UTAH DIVISION OF WATER QUALITY
195 North 1950 West
PO Box 144870
Salt Lake City, Utah 84114-4870

Willard Bay Project Proposal Form

Applicant Name:	City of Saratoga Springs
Project Title:	BaySaver at the Saratoga Springs Marina on Utah Lake
Mailing Address:	1307 N. Commerce Drive, Suite 200, Saratoga Springs, UT 84045
Phone:	Mark Edwards, Public Works Director, (801) 766-9793 x 137
Email:	MEdwards@saratogaspringscity.com

☐ Individual ☐ Non-Profit ☒ Govt. Agency ☐ Academic ☐ Commercial ☐ Other

1. Estimated Project Costs:

Labor	$25,000 (install including earthwork, installation of manholes, installation of BaySaver, repair landscaping)
Materials	$37,000 (10K BaySaver model, two 10' manholes, and shipping costs)
Equipment	$1,500
Administration	$0 (Completed by City)
Miscellaneous	$9,525 (approx. 15% construction contingency for unforeseen items)
Total	**$73,025**

Other Sources of Project Funding:

Saratoga Springs	
Storm Drain Enterprise Fund	$10,000
Total Match:	**$10,000**

Requested funding: ***$63,025***

2. Describe the purpose and need of the project:

The BaySaver is a device that removes sediment and floatable particles from storm water. This shovel-ready project is proposed to be constructed within the Saratoga Springs Marina, to treat storm water from a 1,597 acre drainage basin on the west side of Utah Lake to prevent contamination of the aquatic habitats of Utah Lake, the Jordan River and ultimately the Great Salt Lake.

Purpose

The population of Saratoga Springs was 1,003 at the 2000 census, which the 2010 census put the population of the City at 17,781, making it one of the fastest growing US cities during this time period. This rapid growth was sustained throughout the economic slowdown in 2008, and has continued to increase since that time. Saratoga Springs is planning to meet the

infrastructure needs of this growing community, and has designed this project to ensure that the natural resources that make Saratoga Springs an attractive community are not adversely impacted along the way.

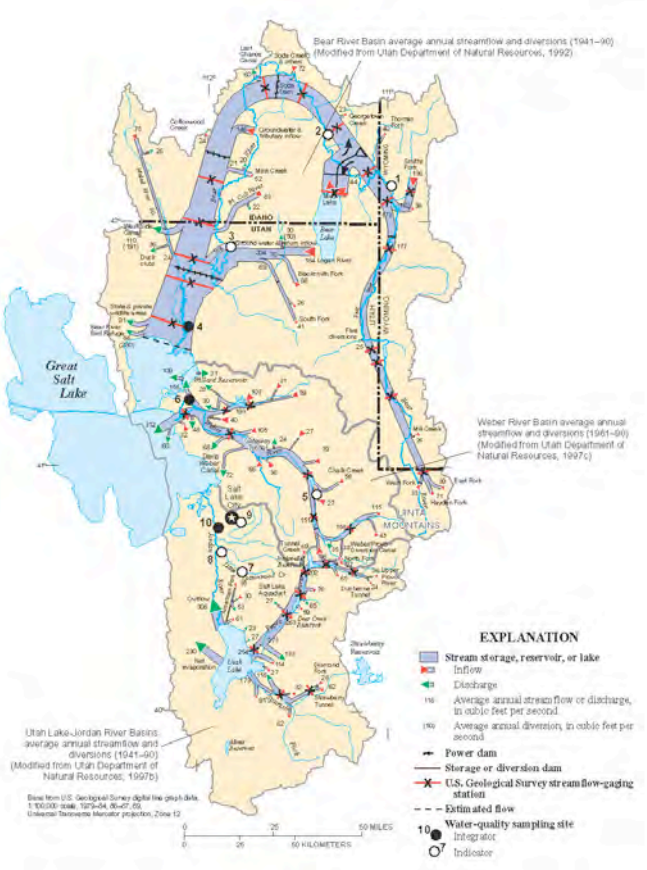
The contributing drainage basin to be addressed with the BaySaver consists of approximately 1,597 acres of which about 165 acres is developed. An estimated 36% of the developed portion of the drainage base basin is impervious and includes about 11,075 linear feet of storm sewer along with approximately 40 storm inlets boxes. There is currently no detention located within the drainage basin. All water flows via gutter or pipe flow in an easterly direction to the proposed BaySaver Location which then discharges the storm water to Utah Lake, about 175 feet to the East.

The majority of the impervious surfaces within the drainage basin consist of paved roadways, parking areas, driveways, and buildings. A church, Marina, and several small parks are also located in the drainage basin. Moderate to heavy traffic volume runs along Redwood Road which is also the main haul route for the gravel pit operation approximately 2.5 miles to the south. The main pollutant sources within the basin are created by vehicular traffic, typical urban residential land use, and atmospheric deposition. Trash and debris accumulate on the surface and enter the storm water system through large openings in the street inlets, sized to accommodate the large storm flows that can occur in this part of Utah. The storm sewer catch basins do not have sumps. There are no other storm water best management practices (BMPs) within the drainage area.

This project would help to improve the quality of already entering Utah Lake and would prevent future contamination by increasing runoff due to future development in the area. The water of Utah Lake is connected directly to that of the Great Salt Lake and Willard Bay, and all water bodies in this connected system play a critical role in the provision of functional habitat for waterfowl and migratory birds.

Need

Utah Lake is the largest naturally occurring freshwater lake in the western United States. Its wetlands have long been recognized locally and nationally for their critical importance to fish and wildlife resources. The Utah Lake wetland ecosystem is important as a breeding area and stopover for many migratory birds in the North American Central Migratory Bird Flyway, and is a key component of the overall Great Salt Lake watershed and eocosystem. Approximately 226 species of birds are known to use Utah Lake wetlands, as well as 49 mammalian species, 16 species of amphibians and reptiles and 18 species of fish. Utah Lake also provides feeding areas for birds nesting on the Great Salt Lake.



The three major watersheds to the east of the GSL (the Bear River, Weber River, and Utah Lake Watersheds) provide the vast majority of water, sediment, and contaminant flux to the Great Salt Lake. Average annual streamflow discharge from Utah Lake into the Jordan River, and ultimately to the Great Salt Lake is 308 cubic feet per second.[1]

As cities like Saratoga Springs develop and urbanize, the impervious surfaces created by buildings and pavement cause rainwater and snowmelt to flow quickly over the landscape, rather than soaking naturally into the soil or being absorbed by plants. This can change stream flows, increase flooding, endanger private and public infrastructure, erode stream banks and channels, and destroy aquatic habitats. Runoff also carries pollutants such as oil, heavy metals, bacteria, sediment, pesticides and fertilizers into streams or groundwater. The combined impacts of hydrologic changes and water pollution can be disastrous for waterbodies in urban areas. Water from the BaySaver drainage basin currently runs into storm drains and then directly into Utah Lake without any sort of treatment or filtration. Numerous studies show that aquatic

life is impacted by very small amounts of impervious surface in a watershed.[2,3,4,5] Given the uniqueness of the Utah Lake, Jordan River, and Great Salt Lake ecosystem, and its critical importance to migratory birds, it is deeply necessary to ensure that growth and development near Utah Lake does not impact this system of natural resources.

3. Estimated time frame of the project with significant milestones (Note: Project must be completed with final reports filed by January 1, 2018):

This project is shovel-ready and can be completed within the first year of this funding timeline. All engineering designs, modeling and testing has been completed, and permissions and easements secured for construction.

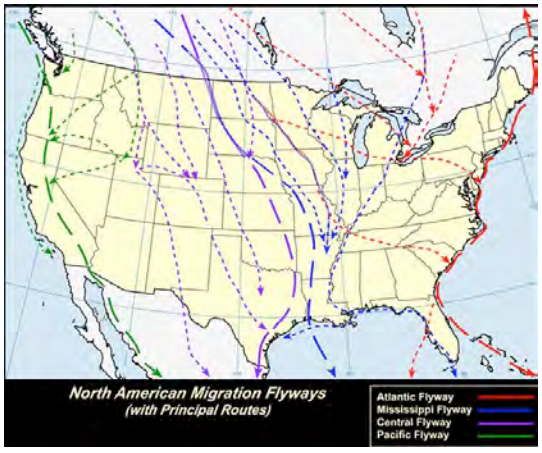
Grant Award:	June 1, 2014
Contractor Bidding Process:	July 1, 2014
Contractor Selected:	August 1, 2014
Construction Begins:	August 20, 2014
Construction Completed:	October 31, 2014

4. Describe the location of the project with attached location map, including details on the total area that will be directly enhanced by the project:

The BaySaver is proposed to be located within the Saratoga Springs Marina located at approximately 250 E Harbor Park Way, Saratoga Springs Utah 84045. The contributing drainage basin to be addressed with the BaySaver consists of approximately 1,597 acres of which about 165 acres is developed. Additional development is expected to occur within this area, and would be connected to this storm sewer system as it occurs. An estimated 36% of the developed portion of the drainage base basin is impervious and includes about 11,075 linear feet of storm sewer along with approximately 40 storm inlets boxes. Please see the attached maps.

5. Describe how the project will specifically enhance and protect waterways affected by the Willard Bay diesel release and improve the conditions of one or more of the following: wildlife, habitat, natural vegetation, water quality or emergency response:

The connected system of wetlands and riparian habitat including the Great Salt Lake, the Jordan River and Utah Lake are part of a trans-continental system. Migratory birds traveling distances up to 18,000 miles and ranging from Canada to South America rely on this network of water bodies to rest and refuel before they begin to cross the arid southwestern United States and northern Mexico. Migratory birds do not see a separation between Utah Lake, the Jordan River and the Great Salt Lake ecosystem, and the system must be thought of holistically. Efforts to improve water quality and habitat in any part of this regional system benefit not only that particular area, but also wildlife needs at a continental scale.



Based on National Oceanic and Atmospheric Administration data, it is estimated that 0.4167 feet of precipitation falls within the existing 165 developed acres within this drainage per year. Development in this area will continue to occur, and the magnitude of pollutants carried towards Utah Lake will only increase over time. The proposed BaySaver project will remove 84.81% of all pollutants collected by storm water runoff and that are currently being discharged into Utah Lake.

Specifically the BaySaver project would prevent the Utah Lake from receiving:

Pollutants*	Amount	Units	Est. Removal	Units
BOD	27.1936	lb/acre*ft	1,585.57	lb/yr
COD	198.5134	lb/acre*ft	9,574.70	lb/yr
TSS	274.6556	lb/acre*ft	10,110.31	lb/yr
Total Lead	0.3916	lb/acre*ft	22.83	lb/yr
Total Copper	0.0897	lb/acre*ft	5.23	lb/yr
Total Zinc	0.3671	lb/acre*ft	21.40	lb/yr
Total Kjeldahl Nitrogen	5.1668	lb/acre*ft	301.26	lb/yr
Nitrate + Nitrite	2.0015	lb/acre*ft	116.70	lb/yr
Total Phosphorus	1.0415	lb/acre*ft	60.73	lb/yr
Soluble Phosphorus	0.3889	lb/acre*ft	22.68	lb/yr

* Pollutants based on Nationwide Urban Runoff Program (US EPA 1983)

Urban Stormwater Load – Simple Method	
Annual Rainfall, P (inches) =	16
Annual Runoff, R (inches) =	5
Total Area, A (acres) =	165
Runoff Coefficient (Rv) =	0.37
% Capture, Pj =	0.9
Pollution Concentration, C (mg/L) =	60
Removal Efficiency % =	84.81%
L Sediment Load (lbs) =	11,921
L Sediment Load Treated (lbs) =	**10,110**

Notes:
Influent Concentration based on Pooled NURP/USGS National Median Concentration for Urban Residential.
Annual Runoff:
$R = P \times Pj \times Rv$
Sediment Load:
$L = 0.226 \times R \times C \times A$

The already compromised water quality of Utah Lake is described in the Division of Water Quality's Utah Lake Report:[6]

> "The EPA National Eutrophication Survey Program conducted in 1973-74 reported Utah Lake to be the most eutrophic lake of the 27 lakes survey in Utah. Furriman (1981) reported the lake to be hypereutrophic with a mean in-flow of phosphorus concentration of 0.218 mg/l and inorganic nitrogen concentration of 2.065 mg/l. Merritt and Wood's, *Utah Lake Phase I Report #20*, reported mean phosphorus concentration of 0.3 mg/l and nitrogen concentration of 1.56 mg/l. Pollution indicators have been established as part of the Standards of Water Quality for waters of the state for phosphate as P at 50 ug/L in streams and 25 ug/L in lakes; and nitrate as N at 4.0 mg/l. Applying these indicator values, it is evident that there is a very large nutrient loading into the lake to sustain algae growth."

The Lake's high level of phosphorous and nitrogen, causes algae blooms that are unsightly, odorous, and deplete oxygen levels in the water. While, depleted oxygen is less of a concern in Utah Lake, low levels of dissolved oxygen (DO) are of concern in the Jordan River. Continuing down the watershed, the water quality concerns that partially originate in Utah Lake enter the Great Salt Lake and degrade the quality of habitat in these unique wetlands.

6. Describe the project's connectivity to other natural areas or projects that further enhance wildlife, habitat, natural vegetation, water quality or emergency response:

The water quality benefits of the BaySaver project will complement and enhance a variety of other ongoing or recently completed projects. Improved water quality in Utah Lake will support the efforts of the Utah Lake Commission as they work to manage invasive vegetation and improve habitat and conditions for fish, birds, native vegetation, and humans including the reestablishment of the endangered June Sucker.

Implementation of storm water best management practices (BMPs) are recommendations included within a variety of planning documents for the region including: the Utah Lake Commission's Utah Lake Master Plan, the Jordan River Commission's Best Practices for Riverfront Communities toolbox, the Salt Lake County Water Quality Stewardship Plan, the Blueprint Jordan River, and the Division of Forestry Fire and State Land's Great Salt Lake Comprehensive Management Plan. Finally, the BaySaver project will support the Division of Water Quality's Jordan River TMDL process, by reducing the amount of phosphorus, sediment, and other pollutants from entering the Utah Lake and Jordan River water system.

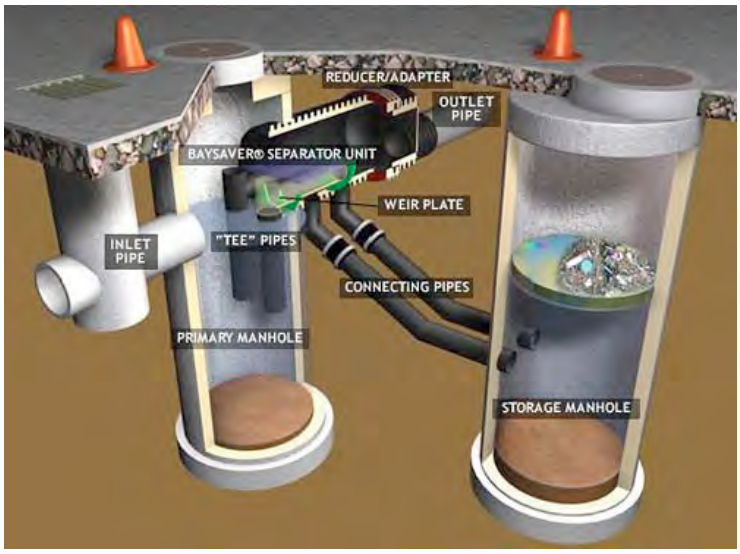
7. Describe any additional social benefits of implementing this project:

Ecosystem services are the benefits of the natural ecosystems on humankind. Improved water quality and aquatic habitat in Utah Lake and connected systems will increase opportunities for recreation (boating and fishing), as well as improve the overall appearance and aesthetics of these water bodies. The BaySaver is proposed to be located at the Saratoga Springs Marina, a location that experiences significant visitation for recreational uses, and the BaySaver will improve that experience. Educational signage at the proposed facility could serve to educate Saratoga Springs residents and visitors about storm water management and its role in improving water quality through the region. Finally, much of the water from Utah Lake and the Jordan River are used for irrigation, and improved water quality may enhance the safety and quality of these products for humans and livestock.

8. Project plans and details, including rights to work on specified piece of land:

The City of Saratoga Springs has fully engineered designs for the BaySaver and all easements in place to begin construction on this storm water BMP. The BaySaver is comprised of two pre-cast concrete manholes and a high-density polyethylene BaySaver Separator Unit. The primary manhole is set in-line with the storm drainpipe, and the storage manhole is offset to either side. The two manholes, which must be watertight, provide the retention time and storage capacity necessary to remove the target pollutants from the influent water. The BaySaver acts as a flow control device, diverting the influent water to the flow path that will result in the most efficient pollutant removal.

The primary manhole removes and retains coarse sediments from the influent water in an eight-foot deep sump. A portion of the influent flow is skimmed from the surface of the primary manhole by the BaySaver and conveyed into the storage manhole. This water enters and exits the off-line storage manhole at an elevation below the water surface and above the floor of the structure, allowing both flotation and sedimentation to occur. The fine sediments and floatables entrained in this water are retained in the storage manhole.



The BaySaver limits the flow through the storage manhole by allowing excess water to pass directly from the primary manhole to the outfall. During higher-intensity storms (usually two-year events), the BaySaver draws water from the center of the primary manhole, approximately four feet below the water surface, and discharges it to the outfall. At the same time, it continues to skim the surface water and treat it through the storage manhole. Extremely high flows are conveyed by the separator unit directly to the outfall, and bypass the storage manhole completely.

The storage manhole stores fine sediments, oils, and floatables off-line, and the internal bypass minimizes the risk of re-suspending and discharging these contaminants. Additionally, the system is designed to minimize the volume of water that must be removed during routine maintenance, which results in lower disposal fees.

The BaySaver device has the following capacities:

- Housing construction/dimensions – two 10-ft diameter concrete manholes
- Maximum treatment capacity – 21.8 cfs
- Peak design capacity – 100 cfs
- Sediment storage – 11.6 yd3
- Sediment chamber size – 10 ft diameter x 8 ft deep
- Floatables storage – 1,740 gal

Please see the detailed engineering drawings attached.

9. Describe your experience in implementing projects of similar scope and magnitude:

The City of Saratoga Springs has a professional engineering and public works department that is skilled in overseeing the design, construction and maintenance of capital projects. In FY 2013 the department oversaw the design, bid, and building of 38 capital projects totaling more than $7.4 million dollars. These projects ranged in size from $50,000 to almost $2,000,000. Storm water infrastructure comprised $1.4 million dollars of that budget. In 2010 the City designed, bid, and installed a CDS PSWC56_78 stormwater cleaning device on a 48" storm drain outfall to Utah Lake. CDS is a brand of oil/water separator similar to the BaySaver. The CDS PSWC56_78 was about $125,000 with a total installation cost around $150,000.

10. Describe how ongoing maintenance of the project will be funded and carried out:

The BaySaver will be regularly maintained to ensure continued effectiveness. The City of Saratoga Springs collects a storm water utility fee that is used to fund maintenance of the City's storm water facilities. The annual budget of the City's Storm Drain Enterprise Fund is about $350,000 with $30,000 specifically allocated for direct maintenance expenses, there is also additional revenue allocated to pay for wages and vehicles including a vacuum truck owned by the City..

Maintenance is performed using the City's vacuum truck when sediment levels reach two feet in either manhole. Access to the contaminant storage is available through 30-in. manhole covers in each structure, and the entire floor of each structure should be visible from the surface. Maintenance can be performed and inspected without confined space entry. The maintenance procedure typically takes from three to five hours. The City will follow BaySaver recommendations by removing all water, debris, oils, and sediment from the storage manhole using the vacuum truck. Then, using a high-pressure hose, the storage manhole should be cleaned and the cleaning water removed using the vacuum truck. The two structures should then be filled with clean water.

11. List consultants or agency partners that have participated in project development:

- Jordan River Commission
- City of Saratoga Springs
- Advanced Drainage Systems
- Bowen Collins & Associates

Signature: _____ Date 5/5/2014

Applicant

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[1] USGS. 2002. Water-Quality Assessment of the Great Salt Lake Basins, Utah, Idaho, and Wyoming - Environmental Setting and Study Design. U.S. Geological Survey. Water Resources Investigations Report 02-4114. National Water-Quality Assessment Program.

[2] Booth, D. et al. 2002. Forest Cover, Impervious-Surface Area, and The Mitigation of Stormwater Impacts. Journal of the American Water Resources Association.38 (3).

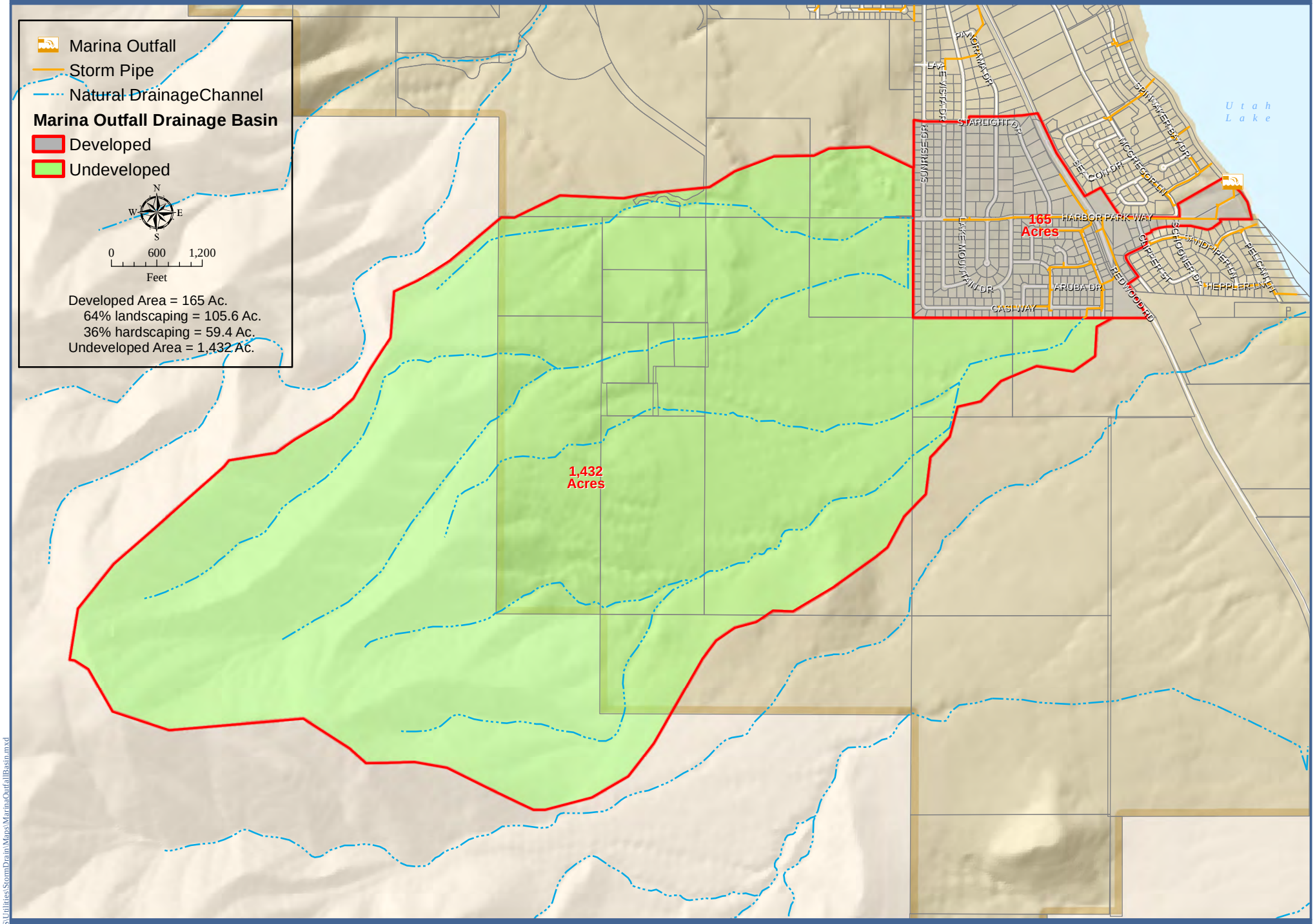
[3] Schueler. T.R. and H.K. Holland. eds. 2000. The practice of watershed protection. Ellicott City, MD: Center for Watershed Protection.

[4] Tilburg, C. and M. Alber. 2006. Impervious Surfaces: Review of Recent Literature. Georgia Coastal Research Council.

[5] Schueler, T.R. 1994. The importance of imperviousness. Watershed Protection Techniques 1(3):100–111.

[6] http://www.waterquality.utah.gov/watersheds/lakes/UTAHLAKE.pdf. Accessed on May 1, 2104.

Marina Storm Drain Outfall Basin



28 April 2014

S:\GIS\Utilities\StormDrain\Maps\MarinaOutfallBasin.mxd


HARBOR PARK WAY
Proposed location for 10K Baysaver
Utah Lake

CITY OF SARATOGA SPRINGS

SARATOGA SPRINGS MARINA OIL/WATER SEPARATOR PROJECT
BAYSAVER 10K
LOCATED IN SARATOGA SPRINGS MARINA AT 156 EAST HARBOR PARK WAY IN SARATOGA SPRINGS, UTAH

REGISTERED PROFESSIONAL ENGINEER
4-30-14
7870724
JEREMY D. LAPIN
STATE OF UTAH

GENERAL NOTES

1. THIS DESIGN IS AN ORIGINAL UNPUBLISHED WORK AND MAY NOT BE DUPLICATED, PUBLISHED AND/OR USED WITHOUT THE WRITTEN CONSENT OF CITY OF SARATOGA SPRINGS.

2. THESE SHEETS - LISTED BY DRAWING INDEX, ALL ACCOMPANYING SPECIFICATIONS FOR MATERIALS, WORKMANSHIP QUALITY, AND NOTES HAVE BEEN PREPARED SOLELY FOR THE CONSTRUCTION AND FINISH OF PROJECT IMPROVEMENTS, COMPLETE AND READY FOR USE.

3. ALL WORK IS TO BE PERFORMED IN ACCORDANCE WITH PERTINENT JURISDICTIONAL CODES, RESTRICTIONS, COVENANTS, AND/OR ORDINANCES. ANY CONFLICT BETWEEN DESIGN AND REQUIREMENT SHALL BE REPORTED TO CITY OF SARATOGA SPRINGS BEFORE PROCEEDING. FAILURE TO DO SO VOIDS THE DESIGN.

4. ANY AND ALL PROPOSED CHANGE, MODIFICATIONS AND/OR SUBSTITUTION SHALL BE REPORTED TO SARATOGA SPRINGS CITY BEFORE PROCEEDING. ANY DEVIATION FROM THE CONTRACT DOCUMENTS, WITHOUT THE EXPRESS WRITTEN AUTHORIZATION OF CITY OF SARATOGA SPRINGS VOIDS THE DESIGN.

5. IN THE EVENT OF CONFLICT BETWEEN THE DESIGN DOCUMENTS AND/OR JURISDICTIONAL REQUIREMENTS, THE MORE RESTRICTIVE FROM THE STANDPOINT OF SAFETY AND PHYSICAL SECURITY SHALL APPLY.

6. ANY INSTALLATION OR WORK NECESSARY TO THE FUNCTIONING, SAFETY AND/OR PHYSICAL SECURITY OF DESIGN THAT IS TO BE ENCAPSULATED OR OTHERWISE PERMANENTLY OBSCURED FROM INSPECTION SHALL BE REPORTED TO CITY OF SARATOGA SPRINGS A MINIMUM OF TWO (2) WORKING DAYS BEFORE ENCLOSURE.

7. DESIGN IS GENERALLY PREDICATED UPON PROVISIONS OF THE CURRENT EDITION OF THE INTERNATIONAL BUILDING CODE AND/OR AMENDMENTS AS MAY HAVE BEEN LOCALLY ENACTED. THIS DESIGN AND ANY CONSEQUENT CONSTRUCTION SHALL ACCOMMODATE ALL REQUIREMENTS OF THE JURISDICTIONAL FIRE SAFETY/PREVENTION DISTRICT.

8. ANY DAMAGE, DISRUPTION OR COMPROMISE OF AMBIENT RIGHTS-OF-WAY, UTILITIES, OR ENVIRONMENTAL QUALITY SHALL BE IMMEDIATELY RECTIFIED BY THE CONTRACTOR TO THE SATISFACTION OF CITY OF SARATOGA SPRINGS AT NO COST TO THE OWNER.

9. THIS DESIGN PURPORTS TO PERMIT FULL ACCESS TO HANDICAPPED PERSONS AS PROVIDED FOR BY PROVISIONS OF FEDERAL LAW. ANY DEVIATION OR COMPROMISE SHALL BE REPORTED TO CITY OF SARATOGA SPRINGS FOR RESOLUTION.

10. ALL WORK SHALL BE INSPECTED BY GOVERNING AGENCIES IN ACCORDANCE WITH THEIR REQUIREMENTS. JURISDICTIONAL APPROVAL SHALL BE SECURED BEFORE PROCEEDING WITH WORK

UTILITY NOTES

1. VERIFY DEPTH AND LOCATION OF ALL EXISTING UTILITIES PRIOR TO CONSTRUCTING ANY NEW UTILITY LINES. NOTIFY CIVIL ENGINEER OF ANY DISCREPANCIES OR CONFLICTS PRIOR TO ANY CONNECTIONS BEING MADE.

2. WATER INFRASTRUCTURE ARE TO BE INSTALLED PER CURRENT WATER DISTRICT STANDARDS AND SPECIFICATIONS. IT WILL BE THE CONTRACTORS RESPONSIBILITY TO INSTALL ALL ITEMS REQUIRED.

4. WATER LINES, VALVES, FIRE HYDRANTS, FITTINGS ETC. ARE TO BE CONSTRUCTED AS SHOWN. CONTRACTOR IS RESPONSIBLE TO CONSTRUCT ANY VERTICAL ADJUSTMENTS NECESSARY TO CLEAR SEWER, STORM DRAIN OR OTHER UTILITIES AS NECESSARY INCLUDING VALVE BOXES AND HYDRANT SPOOLS TO PROPER GRADE.

5. FIELD VERIFY ALL EXISTING AND/OR PROPOSED CONNECTIONS TO STORM WATER SYSTEM WITH CIVIL, PLUMBING & ARCHITECTURAL PLANS, NOTIFY ENGINEER OF ANY DISCREPANCIES.

6. ALL CATCH BASINS AND INLET BOX GRATES ARE TO BE BICYCLE SAFE.

EROSION CONTROL NOTES

1. AT ALL TIMES DURING CONSTRUCTION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR PREVENTING AND CONTROLLING EROSION DUE TO WIND AND RUNOFF. THE CONTRACTOR SHALL ALSO BE RESPONSIBLE FOR MAINTAINING THE EROSION CONTROL FACILITIES SHOWN ON THE PLAN.

2. CONTRACTOR SHALL BE RESPONSIBLE FOR CLEANING DRAINAGE AND EROSION CONTROL FACILITIES AS REQUIRED. STREETS SHALL BE KEPT CLEAN OF DEBRIS FROM TRAFFIC FROM THE SITE.

3. CONTRACTOR SHALL USE VEHICLE TRACKING CONTROL AT ALL LOCATIONS WHERE VEHICLES WILL ENTER OR EXIT THE SITE. CONTROL FACILITIES WILL BE MAINTAINED WHILE CONSTRUCTION IS IN PROGRESS, MOVED WHEN NECESSARY, AND REMOVED WHEN THE SITE IS PAVED.

4. INLET PROTECTION DEVICES SHALL BE INSTALLED IMMEDIATELY UPON INDIVIDUAL INLETS BECOMING FUNCTIONAL.

5. ALL WASH WATER (CONCRETE TRUCKS, VEHICLE CLEANING, ETC.) SHALL BE DISPOSED IN A MANNER THAT PREVENTS CONTACT WITH STORM WATER DISCHARGES FROM THE SITE.

6. FUGITIVE DUST AREAS SHALL BE CONTROLLED BY SPRAYING WATER ON THE DRY AREAS OF THE SITE.

7. NO RUBBISH, TRASH, GARBAGE OR OTHER SUCH MATERIALS SHALL BE DISCHARGED INTO DRAINAGE DITCHES OR WATERS OF THE STATE.

8. ALL MATERIALS SPILLED, DROPPED, WASHED OR TRACKED FROM VEHICLES ONTO ROADWAYS OR INTO STORM DRAINS MUST BE REMOVED IMMEDIATELY.

9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ADJUSTING THE EROSION CONTROL MEASURES (SILT FENCES, STRAW BALES, ETC.) DUE TO GRADE CHANGES OR OTHER UNFORESEEN CONDITIONS DURING DEVELOPMENT OF THE PROJECT.

INDEX

C1	COVER PAGE
SP1	SITE PLAN 1
SP2	SITE PLAN 2
D1	BAYSAVER DETAILS

CONSTRUCTION NOTES

1. ALL WORK WITHIN THE SITE TO CONFORM TO THE CURRENT CITY STANDARDS AND SPECIFICATIONS.

2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MEETING ALL OF THE REQUIREMENTS ESTABLISHED FOR SAFE TRENCHING. (SEE OSHA AND UOSHA REQUIREMENTS, LATEST EDITIONS).

3. CONTRACTOR SHALL LOCATE ALL UNDERGROUND UTILITIES BEFORE LAYING PIPE WITHIN 200 FEET OF SAID UTILITIES WHICH MAY BE EXPOSED, DAMAGED OR CROSSED AS SHOWN ON THE DRAWINGS OR AS "BLUE STAKED". THE CONTRACTOR WILL MAKE ARRANGEMENTS WITH THE UTILITY COMPANY TO MOVE THE UTILITY IF NECESSARY OR OBTAIN PERMISSION FROM THE PROJECT ENGINEER TO MODIFY GRADES OF PROJECT LINES IN ORDER TO GO AROUND EXISTING UTILITIES.

4. SEWER MAINS, WATER MAINS, GAS MAINS AND OTHER UTILITIES ARE SHOWN ON THE PLANS IN A GENERAL SCHEMATIC WAY ACCORDING TO INFORMATION RECEIVED FROM OTHERS AND SOMETIMES FROM FIELD MEASUREMENTS. THE ACCURACY OR COMPLETENESS OF THE LOCATIONS SHOWN IS APPROXIMATE ONLY. THE CONTRACTOR SHALL DETERMINE THE ACTUAL LOCATION OF EXISTING SERVICE CONNECTIONS AND UTILITIES, VERIFY THE HORIZONTAL AND VERTICAL LOCATIONS AND TAKE THE NECESSARY STEPS TO AVOID THEM.

5. SPECIFIC INFORMATION PROVIDED IN THE CONTRACT DOCUMENTS SHALL SUPERSEDE ITEMS COVERED IN THESE DRAWINGS.

General Notes

No.	Revision/Issue	Date

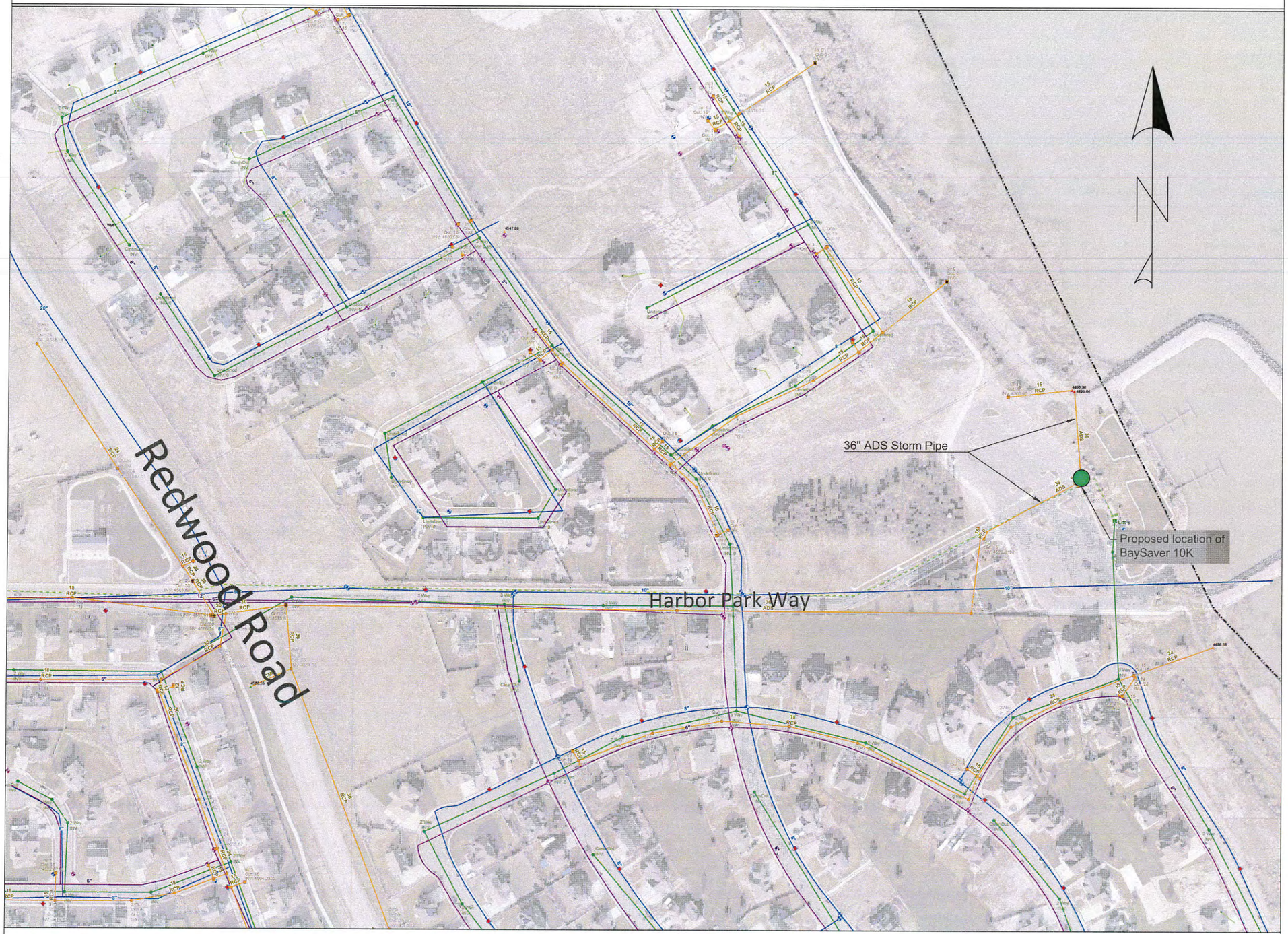
Firm Name and Address

CITY OF SARATOGA SPRINGS
1307 N. COMMERCE DR.
#200
SARATOGA SPRINGS, UT 84045
(801)-766-9793

Project Name and Address

Baysaver Oil/Water Separator
Saratoga Springs Marina
156 E. Harbor Park Way
Saratoga Springs, Utah, 84005

Project: Oil/Water Separator
Date: APRIL 2014
Scale: As Noted
Sheet: C1



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Baysaver Oil/Water Separator
Saratoga Springs Marina
156 E. Harbor Park Way
Saratoga Springs, Utah, 84005

Project	Sheet
Oil/Water Separator	SP1
Date: APRIL 2014	
Scale: As Noted	

General Notes

No.	Revision/Issue	Date

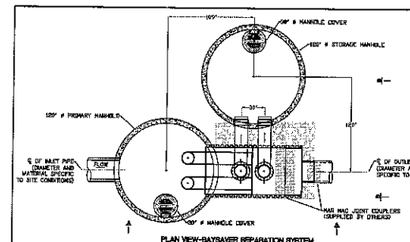
Firm Name and Address

CITY OF SARATOGA SPRINGS
1307 N. COMMERCE DR.
#200
SARATOGA SPRINGS, UT 84045
(801)-766-9793

Project Name and Address

Baysaver Oil/Water Separator
Saratoga Springs Marina
156 E. Harbor Park Way
Saratoga Springs, Utah, 84005

Project	Sheet
Oil/Water Separator	SP2
Date: APRIL 2014	
Scale: As Noted	



INLET PIPE INVERT=	XX.XX
INLET PIPE ID AND MATERIAL=	XXXX
OUTLET PIPE INVERT=	XX.XX
OUTLET PIPE ID AND MATERIAL=	XX.XX
PRIMARY MANHOLE RIM ELEVATION=	XX.XX
STORAGE MANHOLE RIM ELEVATION=	XX.XX
ORIENTATION (RIGHT OR LEFT)=	

GENERAL NOTES:

1. MANHOLES SHOWN REPRESENT STANDARD PRECAST STRUCTURES PROVIDED BY OTHERS.
2. SEAL THE CONNECTING PIPES INTO THE STORAGE MANHOLE USING RUBBER BOOTS/GASKETS.
3. THE BAYSAVER SEPARATION SYSTEM INCLUDES THE SEPARATOR UNIT, (2) CONNECTING PIPES AND (2) MAR MAC COUPLERS.
4. UNLESS OTHERWISE SHOWN FOR RIGHT HAND ORIENTATION ROTATE STORAGE MANHOLE AND CONNECTING PIPES 180°.
5. SEE BAYSAVER SPECIFICATIONS AND INSTALLATION INSTRUCTIONS FOR FURTHER DETAIL.
6. USE NON-SHRINK GROUT TO SEAL THE INLET PIPE AND BAYSEPARATOR 36 TO THE PRIMARY MANHOLE.
7. BACKFILL CLASS I, II OR III BACKFILL SHOULD BE USED TO AN ELEVATION OF AT LEAST 6" OVER THE CROWN OF THE SEPARATOR UNIT.
8. 24" COVER REQUIRED FOR TRAFFIC RATED SURFACE.
9. BAYSEPARATOR IS PROTECTED BY US PATENT NO. 5,746,911

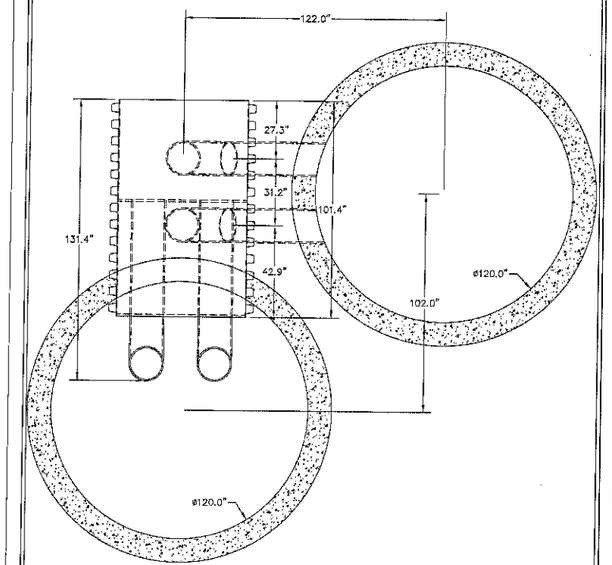
REV	DESCRIPTION	DATE	APPR
	NOTES:		

BAYSAVER TECHNOLOGIES, INC.
Engineering Stormwater Solutions
www.BaySaver.com 888.293.7283

DESIGNED:	TEP	DATE:	11/20/08
DRAWN:	DKH	SCALE:	N.T.S.
CHECKED:	DKH	DWG NO:	10K

10K BAYSEPARATOR™
GENERAL SYSTEM DETAILS

BAYSAVER® SEPARATION SYSTEMS PROTECTED BY U.S. PATENT

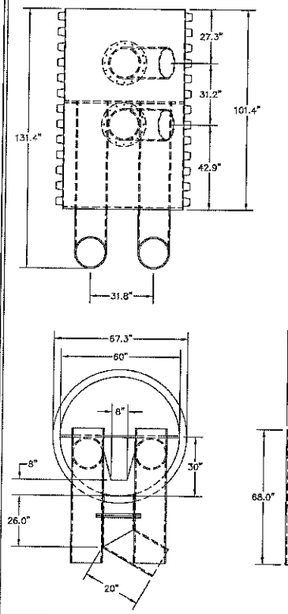


BAYSAVER®
1302 RISING RIDGE ROAD UNIT 1
MOUNT AIRY, MD 21771
(301) 829-6470

DESIGNED:	TEP
DRAWN:	PTT
CHECKED:	ATM
DATE:	8/8/03
SCALE:	N.T.S.
SHEET:	1 OF 2

10K SEPARATOR UNIT
LAYOUT 120X120

BAYSAVER® SEPARATION SYSTEMS PROTECTED BY U.S. PATENT



FABRICATION NOTES:

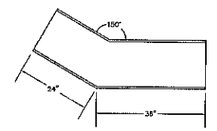
1. SEPARATOR UNIT SHALL BE CONSTRUCTED ENTIRELY OF HIGH DENSITY POLYETHYLENE. HDPE MATERIAL SHALL CONTAIN CARBON-BLACK TO PROVIDE UV RESISTANCE.
2. ALL JOINTS SHALL BE WELDED BY EXTRUSION WELDING OR BUTT-FUSION WELDING. BUTT-FUSED JOINTS SHALL BE REINFORCED BY AN EXTRUDED BEAD AROUND THE FUSION AREA.
3. SOLID WALL HDPE PIPE SHALL BE MINIMUM SDR-26.
4. HDPE PLATE SHALL BE 3/4" THICKNESS.

BAYSAVER®
1302 RISING RIDGE ROAD UNIT 1
MOUNT AIRY, MD 21771
(301) 829-6470

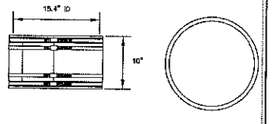
DESIGNED:	TEP
DRAWN:	PTT
CHECKED:	ATM
DATE:	8/13/03
SCALE:	N.T.S.
SHEET:	1 OF 2

10K SEPARATOR UNIT

BAYSAVER® SEPARATION SYSTEMS PROTECTED BY U.S. PATENT

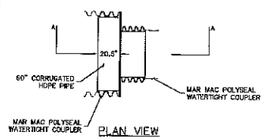


HDPE CONNECTION PIPES
FOR CONNECTION TO STORAGE MANHOLE
NOT TO SCALE

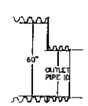


FERNCO FITTING DETAIL
(NOT TO SCALE)
FERNCO PART # 1006-1515
SHEAR RING PART # SR-09

HDPE-HDPE REDUCER DETAIL
FOR USE WITH OUTLET PIPES
NOT TO SCALE



PLAN VIEW



SECTION AA

BAYSAVER®
1302 RISING RIDGE ROAD UNIT 1
MOUNT AIRY, MD 21771
(301) 829-6470

DESIGNED:	TEP
DRAWN:	PTT
CHECKED:	ATM
DATE:	8/13/03
SCALE:	N.T.S.
SHEET:	2 OF 2

10K SEPARATOR UNIT
NOTES AND DETAILS

General Notes

No.	Revision/Issue	Date

Firm Name and Address

CITY OF SARATOGA SPRINGS
1307 N. COMMERCE DR.
#200
SARATOGA SPRINGS, UT 84045
(801)-766-9793

Project Name and Address

Baysaver Oil/Water Separator
Saratoga Springs Marina
156 E. Harbor Park Way
Saratoga Springs, Utah, 84005

Project	Oil/Water Separator
Date	APRIL 2014
Scale	As Noted
Sheet	D1

UNIVERSITY OF MINNESOTA

Twin Cities Campus

Saint Anthony Falls Laboratory
Engineering, Environmental and Geophysical Fluid Dynamics

Department of Civil Engineering
Institute of Technology

Mississippi River at 3rd Avenue S. E.
Minneapolis, MN 55414

Dept. Main Office: 612-624-4363
Fax: 612-624-4398

August 21, 2008

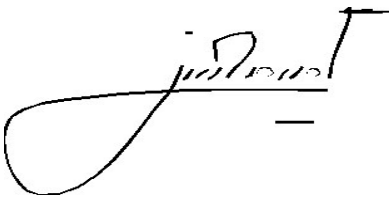
Tom Pank
BaySaver Technologies, Inc.
Engineering Stormwater Solutions
1367 Boxwood
Jackson, MO 63755

Dear Mr. Pank,

As stated in the SAFL Project Report no. 472 entitled "Performance Evaluation of the BaySaver Stormwater Separation System", we conducted four tests on the BaySaver Modified Separator 1K Unit to determine its efficiency in removing oil. The ASTM D6104-97 *Standard Practice for Determining the Performance of Oil/Water Separators Subjected to Surface Run-off* was followed. Vegetable oil was used in the experiment. The specific gravity of this oil was measured to be 0.922. The average removal efficiency of the unit using grab samples was 80%. In all tests, no free oil was evident in the effluent pipe.

If you have any questions, feel free to contact me at 952-832-2665 or via email at omohseni@umn.edu.

Regards,



Omid Mohseni, Ph.D., P.E.

BaySaver® Separation System
Total Suspended Solids Removal Data

University of Maryland Test Data

BaySaver® 3K with two 60" manholes located at a vehicle maintenance and storage facility in Rockville, MD.

- Impervious acreage - 3.67 acres.
- Parking for 128 buses on 3.51 acres of asphalt.
- 7,000 sq. ft. of green space.
- 24" RCP inlet pipe.
- Automatic sampler - 2 minute intervals.

University of Maryland was the third party test administrator at this commercial installation. (Tables 1 - 3)

Storm Date	Average In (mg/L)	Average Out (mg/L)	Peak Flow Rate (cfs)	Peak Flow Rate (gpm)	Average Removal %	
4-1-99	503	41	.47	211	91%	LowFlow Treatment
5-22-99	2019	59	6.31	2,833	97%	Maximum Treatment
6-14-99	524	122	24.33	10,910	76%	Flood Treatment
		Average:	**10.37**	**4,651**		
				Average Removal:	**88%**	

BaySaver Technologies™ / University of Maryland TSS Removal Study Review

The University of Maryland at College Park conducted a field study of a 3K BaySaver® Separation System which is located at a Montgomery county school bus depot in Rockville, Maryland. The unit was installed in the winter of 1998 when some stormwater renovations were being done at the site. The unit is being utilized as a hydrodynamic pretreatment for a detention pond. Samples from the installed BaySaver® system were taken during storm events over a period from June 30, 1998 until June 14, 1999. The bus depot houses approximately 128 buses and has a drainage area of 3.67 acres. This area is composed of approximately 3.51 acres of impervious cover (asphalt) and 0.16 acres of grass, which drains into an inlet and is located just upstream from the BaySaver® system.

Input samples were taken just upstream of the primary manhole for the 3K BaySaver® system. The output samples were taken just past the outlet of the separator system. These samples were collected using two ISCO® 6700 Compact Portable samplers that contained twenty-four 500-ml propylene bottles each and stored in one-liter HDPE or Nalgene LDPE bottles. At the beginning of each storm, samples were taken at two-minute intervals. After the first eight samples, the sampling interval was increased.

Standard Method 209C was followed to measure the Total Suspended Solids in each sample. Gelman® Supor® 1.0 µm pore diameter A/E glass type filters were rinsed, dried and weighed before they were used to capture the suspended solids from 100 ml influent and effluent samples. The filters were then dried at ~104°C for at least one hour until consecutive weightings were within 0.5 mg (Table 1 through 3).

Rainfall and flowrate data were recorded and printed automatically by an ISCO® Model 4250 flow meter. Flowrate was computed using depth and velocity data obtained by a flowmeter probe mounted just inside the inlet to the primary manhole. The rainfall intensity was measured using a tip bucket.

A particle distribution sieve analysis from another 3K BaySaver® Separation System is on Page 4

BaySaver® Separation System TSS Removal Data - Summary

BaySaver® 3K System Suspended Solids Data			
University of Maryland Data			
Storm Date	**Average-In (mg/L)**	**Average-Out (mg/L)**	**Average Removal (%)**
4/01/99	503	41	91.28
5/22/99	2171	59	97.29
6/14/99	524	122	75.56
	Average Removal:		**88.04%**

BaySaver Technologies 3K TSS System Removal Data - Detail

Peak Flow Rate: .47 cfs (211 gpm)

Table 1. TSS Data for 4/1/1999

Sample	Time (min)	TSS In (mg/L)	Sample	Time (min)	TSS Out (mg/L)
1	0	7600	1	0	160
2	2	570	2	2	28
3	6	75	4	6	16
4	8	87	5	8	22
5	10	380	6	10	27
6	12	130	7	12	87
7	14	13	8	14	16
8	16	13	9	16	28
9	24	200	11	24	66
10	25	340	12	28	54
11	32	190	13	32	92
12	36	190	14	36	48
13	40	270	15	40	81
14	44	75	16	44	12
15	48	240	17	48	74
16	54	110	18	54	16
17	100	340	19	100	39
18	106	41	20	106	20
19	112	86	21	112	25
20	118	29	22	118	8
21	124	41	23	124	17
22	130	33	24	130	9
23	142	26	25	142	21
	Avg. In	**503**		**Avg. Out**	**41**

Collection Efficiency: 91.28%

BaySaver Technologies 3K TSS System Removal Data – Detail (Continued)

Peak Flow Rate: 6.31 cfs (2,833 gpm)
Table 2. TSS Data for 5/22/1999

Sample	Time (min)	TSS In (mg/L)	Sample	Time (min)	TSS Out (mg/L)
1	1	53000	1	3	35
2	2	470	2	4	50
3	4	350	3	6	54
4	6	490	4	8	200
5	8	320	5	10	190
6	10	360	6	12	140
7	11	140	7	14	120
8	14	380	8	16	110
9	16	200	9	18	83
10	18	180	10	21	89
11	22	97	11	24	79
12	23	78	12	28	56
13	26	91	13	29	41
14	27	53	14	32	28
15	30	31	15	34	34
16	34	48	16	36	35
17	35	23	17	40	20
18	38	12	18	41	20
19	42	23	19	44	34
20	43	17	20	48	5
21	46	10	21	49	12
22	48	14	22	52	26
23	50	14	23	58	23
24	56	8	24	59	12
25	58	11	25	104	22
26	102	18	26	110	14
	Ave. In	**2171**		**Avg. Out**	**59**

Collection Efficiency: 97.29%

Peak Flow Rate: 24.33 cfs (10,910 gpm)
Table 3. TSS Data for 6/14/1999

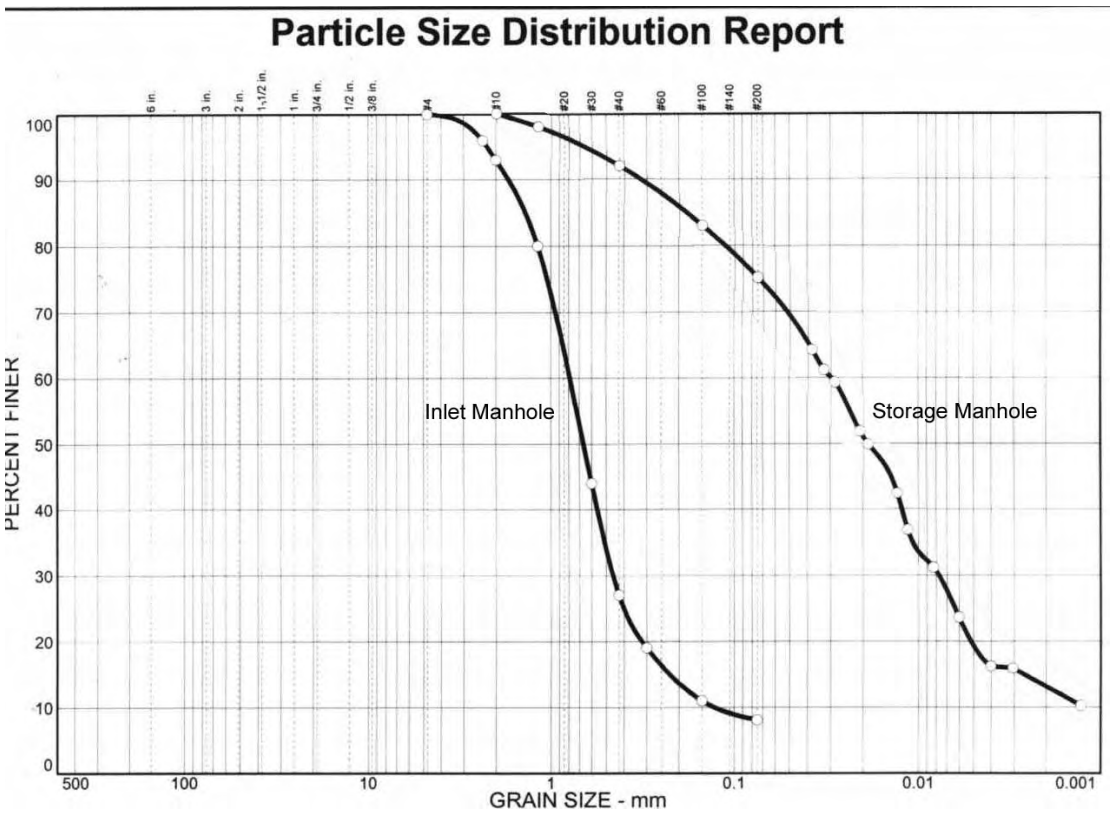
Sample	Time (min)	TSS In (mg/L)	Sample	Time (min)	TSS Out (mg/L)
1	0	1700	1	1	1000
2	2	7100	2	3	910
3	4	690	3	5	310
4	6	150	4	7	290
5	7	100	5	8	88
6	10	120	6	11	79
7	11	56	7	12	60
8	14	61	8	15	73
9	15	31	9	16	46
10	18	32	10	19	49
11	22	20	11	22	36
12	26	19	12	27	45
13	28	19	13	28	44
14	30	9	14	31	20
15	34	9	15	35	14
16	36	16	16	36	39
17	38	22	17	39	35
18	40	690	18	40	160
19	42	3400	19	43	130
20	46	300	20	47	42
21	50	29	21	51	7
22	54	22	22	55	23
23	58	10	23	59	10
24	104	10	24	105	13
25	110	20	25	111	16
26	116	13	26	117	14
27	122	11	27	123	12
28	128	10	28	129	21
	Avg. In	**524**		**Avg. Out**	**128**

Collection Efficiency: 75.56%

BaySaver® Particle Distribution Sieve Analysis

The results below summarize the particle size distribution of collected sediments that were sampled and tested from each of the manholes in a 3K BaySaver® Separation System in Sparks, Nevada. The percentages reported are for particular particle size distributions of actual sediments separated and retained by the BaySaver® system.

As you can see by the graph, the BaySaver® removed fine sediments as small as one micron. In fact 64% of the sediments collected in the storage manhole were smaller than 38 microns. Testing was completed by a third party using ASTM D422 methodology.



Inlet Manhole Sediments

Sand thru:

# 4 sieve	**4.750 mm**	**100.0%**
# 8 sieve	**2.360 mm**	**96.0%**
# 10 sieve	**2.000 mm**	**93.0%**
# 16 sieve	**1.180 mm**	**80.0%**
# 30 sieve	**0.600 mm**	**44.0%**
# 40 sieve	**0.425 mm**	**27.0%**
# 50 sieve	**0.300 mm**	**19.0%**
# 100 sieve	**0.150 mm**	**11.0%**
# 200 sieve	**0.075 mm**	**8.1%**

Storage Manhole Sediments

Sand thru:

# 10 sieve	**2.000 mm**	**100.0%**
# 16 sieve	**1.180 mm**	**98.0%**
# 40 sieve	**0.425 mm**	**92.0%**
# 100 sieve	**0.150 mm**	**83.0%**
# 200 sieve	**0.075 mm**	**75.1%**
# 400 sieve	**0.038 mm**	**64.1%**

Testing Agency – Stantec Consulting, Inc. Date of Test – April 15, 2002.

For a copy of the full sediment capture data report please contact BaySaver Technologies, Inc.