph 864 473-1601

Emergency Telephone Number

USA: 1-800-255-3924
China: (400-1)-400-120-0751
Other: Collect 1-813-248-0585

2. Hazards Identification

Classification

Not a dangerous substance or mixture according to the Globally Harmonized System (GHS)

EMERGENCY OVERVIEW

signal word
Not Hazardous

The product contains no substances which at their given concentration, are considered to be hazardous to health

appearance Red **Physical State** Liquid **Odor** No information available

precautionary statements

P281 - Use personal protective equipment as required
P262 - Do not get in eyes, on skin, or on clothing
P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P501 - Dispose of contents/ container to an approved waste disposal plant

Hazards Not Otherwise Classified (HNOC)

OTHER INFORMATION

Unknown Acute Toxicity

98.2 percent of the mixture consists of ingredient(s) of unknown acute toxicity

3. Composition/information on Ingredients

This chemical is not considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200).

4. First aid measures

First aid measures for different exposure routes

Eye Contact Rinse thoroughly with plenty of water for at least 15 minutes, lifting lower and upper eyelids. Consult a physician.

Skin Contact Wash skin with soap and water.

INHALATION Move to fresh air.

INGESTION Rinse mouth.

Most important symptoms/effects, acute and delayed

Main Symptoms No information available.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician Treat symptomatically.

5. Fire-fighting measures

Suitable extinguishing media

Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Unsuitable extinguishing media Keep away from heat and sources of ignition.

Specific Hazards Arising from the Chemical

No information available.

Explosion Data

Sensitivity to Mechanical Impact None.

Sensitivity to Static Discharge None.

Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

Personal Precautions Avoid contact with the skin and the eyes. Use personal protective equipment. For personal protection see section 8. Ensure adequate ventilation.

Environmental Precautions

Environmental Precautions Prevent further leakage or spillage if safe to do so.

Methods and materials for containment and cleaning up

Methods for containment Prevent further leakage or spillage if safe to do so.

Methods for Cleaning Up Use personal protective equipment. Dam up. Cover liquid spill with sand, earth or other noncombustible absorbent material. Take up mechanically, placing in appropriate containers for disposal. Clean contaminated surface thoroughly.

7. Handling and Storage

Precautions for Safe Handling

Advice on safe handling Avoid contact with skin, eyes and clothing. Do not breathe vapors/dust. In case of insufficient ventilation, wear suitable respiratory equipment. Wear personal protective equipment. Handle in accordance with good industrial hygiene and safety practice. Remove and wash contaminated clothing before re-use. Provide appropriate exhaust ventilation at places where dust is formed. Do not eat, drink or smoke when using this product. Use personal protection recommended in Section 8.

Conditions for safe storage, including any incompatibilities

Technical measures/Storage conditions Store locked up. Keep containers tightly closed in a dry, cool and well-ventilated place. Keep in properly labeled containers. Store in accordance with the particular national regulations. Store in accordance with local regulations.

Incompatible Products None known based on information supplied.

8. Exposure Controls/Personal Protection

Control Parameters

Exposure guidelines This product, as supplied, does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies

Exposure Controls

Engineering Measures Showers
Eyewash stations
Ventilation systems. Apply technical measures to comply with the occupational exposure limits. Process enclosure and/or ventilation systems.

Individual protection measures, such as personal protective equipment

Eye/Face Protection Face-shield. Chemical resistant goggles must be worn. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substances; this is irrespective of the recommendation involving the wearing of eye protection. If splashes are likely to occur, wear:. Goggles.

Skin and Body Protection Skin and Body Protection. Wear protective gloves and protective clothing. Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Respiratory Protection If exposure limits are exceeded or irritation is experienced, NIOSH/MSHA approved respiratory protection should be worn.

Hygiene Measures Do not eat, drink or smoke when using this product.

9. Physical and Chemical Properties

Physical and Chemical Properties

Physical State	Liquid		
appearance	Red	**Odor**	No information available
odor threshold	No information available		

Property	VALUES	Remarks • Method
pH	10.00	
melting point		N/A
Boiling point/boiling range	< 110 °C / 230.00 °F ºF	
Flash Point	< 121 °C / < 250.00 °F ºF	
Evaporation Rate	no data available	
flammability (solid, gas)	no data available	no data available
Flammability Limits in Air		
Upper Flammability Limit	No information available	
Lower Flammability Limit	No information available	
vapor pressure	No information available	
Vapor Density	No information available	
Specific gravity	No information available	N/A
Solubility in Other Solvents	No information available	
Partition coefficient: n-octanol/water	No information available	
Autoignition Temperature	No Data Available	N/A
decomposition temperature	No information available	
Kinematic viscosity	No Data Available	
Dynamic viscosity	No information available	
Explosive Properties	No information available	
Oxidizing properties	No information available	

OTHER INFORMATION

softening point	No information available
Molecular Weight	.
VOC Content(%)	No information available.
density	No information available

10. Stability and Reactivity

Reactivity
no data available

Chemical Stability
Stable under recommended storage conditions.

Hazardous Reactions
None under normal processing

Conditions to avoid
Extremes of temperature and direct sunlight.

incompatible materials
None known based on information supplied.

Hazardous decomposition products
May emit toxic fumes under fire conditions.

11. Toxicological Information

Information on Likely Routes of Exposure

Product information

INHALATION	Avoid breathing vapors or mists.
Eye Contact	Avoid contact with eyes.
Skin Contact	Avoid contact with skin.
INGESTION	Not an expected route of exposure.

Information on Toxicological Effects

Symptoms No information available.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

sensitization	No information available.
Germ cell mutagenicity	No information available.
carcinogenicity	No information available.
Reproductive Toxicity	No information available.
Specific target organ systemic toxicity (single exposure)	No information available.
Specific target organ systemic toxicity (repeated exposure)	No information available.
Aspiration Hazard	No information available.

Numerical Measures of Toxicity - Product information

Unknown Acute Toxicity 98.2 percent of the mixture consists of ingredient(s) of unknown acute toxicity
The following values are calculated based on chapter 3.1 of the GHS document .
ATEmix (oral) 39333 mg/kg

12. Ecological Information

ecotoxicity

98.2% of the mixture consists of components(s) of unknown hazards to the aquatic environment

Persistence and Degradability
No information available.

Bioaccumulation
No information available.

Other Adverse Effects No information available

13. Disposal Considerations

Waste treatment

Waste Disposal Methods Should not be released into the environment. Dispose of in accordance with local regulations. This material, as supplied, is not a hazardous waste according to state and federal regulations (40 CFR 261).

Contaminated Packaging Do not re-use empty containers. Dispose of in accordance with local regulations.

14. TRANSPORT INFORMATION

DOT
Description NOT REGULATED

MEX NOT REGULATED

IATA

Description	NOT REGULATED

IMDG

Description	NOT REGULATED

RID

ADN

15. Regulatory Information

International Inventories

TSCA	Listed
EINECS/ELINCS	Listed
DSL	Not Determined
NDSL	Not Determined
PICCS	Not Determined
ENCS	Not Determined
IECSC	Not Determined
AICS	Not Determined
KECL	Not Determined
NZIoC	Not Determined

Legend

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
EINECS/ELINCS - European Inventory of Existing Commercial Chemical Substances/EU List of Notified Chemical Substances
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
PICCS - Philippines Inventory of Chemicals and Chemical Substances
ENCS - Japan Existing and New Chemical Substances
IECSC - China Inventory of Existing Chemical Substances
AICS - Australian Inventory of Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances
NZIoC - New Zealand Inventory of Chemicals

REACH registration number	Keystone has taken all relative steps to ensure REACH-Compliance. Please contact us with any REACH-Related questions at REACH@Keystone-Europe.CO.UK
RESTRICTIONS - REACH TITLE VIII	No information available

US Federal Regulations

SARA 313
Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

SARA 311/312 Hazard Categories

Acute health hazard	NO.
Chronic health hazard	NO.
Fire hazard	NO.
Sudden Release of Pressure Hazard	NO.
Reactive Hazard	NO.

Clean Water Act
This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42).

CERCLA
This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material

US State Regulations

California Proposition 65
This product does not contain any Proposition 65 chemicals

U.S. State Right-to-Know Regulations

This product does not contain any substances regulated by state right-to-know regulations

International regulations

Mexico - Grade Slight risk, Grade 1.

CANADA

WHMIS Note
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Hazard Class
Non-controlled

HMIS	**Health Hazard** 1	**flammability** 1	**Physical hazard** 0	**PERSONAL PROTECTION** H

16. Other Information

Revision Date 05-May-2014

Revision note No information available.

Restrictions on use No information available.

Contact Information Website WWW.DYES.COM.

Disclaimer
The information provided on this MSDS is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text

End of Material Safety Data Sheet

Keystone
Innovation in Color Solutions

KEYACID™ RHODAMINE WT LIQUID

GLOBAL COLOR INTELLIGENCE

Description

Keyacid™ Rhodamine WT Liquid is a bright fluorescent dye with high tintorial strength designed for water tracing by fluorometry or by visual methods.

Identification Information

Product Code:	**703-010-27**
CI Name:	**Proprietary**
CI Number:	**Proprietary**
Registration:	**Proprietary**
Chemical Family:	**Xanthene**

Product Specifications

Property	Tolerance
Purity	20% - 23%

Standard Packing: 450 lbs.

Safe Handling Information:

See Material Safety Data Sheet for complete list of….

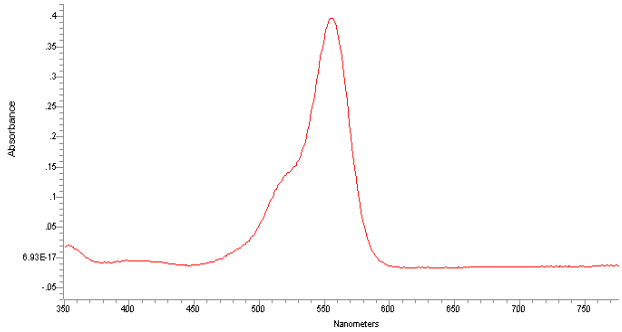
- Hazardous Ingredients
- First Aid Measures
- Fire Fighting Measures
- Accidental Release Measures
- Handling & Storage
- Recommended Personal Protection

Typical Properties

Property	Observation
Dye Content	~20%
pH of Solution	Approx. 10.8
pH Stability	Typically 2.5 – 9.5
Specific Gravity	1.15 g/ml
Light Fastness (Blue Wool Scale)	1
Peak Absorption Wavelength	555 nm

NOTE: These typical values should not be interpreted as specifications.

Absorbance:



DISCLAIMER: These data were obtained by testing according to our methods, with any necessary test deviations. Other test methods may give different results. Incoming evaluations, by the customer is therefore unconditionally recommended. The use and application of our colorants and information included is without any warranty, whether expressed or implied, verbal or written. No statements of recommendation contained in this product literature is to be construed as inducement to infringe on any relevant patent now or hereafter in existence.

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U.S. CORPORATE OFFICE 2501 West Fulton Street, Chicago, IL 60612 (800) 522-4393 *T* (312) 666-2015 *F* (312) 666-8530
U.S. SOUTH CAROLINA PLANT Inman, SC (864) 473-1601 **KEYSTONE EUROPE** Huddersfield, UK +44 1484 341466

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