APPENDIX B

VE IDEA EVALUATION

LONGVIEW VALUE ENGINEERING STUDY
WATER SUPPLY ALTERNATIVES

VE IDEA NUMBER: E1

DESCRIPTION: Install gravity grit separator

EVALUATED BY: Sindt

ORIGINAL CONCEPT:

Hyrdocyclone (Krebs Engineering) separators

PROPOSED ALTERNATIVE:

Conventional gravity grit separator basin with circular grit collectors
Grit pumps
Locate basin in area of existing sludge dewatering basins
Relocate sludge dewatering basins

ADVANTAGES:
Better equipped to handle periodic very large grit loading
More effective at removing grit before it gets into main treatment plant
Reduction in maintenance associated with grit escaping into main treatment plant

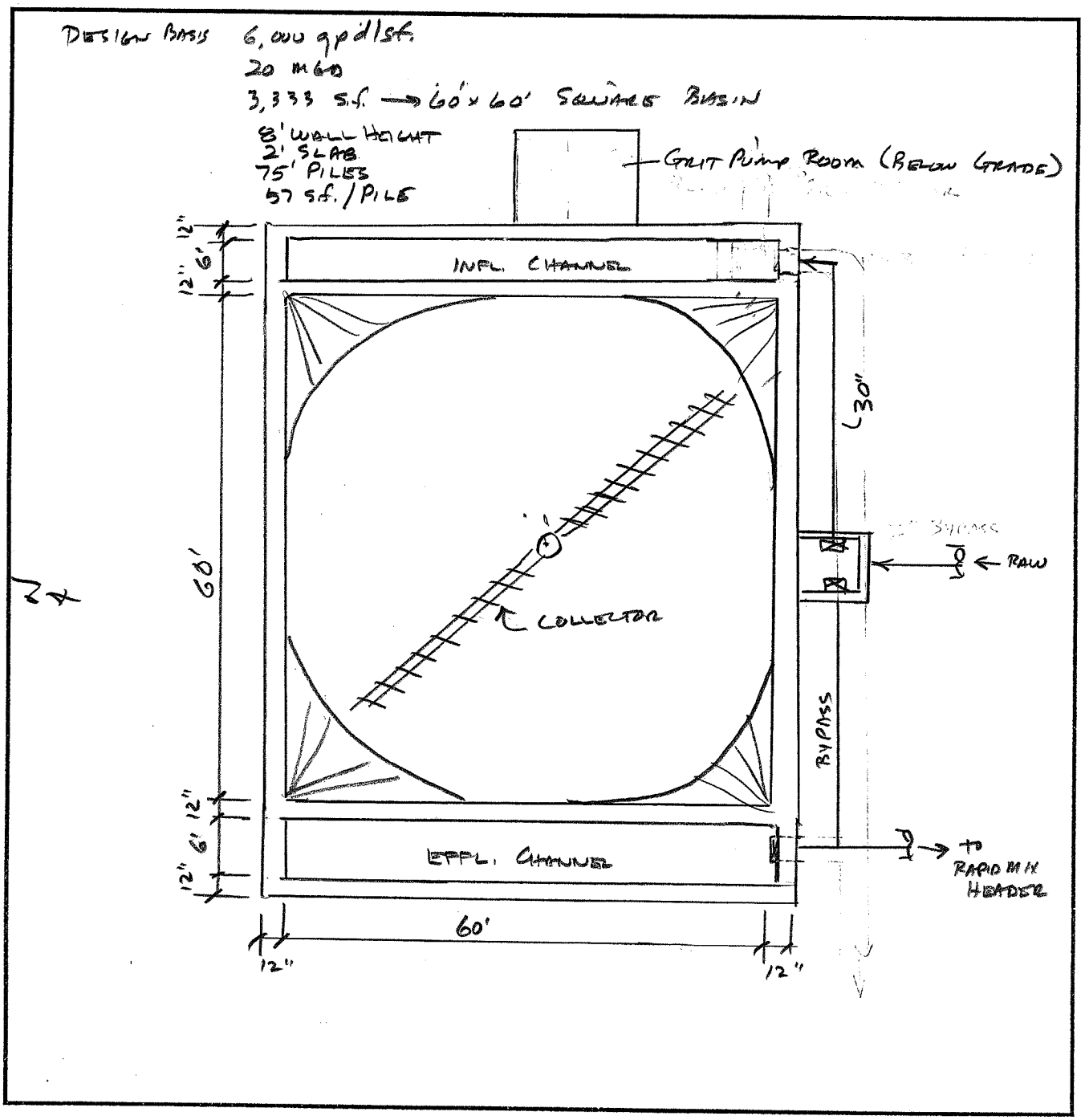
DISADVANTAGES:
Increases capital cost
(Savings in operation and maintenance will offset some of the added capital but it is not possible to accurately estimate these savings and they are not shown below)

	ORIGINAL	ALTERNATIVE ONE	ALTERNATIVE TWO
INITIAL COST	$445,000	$1,210,000	
INITIAL SAVINGS	XXXXXXXXXXXXXXXXX	($765,000)	
ANNUAL COST			
ANNUAL SAVINGS	XXXXXXXXXXXXXXXXX		
PW SAVINGS	XXXXXXXXXXXXXXXXX		

WORKSHEET

No. - DESCRIPTION: E-1 GRAVITY GRIT SEPARATOR

BY: SINOT



VALUE ENGINEERING

DEVELOPMENT PHASE

ESTIMATE WORKSHEET

PROJECT NAME: LONGVIEW, WA CWTP

PROJECT NO.: _____ DATE: 8/29/07 WRITTEN BY: SINOT

ALT. NO.: E-1 GRAVITY GRIT SEPARATOR COSTS FOR: (check one) ☐ Original. ☒ Alternative.

ITEM	QUANTITY		LABOR		MATERIAL		TOTAL COST
	No. Units	Unit Meas.	Per Unit	Total	Per Unit	Total	
PILING							
(65)(80) s.f./57 s.f./PILE (BASED ON 1998 SOLIDS RESEARCH TANK DESIGN)							
= 91 PILES x 75 ft/PILE =	6,800	LF			40		272,000
BASE SLAB (65)(80)(1)/27	193	CY			600		116,000
WALLS (75+75+(4)60)(8)(1)/27	116	CY			1000		116,000
PUMP ROOM STRUCTURE		LS					50,000
MECHANISM - EQUIPMENT		LS					90,000
- INSTALL		LS					30,000
GRIT PUMP							30,000
SLUICE GATES, 30"	3	EA					6,000
WEIRS		LS					4,000
YARD PIPING - 30" D.I.P.	180	LF			350		63,000
GRIT PIPING ALLOWANCE							20,000
ELECTRICAL ALLOWANCE							20,000
SITE WORK ALLOWANCE							20,000
SUBTOTAL							837,000
O.H. P. CONTINGENCY 38%							318,000
ADD: RELOCATE SOLIDS DEWATERING BASINS							54,000
					TOTAL		$1,209,000

VALUE ENGINEERING

DEVELOPMENT PHASE

ESTIMATE WORKSHEET

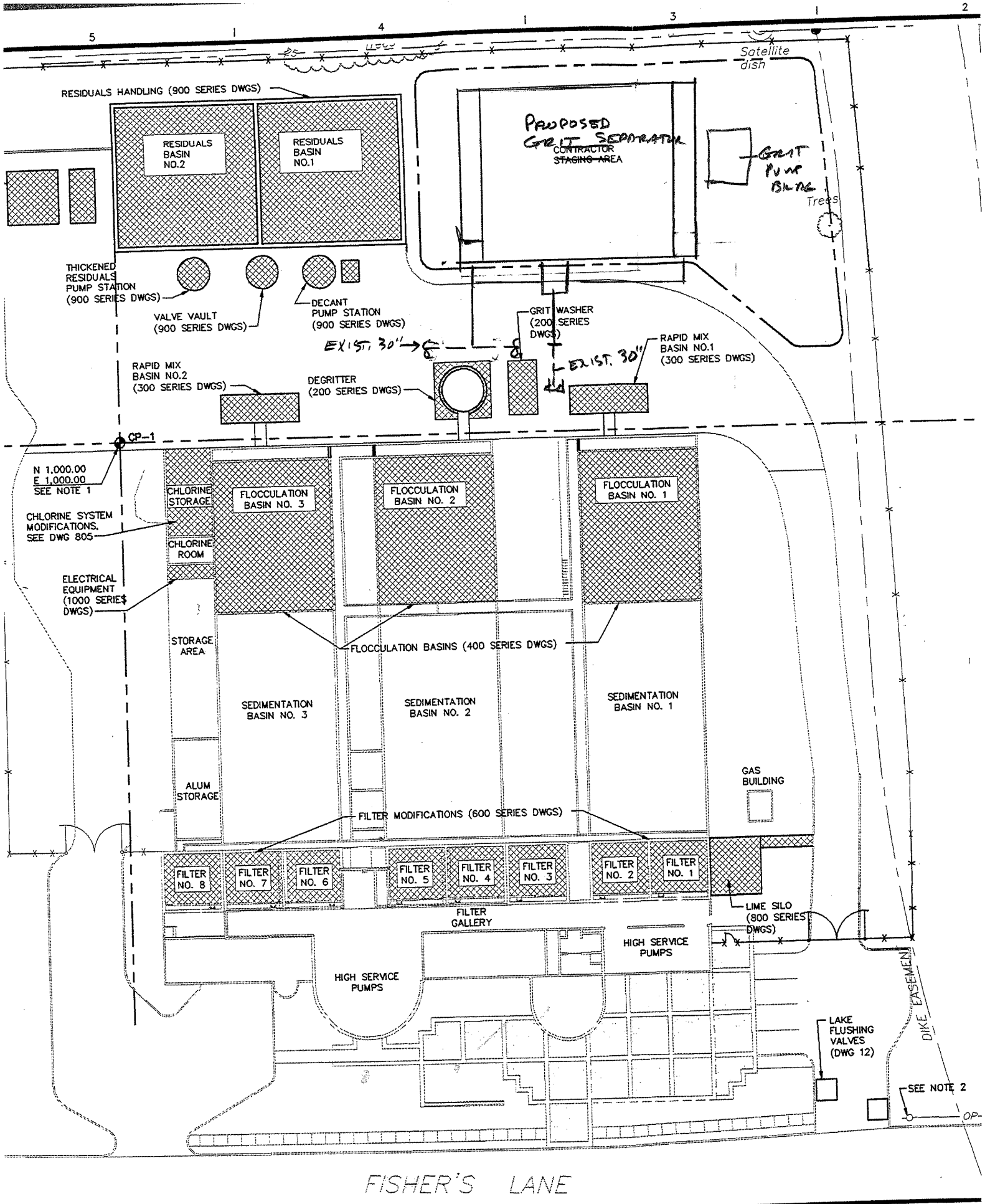
PROJECT NAME: Longview WTP

PROJECT NO.: ______ DATE: 8/29/07 WRITTEN BY: Sindt

ALT. NO.: E-1 Gravity Grit Separator COSTS FOR: (check one) ☒ Original. ☐ Alternative.

ITEM	QUANTITY		LABOR		L + MATERIAL		TOTAL COST
	No. Units	Unit Meas.	Per Unit	Total	Per Unit	Total	
Original Design							
Grit Removal Equipment	Installed	(Ref: Pace Est.,			Item 2.0)		335,000
Add: Raw Piping to	Proposed		Grit Cyclones				
30" DIP	180	LF			330		60,000
Pipe Supports							20,000
Subtotal Adds							80,000
O.H, P, Conting. (38%)							30,000
Total Adds.							110,000
Total Original Design							445,000

TOTAL 445,000


RESIDUALS HANDLING (900 SERIES DWGS)
RESIDUALS BASIN NO.2
RESIDUALS BASIN NO.1
PROPOSED GRIT SEPARATOR
CONTRACTOR STAGING AREA
GRIT PUMP BLDG.
Satellite dish
Trees
THICKENED RESIDUALS PUMP STATION (900 SERIES DWGS)
VALVE VAULT (900 SERIES DWGS)
DECANT PUMP STATION (900 SERIES DWGS)
GRIT WASHER (200 SERIES DWGS)
EXIST. 30"
EXIST. 30"
RAPID MIX BASIN NO.1 (300 SERIES DWGS)
RAPID MIX BASIN NO.2 (300 SERIES DWGS)
DEGRITTER (200 SERIES DWGS)
CP-1
N 1,000.00
E 1,000.00
SEE NOTE 1
CHLORINE STORAGE
CHLORINE ROOM
CHLORINE SYSTEM MODIFICATIONS, SEE DWG 805
ELECTRICAL EQUIPMENT (1000 SERIES DWGS)
FLOCCULATION BASIN NO. 3
FLOCCULATION BASIN NO. 2
FLOCCULATION BASIN NO. 1
FLOCCULATION BASINS (400 SERIES DWGS)
STORAGE AREA
SEDIMENTATION BASIN NO. 3
SEDIMENTATION BASIN NO. 2
SEDIMENTATION BASIN NO. 1
ALUM STORAGE
GAS BUILDING
FILTER MODIFICATIONS (600 SERIES DWGS)
FILTER NO. 8
FILTER NO. 7
FILTER NO. 6
FILTER NO. 5
FILTER NO. 4
FILTER NO. 3
FILTER NO. 2
FILTER NO. 1
FILTER GALLERY
LIME SILO (800 SERIES DWGS)
HIGH SERVICE PUMPS
HIGH SERVICE PUMPS
LAKE FLUSHING VALVES (DWG 12)
DIKE EASEMENT
SEE NOTE 2
FISHER'S LANE

LONGVIEW VALUE ENGINEERING STUDY
WATER SUPPLY ALTERNATIVES

VE IDEA NUMBER: E5

DESCRIPTION: Replace existing flocc/sed basins with Actiflo clarifier

EVALUATED BY: Hansen

ORIGINAL CONCEPT:

Retain and rehabilitate existing flocculation and sedimentation basins

PROPOSED ALTERNATIVE:

Demolish flocc/sed basin number two and install new high-rate Actiflo basin in that location

ADVANTAGES:

Replaces existing floc/sed facilities and provides 20 mgd of capacity. Eliminates old basins and associated maintenance of existing equipment.

DISADVANTAGES:

Substantially greater cost than rehabilitating existing basins
(Savings in operation and maintenance will offset some of the added capital but it is not possible to accurately estimate these savings and they are not shown below)

	ORIGINAL	ALTERNATIVE ONE	ALTERNATIVE TWO
INITIAL COST	$703,000	$7,825,000	
INITIAL SAVINGS	XXXXXXXXXXXXXXXXX	($7,122,000)	
ANNUAL COST			
ANNUAL SAVINGS	XXXXXXXXXXXXXXXXX		
PW SAVINGS	XXXXXXXXXXXXXXXXX		

VALUE ENGINEERING

DEVELOPMENT PHASE

ESTIMATE WORKSHEET

PROJECT NAME: Longview WTP

PROJECT NO.: _____ DATE: 8/29/07 WRITTEN BY: SNH

ALT. NO.: E-5 Actiflo Alternative COSTS FOR: (check one) ☐ Original. ☒ Alternative.

ITEM	QUANTITY		LABOR		MATERIAL		TOTAL COST
	No. Units	Unit Meas.	Per Unit	Total	Per Unit	Total	
Demolition Exist Plant/Rel							40,000
Concrete basins							1,669,000
(2 basins - 20 ft wide							
by 40 ft long							
Basins O.R. @ 15 gpm/ft²							
w/ floc detention time							
of 15 min -							
Basins on existing piling							
Actiflo Equipment							2,830,000
Piping and valves							400,000
Electrical/Instrumentation							740,000
Subtotal							5,670,000
OH, P, Cont @ 38%							2,155,000
						TOTAL	7,825,000

VALUE ENGINEERING

DEVELOPMENT PHASE

ESTIMATE WORKSHEET

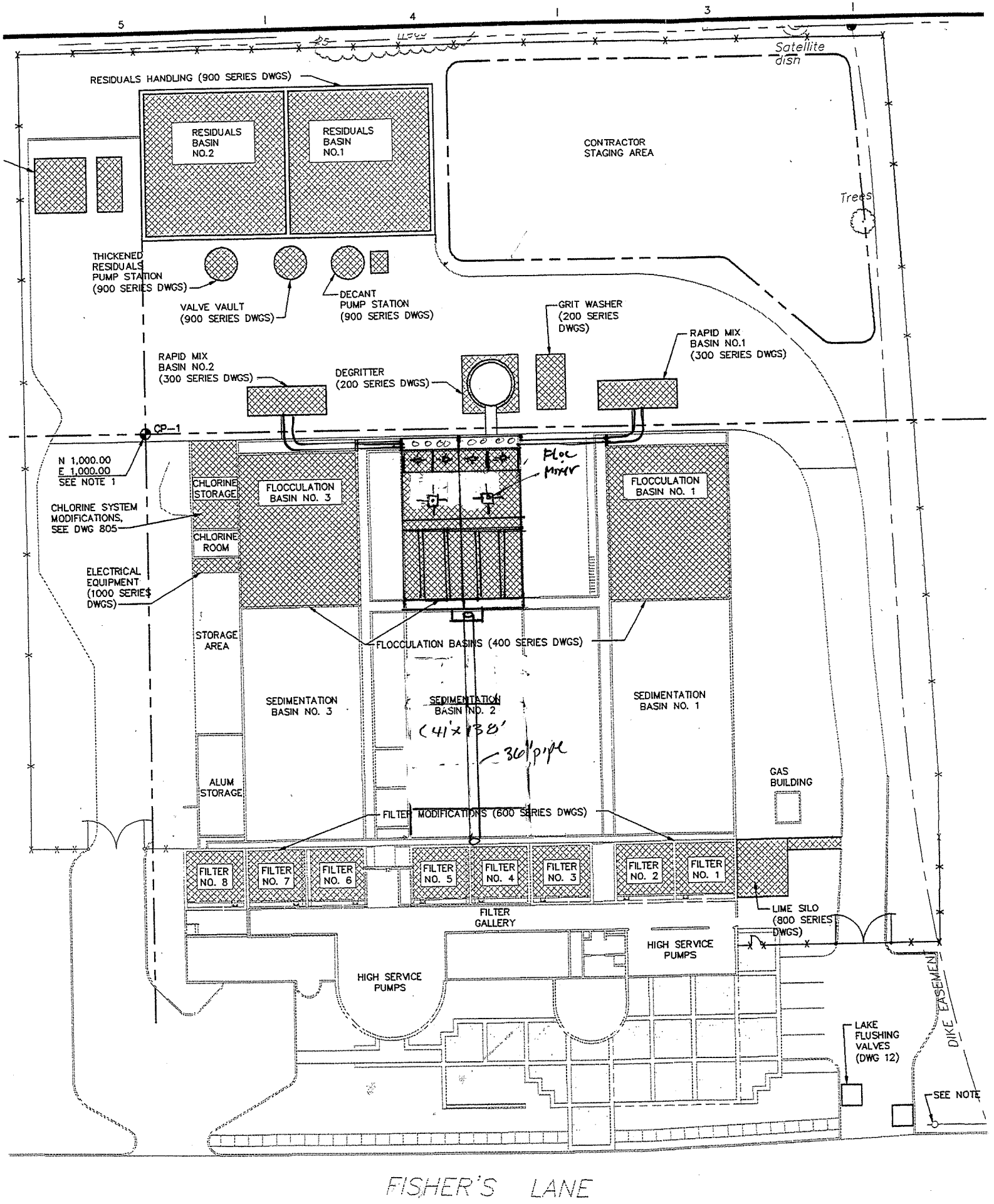
PROJECT NAME: Longview, WA WTP

PROJECT NO.: ______ DATE: 8/29/07 WRITTEN BY: SPH

ALT. NO.: ES- Actiflo Alternative COSTS FOR: (check one) ☒ Original. ☐ Alternative.

ITEM	QUANTITY		LABOR		MATERIAL		TOTAL COST
	No. Units	Unit Meas.	Per Unit	Total	Per Unit	Total	
ORIGINAL CONCEPT							
REBUILD SLUDGE COLLECTORS (PAGE COST EST. 3.1)							105,000
REBUILD SLUDGE DRIVES (ITEM 3.2)							30,000
REPLACE SLUDGE VALVES (ITEM 3.4)							40,000
REPLACE SLUDGE VALVE ACTUATORS (ITEM 3.5)							20,000
REPLACE BASIN INFLUENT GATE (ITEM 3.6)							6,000
REPAIR SED. BASIN (ITEM 3.7)							—
SEAL INSIDE FLOC/SED BASINS (ITEM 3.8)							270,000
STOP LEAK SLUDGE SUMP WELL (ITEM 3.9)							22,000
REPLACE TUBE SETTLERS (ITEM 3.10)							210,000

TOTAL 703,000


RESIDUALS HANDLING (900 SERIES DWGS)
RESIDUALS BASIN NO.2
RESIDUALS BASIN NO.1
CONTRACTOR STAGING AREA
Satellite dish
Trees
THICKENED RESIDUALS PUMP STATION (900 SERIES DWGS)
VALVE VAULT (900 SERIES DWGS)
DECANT PUMP STATION (900 SERIES DWGS)
GRIT WASHER (200 SERIES DWGS)
RAPID MIX BASIN NO.1 (300 SERIES DWGS)
RAPID MIX BASIN NO.2 (300 SERIES DWGS)
DEGRITTER (200 SERIES DWGS)
CP-1
N 1,000.00
E 1,000.00
SEE NOTE 1
CHLORINE STORAGE
FLOCCULATION BASIN NO. 3
FLOCCULATION BASIN NO. 1
CHLORINE SYSTEM MODIFICATIONS, SEE DWG 805
CHLORINE ROOM
ELECTRICAL EQUIPMENT (1000 SERIES DWGS)
STORAGE AREA
FLOCCULATION BASINS (400 SERIES DWGS)
SEDIMENTATION BASIN NO. 3
SEDIMENTATION BASIN NO. 2
SEDIMENTATION BASIN NO. 1
ALUM STORAGE
GAS BUILDING
FILTER MODIFICATIONS (600 SERIES DWGS)
FILTER NO. 8
FILTER NO. 7
FILTER NO. 6
FILTER NO. 5
FILTER NO. 4
FILTER NO. 3
FILTER NO. 2
FILTER NO. 1
FILTER GALLERY
LIME SILO (800 SERIES DWGS)
HIGH SERVICE PUMPS
HIGH SERVICE PUMPS
LAKE FLUSHING VALVES (DWG 12)
DIKE EASEMENT
SEE NOTE
FISHER'S LANE

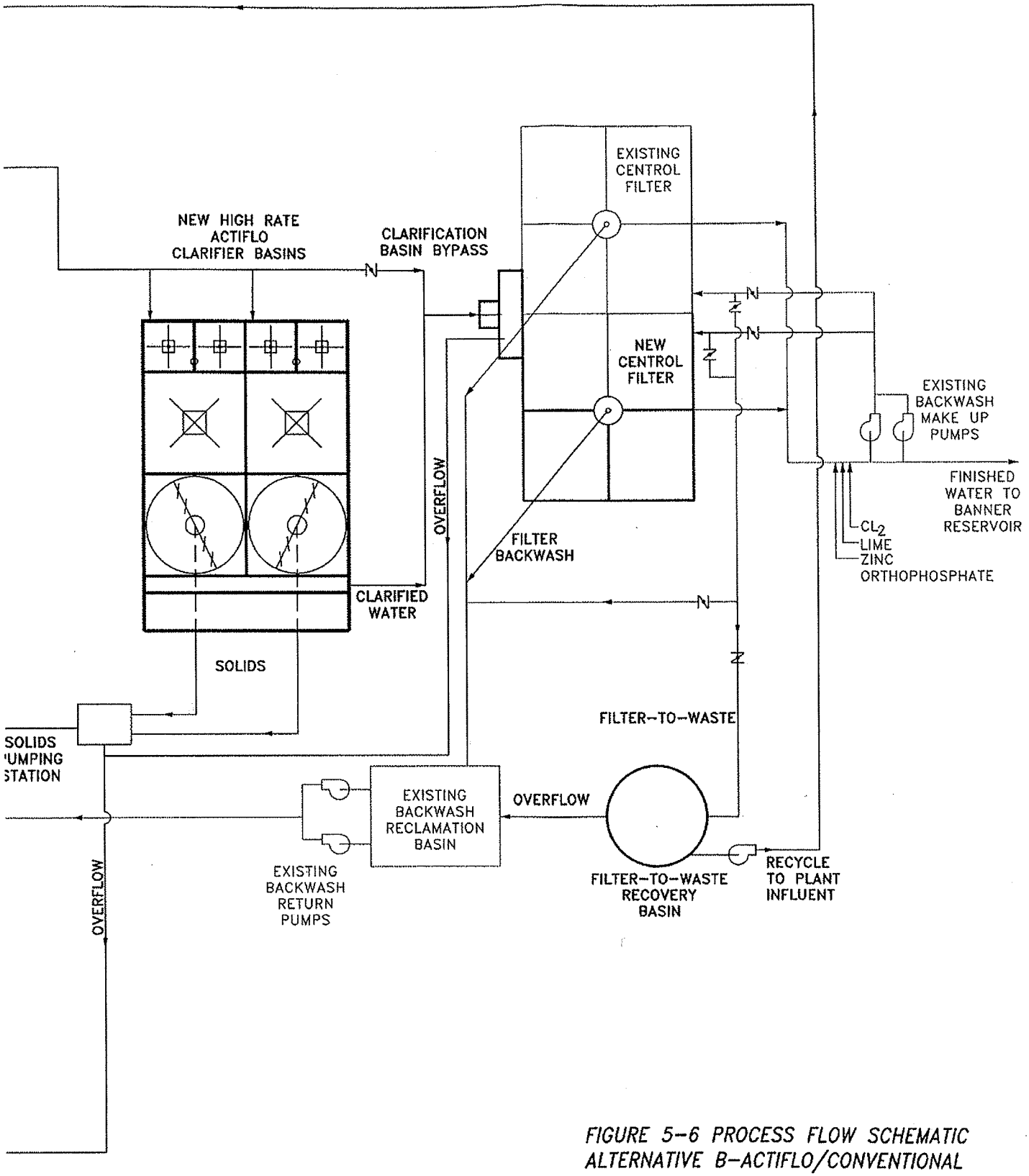
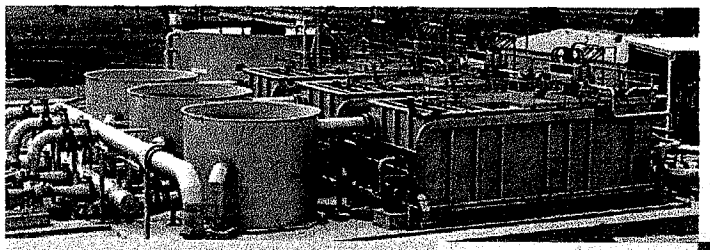


FIGURE 5-6 PROCESS FLOW SCHEMATIC
ALTERNATIVE B-ACTIFLO/CONVENTIONAL FILTRATION
ELIZABETH GEORGE WTP
NEVADA IRRIGATION DISTRICT



ACTIFLO®

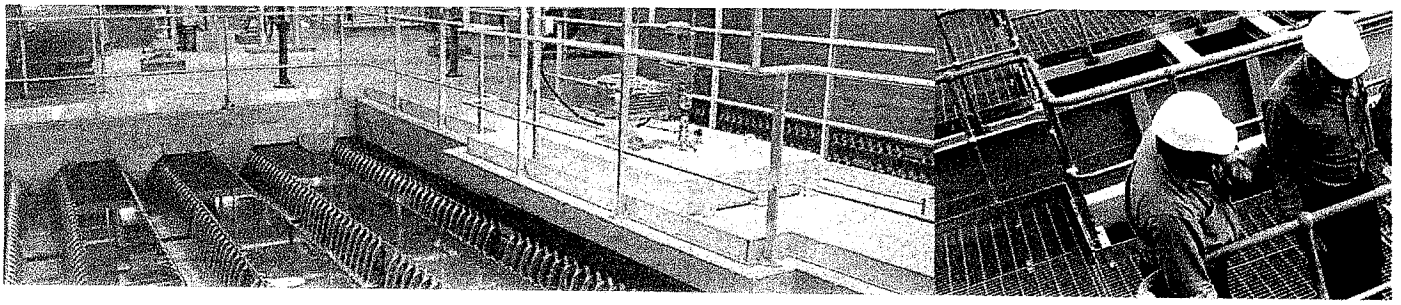
The ultimate clarifier

Ballasted coagulation/flocculation and lamella settling for:

- drinking water
- process water
- wastewater

VEOLIA
WATER

Solutions & Technologies



Ballasted clarification for a **very high rate** and **compact** process

Actiflo® is a **compact process** that operates with **microsand** (Actisand™) as a seed for **floc formation**. Actisand™ provides surface area that enhances flocculation and also acts as a ballast or weight to aid a rapid settlement.

Actiflo® is recommended for:

> **surface water** clarification,

> **industrial process water** production,

> **wastewater** treatment,

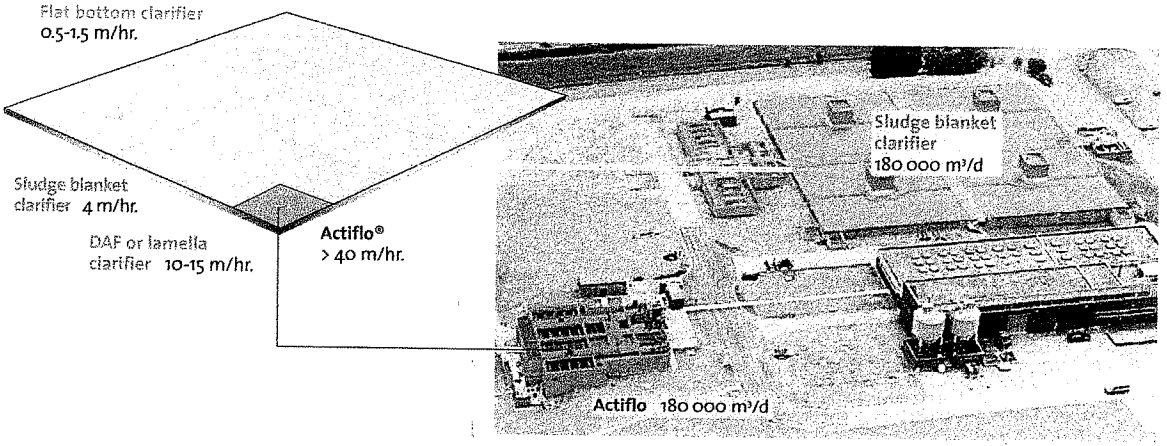
> **storm flow water** settlement.

Actiflo®: **compactness** displaying its **true potential**

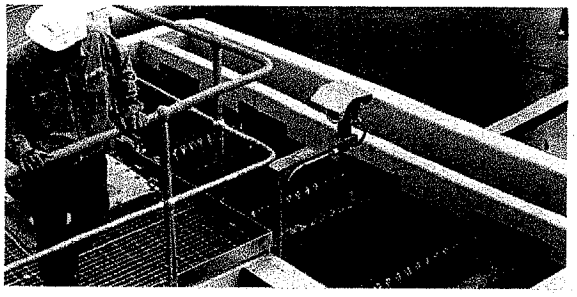
The microsand ballasted flocs display **unique settling characteristics**, which allow for clarifier designs with **very high overflow rates** and **short retention times**. These designs result in footprints that are 5 times smaller than classic lamella clarifier or dissolved air flotation (DAF) and **up to 20 times smaller than conventional clarification systems**.

MAJOR PROCESS BENEFITS

- **High treatment efficiency;** removal rate of turbidity > 90%
- **Very small footprint** compared to conventional clarifiers; suited for restricted spaces and easy retrofit of existing plants
- **Reduced civil engineering**
- **Flexible**: reacts quickly to changing raw water quality; provides **consistently high quality effluent**
- **Very short start-up time** < 10 minutes
- The sludge produced can be thickened and dewatered easily
- Can be **entirely automated** and **remotely controlled**
- **Minimum equipment** to maintain, all **easily accessible**
- **15 years of operating experience** with more than **300 Actiflo® references worldwide**
- Prefabricated **package plants** (1 000 to 10 000 m³/d per unit) which can be **combined for larger flow rates**



Overview of the Iver plant, London - Heathrow (United Kingdom). Clarification, interozonation and granular activated carbon filtration for drinking water production.



Actiflo®: **rapid, flexible** and **performant**

Actiflo® is a very high-rate clarifier **exclusively developed and patented** by Veolia Water Solutions & Technologies.

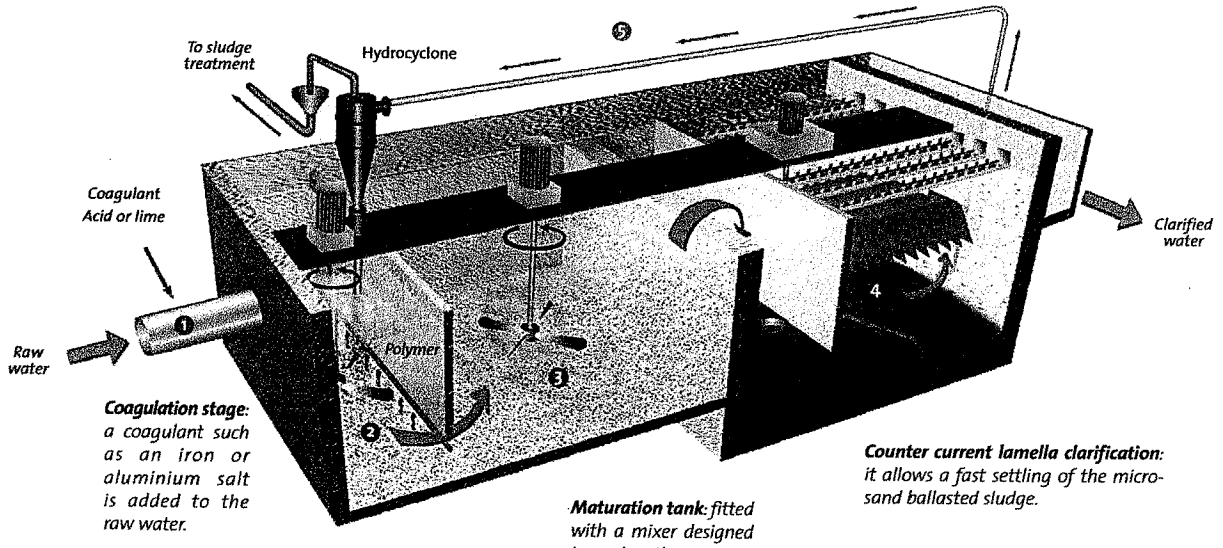
- In **drinking water** applications, its removal efficiency exceeds **90% for turbidity**, colour, algae or arsenic;
- In **wastewater** applications, it consistently produces high quality water, even in varying raw water conditions, with removal efficiency:
  > higher than **90% for total suspended solids** (TSS), colloidal matter, total phosphorus, heavy metals and faecal coliforms,
  > of **60% for BOD** and COD.

Depending on the application, the following upflow velocities are consistently achieved:
> drinking water: **40-80 m/hr.**
> process water: **50-100 m/hr.**
> highly loaded industrial effluents or municipal wastewater: **50-100 m/hr.**
> primary treatment of wastewater or storm flow treatment: **100-150 m/hr.**

For applications requiring a **high turn down ratio**, Actiflo® can also operate with microsand recirculation at a high overflow rate and without microsand at a rise rate lower than 20 m/hr. The microsand is simply stored in the process at low flows until it is required again. In this configuration, Actiflo® then becomes a conventional lamella clarifier (Actiflo® Duo).

The Actiflo® process

***Recirculation**: the sludge is pumped to the hydrocyclone to be separated from the microsand. The clean microsand is returned into the injection tank to minimize loss; the sludge is continuously removed for further processing.*



***Coagulation stage**: a coagulant such as an iron or aluminium salt is added to the raw water.*

***Injection tank**: the flocs produced during the coagulation stage are ballasted by the dense microsand, which is continuously reinjected into the process.*

***Maturation tank**: fitted with a mixer designed to produce the optimum velocity gradients, it allows flocs to swell and mature.*

***Counter current lamella clarification**: it allows a fast settling of the micro-sand ballasted sludge.*

Actiflo®: a **versatile range of uses**

Drinking water

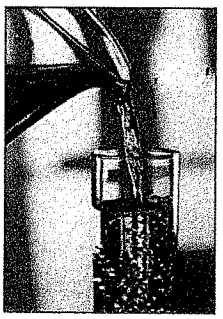
Actiflo® applies to both **surface and ground water** where improved performance and/or capital cost reduction is desired.
It is ideally suited for the treatment of:

> **rapidly fluctuating** water sources,

> **low temperature water** (1°C),

> **reservoir water** with very low turbidity,

> **sea or brackish water.**



Through the use of Actisand™, Actiflo® achieves **better performance than all existing clarification processes**, displaying consistent removal of:

> turbidity, colour, total organic carbon (TOC),

> algae, particle count, pathogens, cryptosporidium,

> oxidised iron, manganese and arsenic...

Actiflo® is particularly efficient to remove **taste and odour** associated with algal bloom. It can also be used for the **recovery of backwash water from rapid gravity filter** thus reducing water loss and running costs.

Wastewater

Actiflo® can be used in most municipal applications:

> **primary settlement**: due to the mass of microsand constantly in the process, Actiflo® handles very swift raw water quality variations and rapid flow changes;

> **treatment of biofilter backwash water**: due to its short residence time, the biological sludge is unlikely to go septic; it is therefore clarified extremely efficiently, with **superior levels of treatment compared to flotation**;

> **clarification of trickling filter effluents**, in replacement of a conventional clarifier;

> **storm water treatment** (combined sewer overflow): Actiflo® treats storm peak flows **as they occur**. In combination with UV disinfection (Actistar™), it delivers an effluent compliant with the most stringent bathing and shellfish water directives;

> **tertiary polishing** or **phosphorus removal**: whether it is used for suspended solids, colour or phosphorus removal, Actiflo® meets or exceeds water quality standards with removal rates usually higher than 90%. **The same Actiflo® unit** applies to storm flow treatment in **peak flow** and to tertiary treatment in **dry flow conditions**, with a significant removal of hormones (endocrine perturbators) for the latter;

> **water reuse** for crop irrigation or aquifer recharge, in combination with Discfilter and UV disinfection (Actidisc Plus™).

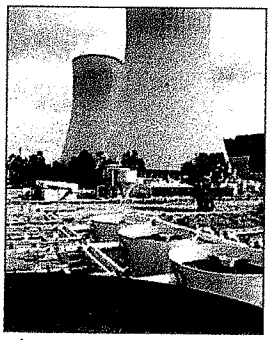
Industrial water and effluents

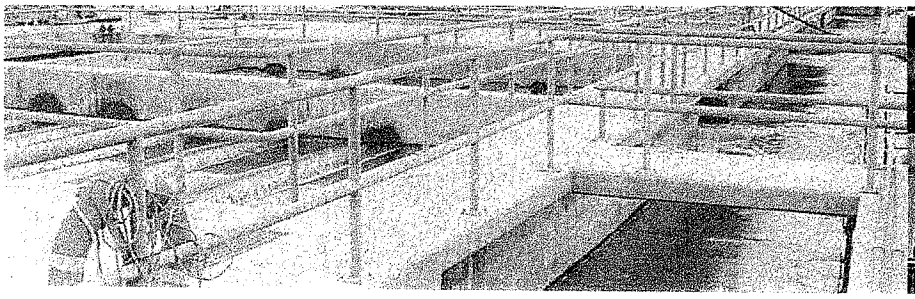
Actiflo® is an ideal solution for the **recycling of process water** and **pre-treatment of boiler feed or cooling tower make-up water**. Similarly it treats any type of **process water** as well as **most industrial effluents**.

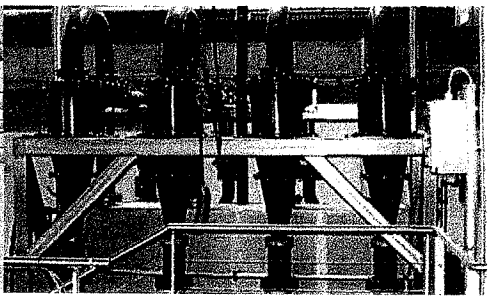
> **solids and colour removal**: prior to membrane treatment, reverse osmosis (Actimem™), or in combination with Discfilter (Actidisc™), to produce process water for the pulp and paper or food industry;

> **removal of heavy metals** (lead, cadmium, zinc...) **and ashes** from power plant and steel mill effluents, or polishing treatment to remove suspended solids and associated pollutants;

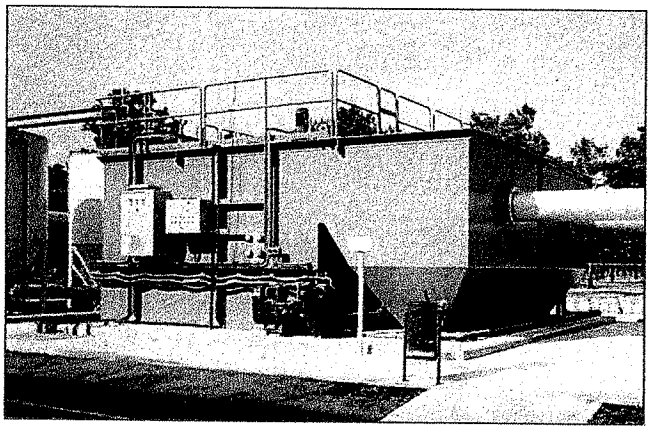
> **lime soda softening** (Actisoft™) for the production of demineralised water.







Actiflo® Package Plant: **fast-track and modular solutions**



For small to medium-sized applications (1 000 to 10 000 m³/d), a range of package plant solutions has been designed, also providing **built-in sand filtration** (Actifloc®) or **sludge thickening** (in combination with Actidyn™) when required.

- These units can be set in a multiple stream arrangement to handle much larger flows; they are ideal when **low cost fast-track, pre-tested treatment units** are required.
- These package plants, manufactured in stainless steel or glass reinforced plastic, can be delivered on a trailer and **installed within days**. The layout of these package solutions is extremely flexible and can be "shoe horned" into the most constrained sites.

ACTIFLO® MOBILE PLANT

- To demonstrate the effectiveness of the Actiflo® process, the services of an Actiflo® mobile plant **equipped with laboratory** can be provided.
- This unit is housed in a shipping container, mounted on a trailer, and once delivered on site it can be **operational within hours**.
- The range of Actiflo® mobile plants (from 40 to 160 m³/hr.) can also provide **temporary treatment** during plant failure or unforseen flow or quality variations.

Outstanding capabilities

The data listed below are typical plant performances. Details can be provided upon request.
Please ask your Veolia Water Solutions & Technologies representative for more information.

Performance for **municipal and industrial wastewater** applications

	Stormwater	Biofilter backwash Biological sludge	Primary settlement	Tertiary polishing
TSS	80-98%	75-99%	75-90%	50-80%
COD	65-90%	55-80%	55-80%	20-50%
Total phosphorus	50-95%	50-95%	50-95%	50-95%
Orthophosphate	50-98%	50-98%	50-98%	50-98%
Faecal coliforms (cells/ml)	1-1.5 log	1-1.5 log	1-1.5 log	1-1.5 log

Performance for **process and drinking water** applications

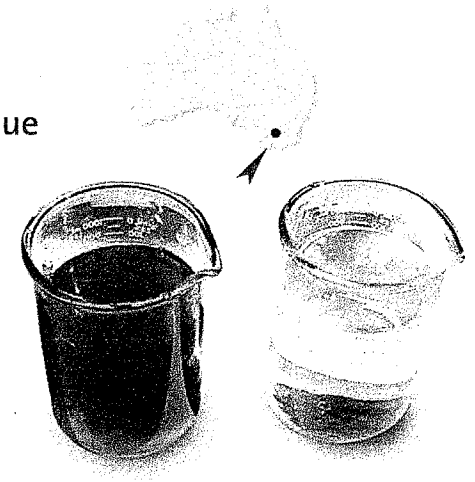
	Unit	Raw water (inlet value)	Actiflo® clarified (outlet value or removal)
Turbidity	NTU	0-2 000	0.2-2.0(1)
TSS	mg/l	0-3 000	0.5-5.0
True colour	mg/l Pt/Co	0-350	0-10
TOC	mg/l	1-30	30-60%
Algae	cells/ml	0-100 000	90-99%
Chlorophyll A	µg/l	0-100	90-99%
Manganese	mg/l	0-2.5	60-95%(2)
Arsenic	mg/l	0-2.0	50-90%(2)
Iron	mg/l	0-5.0	60-98%(3)
Particle count (2-15 µm)	unit/ml	< 2×10^6	1.5-3.0 log
Faecal coliforms	cells/ml	0-10^4	1.0-1.5 log
Bacteria	cells/ml, at 20°C	< 20 000	1.0-1.5 log

(1) if combined with sand filtration, filtered water typically < 0.5 NTU
(2) with pre-oxidation
(3) with pre-oxidation or aeration

With Actiflo®, algae is no longer an issue

At Shepparton (Australia), 2 Actiflo® units (25 000 m³/d) are used to treat effluent from a wastewater lagoon.

- During the summer months, effluent can be highly loaded with algae; it is first treated by the Actiflo® plant and then filtered in order to obtain an effluent suitable for irrigation.
- During winter, the Actiflo® plant is shut down and the effluent is directly discharged into the Goulburn river.



Effluent loaded with algae *Clarified water*

An unrivalled track-record of **worldwide references**

The Actiflo® process is currently in operation worldwide in small communities and large metropolitan areas, as well as in various installations for the treatment of industrial water and effluents.

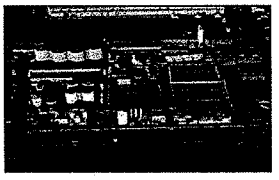
Calgary, Canada
Glenmore drinking water treatment plant

Actiflo® for reduction of turbidity (> 1 000 NTU during spring runoff) on a direct river abstraction supply - 2 x 550 000 m³/d

Stora Enso paper mill
Port Hawkesbury, Canada

Turnkey plant to supply high purity water. Actiflo® for reduction of turbidity, iron, aluminium and manganese contained in the raw water upstream of gravity filter (Dusenflo®) - 60 000 m³/d

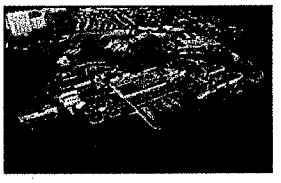
Liverpool, United Kingdom
Sandon dock wastewater treatment plant



Actiflo® for biofilter backwash water treatment - 110 000 m³/d

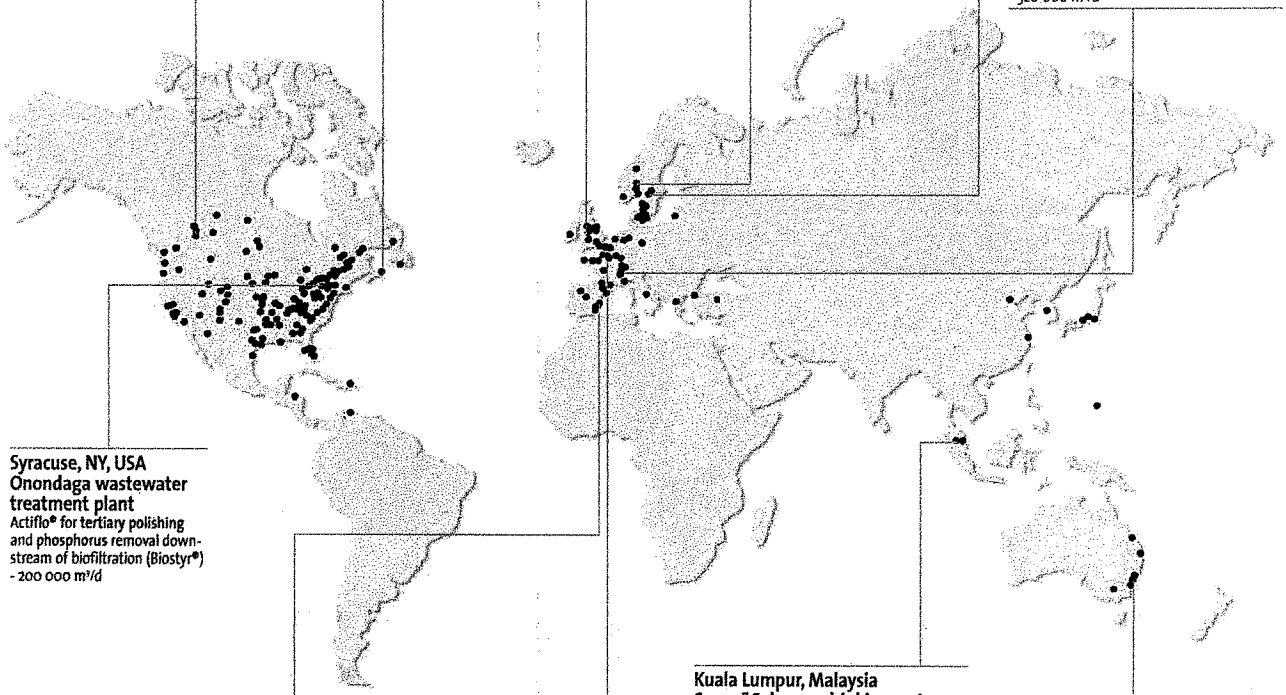
Bäckhammars Bruk AB paper mill
Kristinehamn, Sweden
Production of process and cooling water for an integrated pulp and paper mill.
Actiflo® for reduction of turbidity, organic compounds and colour upstream of disc filtration (Actidisc™) - 50 000 m³/d

Geneva, Switzerland
Aïre wastewater treatment plant



Actiflo® for primary treatment, storm flow treatment (wet weather) and biofilter backwash water treatment (Biostyr®) - 520 000 m³/d

Oslo, Norway
Oset drinking water treatment plant
Actiflo® for drinking water clarification upstream of high rate dual media filtration and UV disinfection - 390 000 m³/d



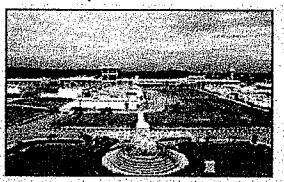
Syracuse, NY, USA
Onondaga wastewater treatment plant
Actiflo® for tertiary polishing and phosphorus removal downstream of biofiltration (Biostyr®) - 200 000 m³/d

Barcelona, Spain
Baix Llobregat municipal wastewater reuse plant
Reuse of 5 millions m³/year of treated water for irrigation.
Actiflo® for tertiary treatment upstream of disc filtration (Actidisc™) - 302 400 m³/d

Paris, France
Seine-Aval wastewater treatment plant

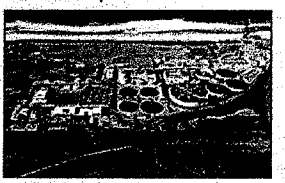
Actiflo® for storm flow treatment (wet weather) or tertiary treatment (dry weather) - 2 600 000 m³/d

Kuala Lumpur, Malaysia
Sungaï Selangor drinking water treatment plant



Actiflo® for reduction of suspended solids, algae and turbidity (up to 2 100 NTU during the tropical rainfall) on a direct river abstraction supply - 950 000 m³/d

Sydney, Australia
Illawarra wastewater reclamation plant



Actiflo® for storm flow treatment upstream of UV disinfection - 320 000 m³/d

LONGVIEW VALUE ENGINEERING STUDY
WATER SUPPLY ALTERNATIVES

VE IDEA NUMBER: E6

DESCRIPTION: Replace existing flocc/sed basins with DensaDeg clarifier

EVALUATED BY: Sindt/Wesner

ORIGINAL CONCEPT:

Retain and rehabilitate existing flocculation and sedimentation basins

PROPOSED ALTERNATIVE:

Demolish center flocc/sed basin and install two DensaDeg clarifiers in that location

ADVANTAGES:

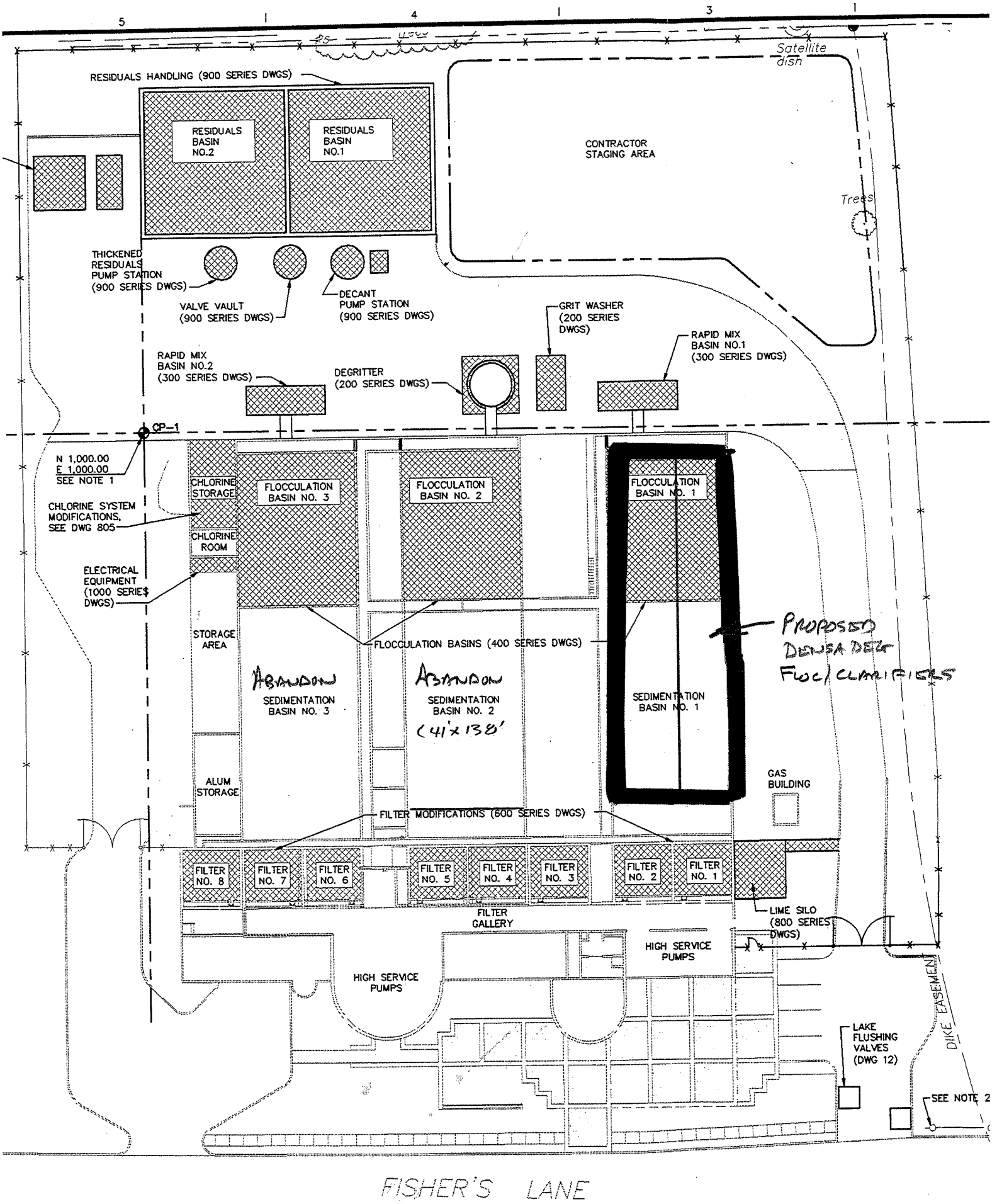
Replaces existing flocc/sed facilites and provides 20 mgd of capacity. Eliminates old basins and associated maintenance of existing equipment.

DISADVANTAGES:

Substantially increases capital costs.

(Savings in operation and maintenance will offset some of the added capital but it is not possible to accurately estimate these savings and they are not shown below)

	ORIGINAL	ALTERNATIVE ONE	ALTERNATIVE TWO
INITIAL COST	$703,000	$3,754,000	
INITIAL SAVINGS	XXXXXXXXXXXXXXXXX	($3,051,000)	
ANNUAL COST			
ANNUAL SAVINGS	XXXXXXXXXXXXXXXXX		
PW SAVINGS	XXXXXXXXXXXXXXXXX		


RESIDUALS HANDLING (900 SERIES DWGS)
RESIDUALS BASIN NO.2
RESIDUALS BASIN NO.1
CONTRACTOR STAGING AREA
Satellite dish
Trees
THICKENED RESIDUALS PUMP STATION (900 SERIES DWGS)
VALVE VAULT (900 SERIES DWGS)
DECANT PUMP STATION (900 SERIES DWGS)
GRIT WASHER (200 SERIES DWGS)
RAPID MIX BASIN NO.1 (300 SERIES DWGS)
RAPID MIX BASIN NO.2 (300 SERIES DWGS)
DEGRITTER (200 SERIES DWGS)
CP-1
N 1,000.00
E 1,000.00
SEE NOTE 1
CHLORINE STORAGE
CHLORINE SYSTEM MODIFICATIONS, SEE DWG 805
CHLORINE ROOM
ELECTRICAL EQUIPMENT (1000 SERIES DWGS)
FLOCCULATION BASIN NO. 3
FLOCCULATION BASIN NO. 2
FLOCCULATION BASIN NO. 1
STORAGE AREA
FLOCCULATION BASINS (400 SERIES DWGS)
PROPOSED DENSA DEG FLOC/CLARIFIERS
ABANDON
SEDIMENTATION BASIN NO. 3
ABANDON
SEDIMENTATION BASIN NO. 2
(41'x 138'
SEDIMENTATION BASIN NO. 1
GAS BUILDING
ALUM STORAGE
FILTER MODIFICATIONS (600 SERIES DWGS)
FILTER NO. 8
FILTER NO. 7
FILTER NO. 6
FILTER NO. 5
FILTER NO. 4
FILTER NO. 3
FILTER NO. 2
FILTER NO. 1
FILTER GALLERY
LIME SILO (800 SERIES DWGS)
HIGH SERVICE PUMPS
HIGH SERVICE PUMPS
LAKE FLUSHING VALVES (DWG 12)
DIKE EASEMENT
SEE NOTE 2
FISHER'S LANE

VALUE ENGINEERING

DEVELOPMENT PHASE

ESTIMATE WORKSHEET

PROJECT NAME: LONGVIEW, WA WTP

PROJECT NO.: _____ DATE: 8/29/07 WRITTEN BY: SINAT / WIESNER

ALT. NO.: E6 - DENSA DEG CLARIFIER. COSTS FOR: (check one) ☒ Original. ☐ Alternative.

ITEM	QUANTITY		LABOR		MATERIAL		TOTAL COST
	No. Units	Unit Meas.	Per Unit	Total	Per Unit	Total	
ORIGINAL CONCEPT							
REBUILD SLUDGE COLLECTORS	(PAGE COST EST. 3.1)						105,000
REBUILD SLUDGE DRIVES	(ITEM 3.2)						30,000
REPLACE SLUDGE VALVES	(ITEM 3.4)						40,000
REPLACE SLUDGE VALVE ACTUATORS	(ITEM 3.5)						20,000
REPLACE BASIN INFLUENT GATE	(ITEM 3.6)						6,000
REPAIR SED. BASIN	(ITEM 3.7)						—
SEAL INSIDE FLOC/SED BASINS	(ITEM 3.8)						270,000
STOP LEAK SLUDGE SUMP WELL	(ITEM 3.9)						22,000
REPLACE TUBE SETTLERS	(ITEM 3.10)						210,000
TOTAL							703,000

VALUE ENGINEERING

DEVELOPMENT PHASE

ESTIMATE WORKSHEET

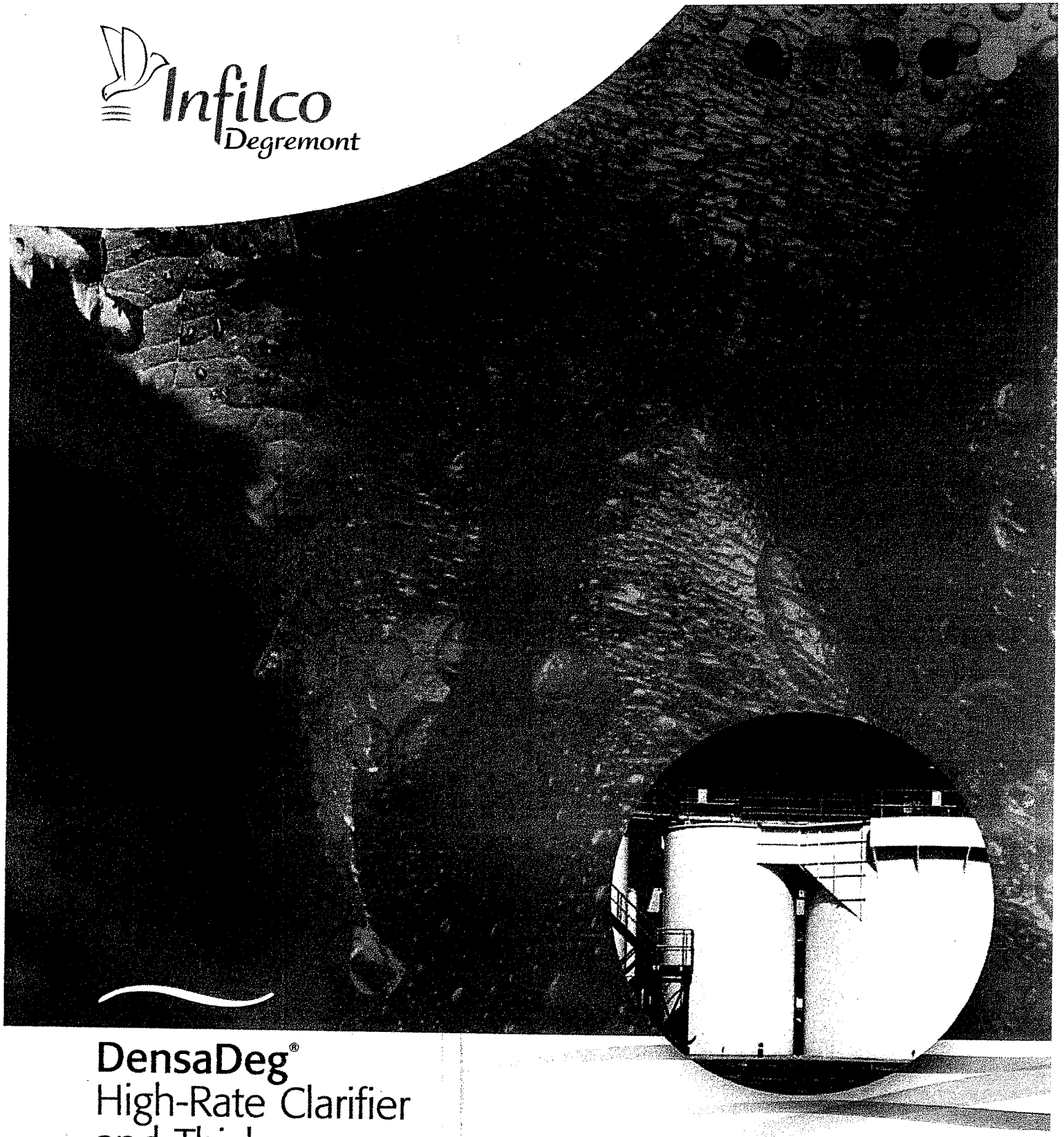
PROJECT NAME: LONGVIEW, WA WTP

PROJECT NO.: _____ DATE: 8/29/07 WRITTEN BY: SINOT / WESNER

ALT. NO.: E6 - DENSA DEG CLARIFIER COSTS FOR: (check one) ☐ Original. ☒ Alternative.

ITEM	QUANTITY		LABOR		+ MATERIAL		TOTAL COST
	No. Units	Unit Meas.	Per Unit	Total	Per Unit	Total	
ALTERNATE CONCEPT							
DENSADEG EQUIPMENT							
INSTALLED IN CONC. TANKS.							
TWO UNITS.							
COST BASED ON PREVIOUS PROJECT EXPERIENCE							2,600,000
6,500 g.p.d./s.f. HYD LOAD							
TWO - 20' x 100 UNITS							
PILING - USE EXISTING PILING	UNDER SED. BASIN						
PIPING ALLOWANCE							60,000
DEMOLITION							40,000
ELECTRICAL ALLOWANCE							20,000
SUBTOTAL							2,720,000
O.H, P, & CONT. 38%							1,034,000
					TOTAL		3,754,000

Infilco Degremont

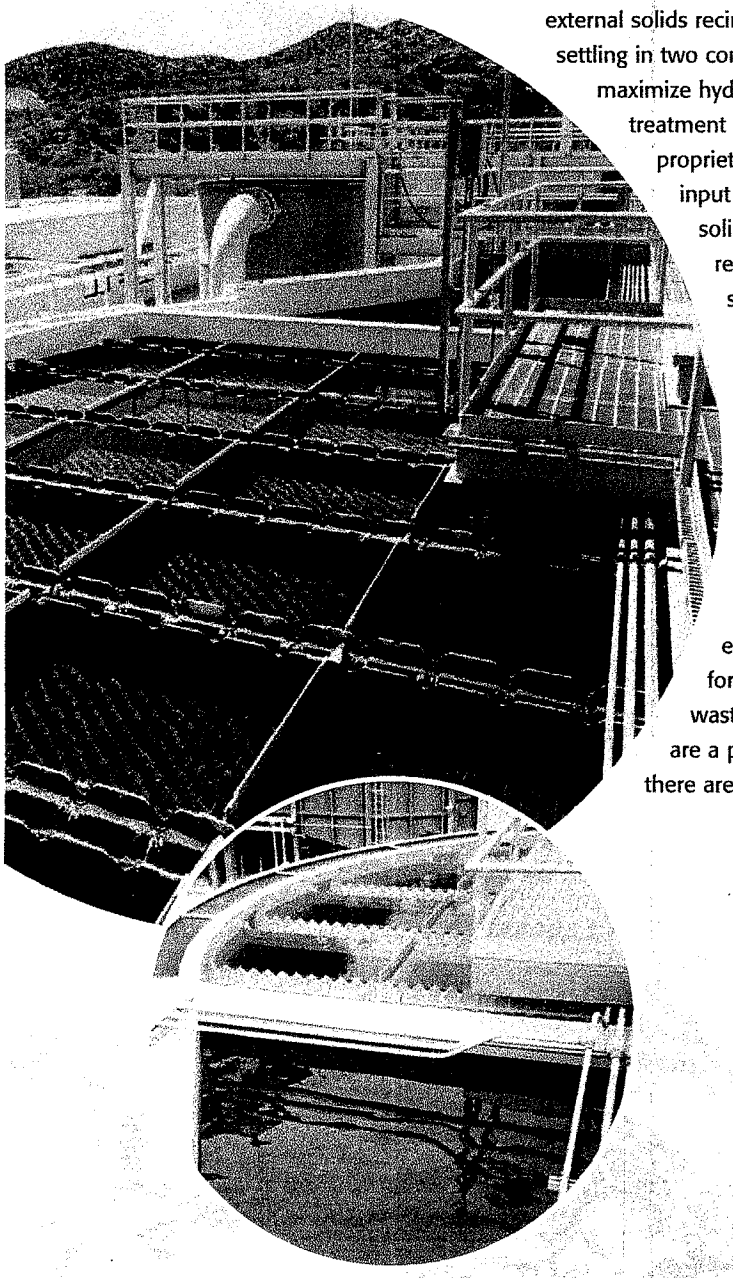


DensaDeg®
High-Rate Clarifier and Thickener

Drinking water clarification
Enhanced primary clarification
Tertiary phosphorus removal
Softening
CSO/SSO treatment

SUEZ

DensaDeg® High-Rate Clarifier and Thickener

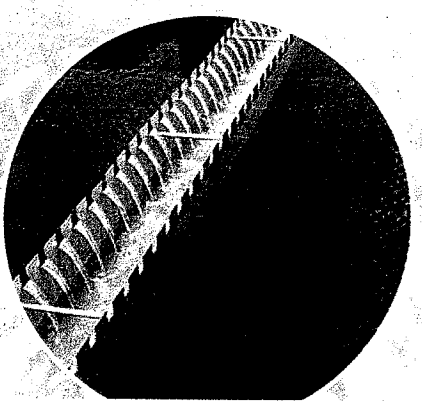


The DensaDeg Clarifier is a high-rate solids contact clarifier that combines optimized flocculation, internal and external solids recirculation, and tube settling in two conjoined vessels to maximize hydraulic loading and treatment efficiencies. The proprietary blend of energy input and high volume solids recirculation reduces the waste sludge volume and results in rapid settling to optimize unit operation and treatment results.

Because it both clarifies and thickens, DensaDeg is especially effective for plants where waste sludge volumes are a problem or where there are site constraints.

DensaDeg means efficiency with real value.

- **Construction economy.** Integrated functions within a single unit require approximately 50 percent less space than conventional solids contact clarifiers.
- **Accelerated processing.** Combined internal and external sludge recirculation and high reactor solids concentration reduce startup time and increase treatment rates.
- **Excellent effluent quality.** Combined solids recirculation and high reactor concentration optimize unit operation and overall treatment results.
- **Optimal chemical efficiency.** Optimized flocculation through intense solids contact stabilizes treatment chemistry.
- **Low-cost operation.** Automatic startup, shutdown, metering, and draw-off control are based on flow rate and turbidity data, requiring minimal operator attention.
- **Reduced waste volume.** Waste sludge is very dense, which minimizes handling and storage.
- **Consistent, flexible performance.** Hydraulic loading management enables operation over a broad range of flows and raw water characteristics.
- **Long service life.** No abrasive material is added to the system so there is no wear on pumps, mixers, or scrapers.

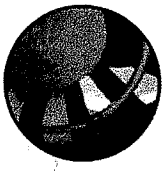


Integrated, 3-stage process

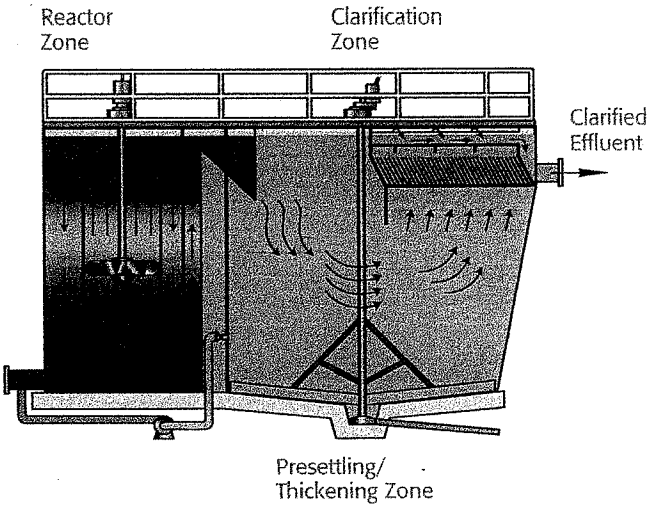
1

In the **Reactor Zone,** influent water combines with reactants and pre-formed solids from the presettling/thickening zone, flowing up through a draft tube, where a specially designed turbine initiates flocculation. As the mixture resettles, its density increases. This internal recirculation is performed at a rate of up to ten times the influent flow rate, producing optimum flocculation density for the application and selected chemistry.

Reactor Vessel



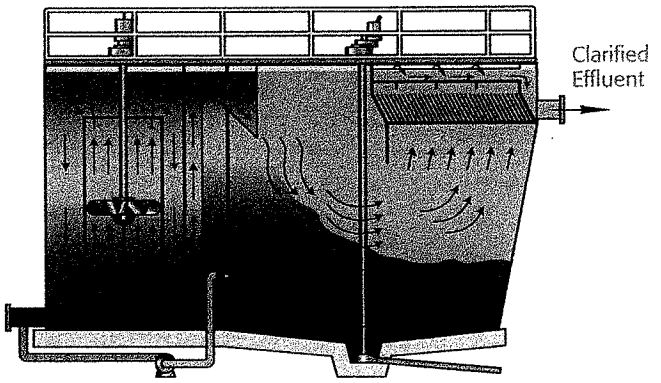
Reactor Turbine



2

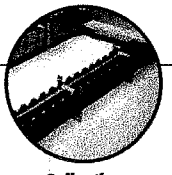
The slurry enters the **Presettling/ Thickening Zone** over a submerged weir where, due to the density of the solids within the slurry, it is separated and deposited on the bottom of the vessel. Aided by a slow-moving rake, the deposited solids continue to thicken. The process maintains solids homogeneity, while facilitating further release of entrained water. Thickened sludge is periodically blown down from the bottom of the thickener, and is typically pumped directly to a final dewatering mechanism.

Rake/Scraper



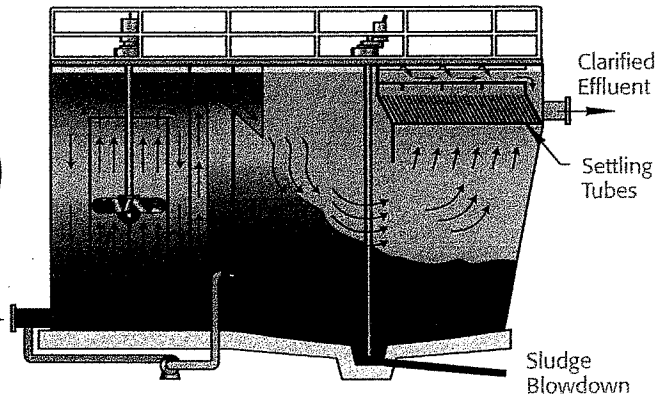
3

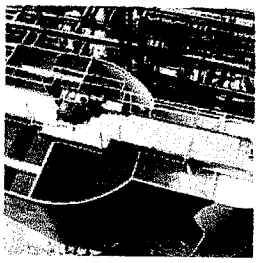
In the **Clarification Zone,** supernatant flows upward through settling tubes and is polished. The settling tubes allow rise rates of up to 10 gpm/ft² for most metal salt coagulation processes – often higher for lime addition processes – and up to 50 gpm/ft² for most CSO/SSO applications. Clarified water is uniformly collected in effluent launders located above the tubes.



Collection

Clarification Zone





DensaDeg®
High-Rate Clarifier and Thickener

Get maximum versatility with the DensaDeg Clarifier

- Lime softening
- Clarification of surface waters
- Combined clarification and softening
- Enhanced primary treatment of wastewater
- Tertiary treatment of wastewater (phosphorus removal)
- Wet weather treatment (CSO, SSO, stormwater)
- Treatment of filter or membrane backwash water

Infilco Degremont

Contact us for information on cost-effective water treatment solutions.

P.O. Box 71390
Richmond, VA 23255-1390 USA
Phone: (800) 446-1150
(804) 756-7600
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SUEZ

 DB555

DENSADEG — COST MODEL BACKGROUND

High Rate Clarifier Process No. 120

High rate clarifiers are used for treatment of secondary effluent waste backwash water and potable water. This type of unit has separate rapid mix, flocculation and sedimentation compartments. There are settling tubes in the sedimentation basin and some settled sludge is recycled to the flocculation basin. Costs are based on sedimentation basin loadings of 6,500 gpd/sq ft. Higher rates can be used for some applications.

Construction costs include concrete basins, all equipment in the basins, settling tubes, sludge recycle pumps and sludge pumps. Chemical feed facilities are not included in the costs and must be added separately. It is assumed that the largest single unit can treat 15 mgd. Larger plants include multiple units with some common walls.

O& M costs include all items for the unit: Electricity, labor and materials. However, chemical costs are not included.

LONGVIEW VALUE ENGINEERING STUDY
WATER SUPPLY ALTERNATIVES

VE IDEA NUMBER: E11

DESCRIPTION: Eliminate air scour for filter backwash

EVALUATED BY: Sindt

ORIGINAL CONCEPT:

Add air scour to filters in addition to existing surface wash

PROPOSED ALTERNATIVE:

Delete proposed air scour

ADVANTAGES:

Air scour adds complexity to filter backwash and is not needed for the operating modes used at the plant (no polymer applied to the filters, without polymers filters are producing extremely low turbidities)

Significant reduction in capital costs (savings based on PACE estimate of air scour costs)

DISADVANTAGES:

None apparent

	ORIGINAL	ALTERNATIVE ONE	ALTERNATIVE TWO
INITIAL COST	$1,230,000	0	
INITIAL SAVINGS	XXXXXXXXXXXXXXXXX	$1,230,000	
ANNUAL COST			
ANNUAL SAVINGS	XXXXXXXXXXXXXXXXX		

LONGVIEW VALUE ENGINEERING STUDY
WATER SUPPLY ALTERNATIVES

VE IDEA NUMBER: E16

DESCRIPTION: Separate/thicken sed basin sludge

EVALUATED BY: Sindt

ORIGINAL CONCEPT:

Modify existing residuals basins for handling heavy sludge from sed basins and filter backwash

PROPOSED ALTERNATIVE:

Separate sludge from sedimentation basis from filter backwash wastewater. Construct thickener for sedimentation basin sludge. Send only filter backwash to existing residuals basins. Thickened sludge to dewatering basins. Do not modify existing residuals basins.

ADVANTAGES:

Heavy sludge is not placed in residuals basins so no modifications to these basins would be required.
Better control of the heavy sludge removed from the sedimentation basins
Reduce maintenance associated with residuals basins

DISADVANTAGES:

Higher capital costs

	ORIGINAL	ALTERNATIVE ONE	ALTERNATIVE TWO
INITIAL COST	$251,000	$392,000	
INITIAL SAVINGS	XXXXXXXXXXXXXXXXX	($141,000)	
ANNUAL COST			
ANNUAL SAVINGS	XXXXXXXXXXXXXXXXX		
PW SAVINGS	XXXXXXXXXXXXXXXXX		

WORKSHEET

No. - DESCRIPTION: E16 - SED. BASIN SLUDGE THICKENER

BY: SINOT

DESIGN BASIS:

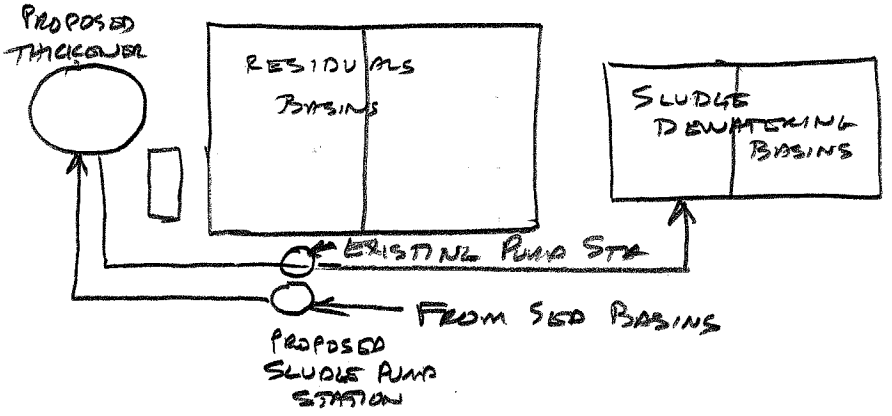
1% DAILY SLUDGE VOLUME

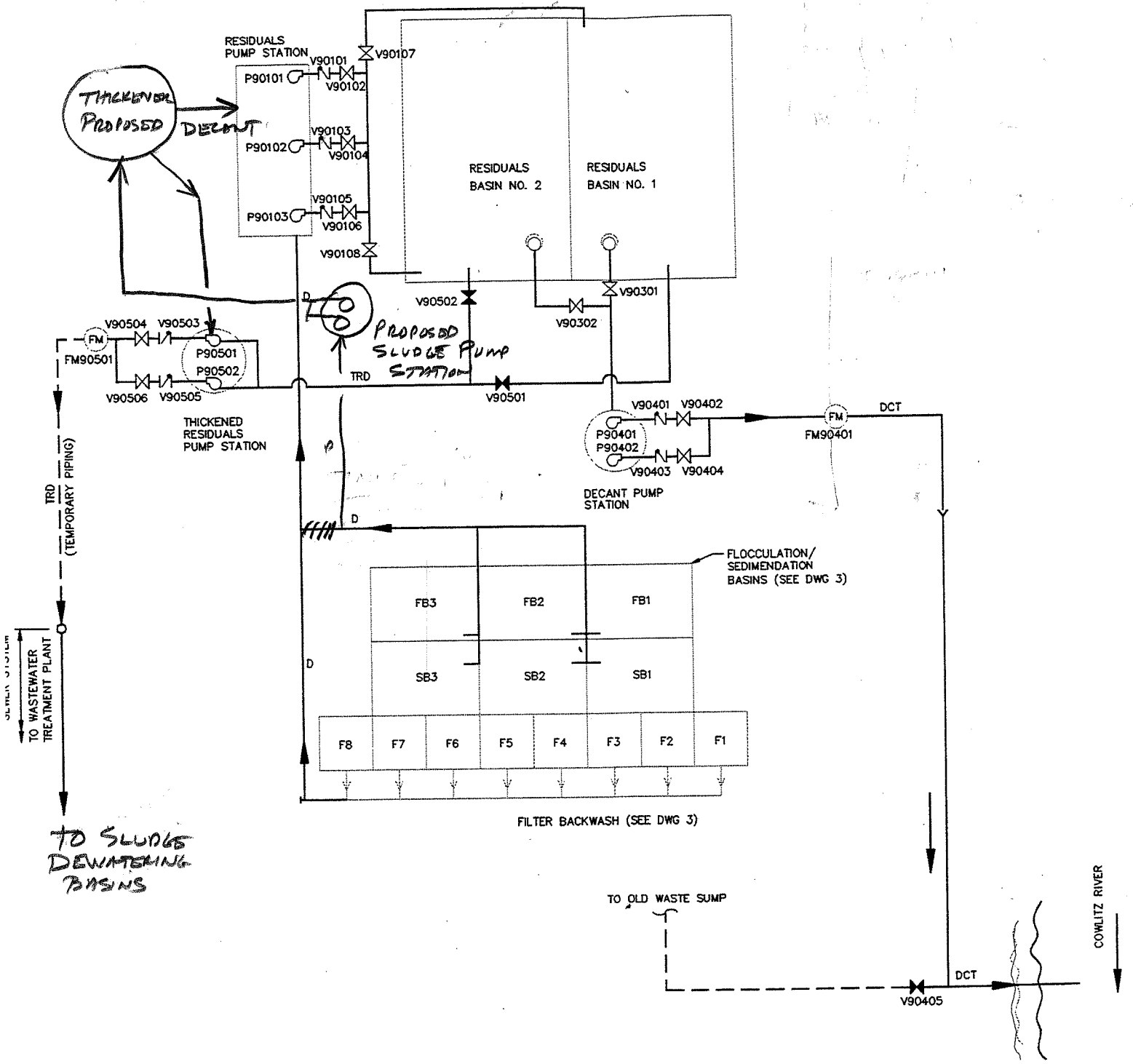
250 gpd/s.f. HYD. LOAD

(20) MGD (1%) = 200,000 gpd SED. BASIN SLUDGE

$\frac{200{,}000 \text{ gpd}}{250 \text{ gpd/s.f.}} = 800$ s.f.

$\frac{\pi D^2}{4} = 800 \rightarrow D = 32$ ft DIA




RESIDUALS PUMP STATION
V90101
V90107
P90101
V90102
THICKENER PROPOSED
DECANT
V90103
P90102
V90104
RESIDUALS BASIN NO. 2
RESIDUALS BASIN NO. 1
V90105
P90103
V90106
V90108
V90502
V90301
V90302
D
PROPOSED SLUDGE PUMP STATION
TRD
V90504
V90503
FM
FM90501
P90501
P90502
V90506
V90505
V90501
THICKENED RESIDUALS PUMP STATION
V90401
V90402
P90401
P90402
V90403
V90404
DECANT PUMP STATION
FM
FM90401
DCT
TRD (TEMPORARY PIPING)
FLOCCULATION/ SEDIMENDATION BASINS (SEE DWG 3)
FB3
FB2
FB1
SB3
SB2
SB1
F8
F7
F6
F5
F4
F3
F2
F1
FILTER BACKWASH (SEE DWG 3)
TO WASTEWATER TREATMENT PLANT
TO SLUDGE DEWATERING BASINS
TO OLD WASTE SUMP
V90405
DCT
COWLITZ RIVER

VALUE ENGINEERING

DEVELOPMENT PHASE

ESTIMATE WORKSHEET

PROJECT NAME: LONGVIEW, WA WTP

PROJECT NO.: _____ DATE: 8/29/07 WRITTEN BY: SINST

ALT. NO.: E16 - SED. BASIN SLUDGE THICKENER COSTS FOR: (check one) ☐ Original. ☒ Alternative.

ITEM	QUANTITY		LABOR		MATERIAL		TOTAL COST
	No. Units	Unit Meas.	Per Unit	Total	Per Unit	Total	
THICKENER STRUCTURE							
BASE SLAB $\frac{\pi(36)^2(2)}{4}/27$	75	CY			$600		45,000
WALL $\frac{\pi(33^2-32^2)(10)}{4}/27$	19	CY			$1,000		19,000
PILING							
$(\pi(36)^2/4)$ s.f. /57 sf/PILE							
=20 PILES							
(20)(75) ft/PILE =	1500	LF			$40		60,000
THICKENER MECHANISM							50,000
YARD PIPING ALLOWANCE							20,000
SLUDGE PUMPING STATION							40,000
ELECTRICAL ALLOWANCE							30,000
SITE WORK							20,000
SUBTOTAL							284,000
O.H., P., CONTING. 38%							108,000
TOTAL							392,000

LONGVIEW VALUE ENGINEERING STUDY
WATER SUPPLY ALTERNATIVES

VE IDEA NUMBER: E17

DESCRIPTION: Treat Mint Farm well water at existing plant

EVALUATED BY: Sindt

ORIGINAL CONCEPT:

Construct new membrane treatment plant at Mint Farm well site

PROPOSED ALTERNATIVE:

Construct new wells at Mint Farm.
Construct raw well water transmission line to existing water treatment plant
Discontinue use of river intake for drinking water supply
Convert existing sedimentation basins to detention tanks for iron and manganese oxidation using forced draft aeration
Rehabilitate existing filters
Expand clearwell

ADVANTAGES:

More reliable supply than river source
Less complex treatment equipment to maintain with filters than with membranes
Wells could possibly be located along transmission line to reduce perceptions associated with wells in an industrial park
Makes use of existing asset
Lower cost than membrane alternative

DISADVANTAGES:

Long raw water pipeline
Possible long term structural and maintenance issues with continued use of existing filters that could be avoided by building new conventional filters at the Mint Farm site

	ORIGINAL	ALTERNATIVE ONE	ALTERNATIVE TWO
INITIAL COST	$29,700,000[1]	$21,445,000	
INITIAL SAVINGS	XXXXXXXXXXXXXXXXX	$8,255,000	
ANNUAL COST	$2,644,760[2]	$1,309,000[3]	
ANNUAL SAVINGS	XXXXXXXXXXXXXXXXX	$1,336,000	
PW SAVINGS	XXXXXXXXXXXXXXXXX	$23,218,000	

[1]VE team estimate of membrane filtration system cost
[2]PACE O&M costs adjusted include chemical costs for oxidizing iron and manganese, membrane replacement (10-year interval) and other maintenance materials
[3]O&M costs calculated for N1 plus one additional staff to deal with rehabilitated older facilities

VALUE ENGINEERING

DEVELOPMENT
PHASE

ESTIMATE WORKSHEET

PROJECT NAME: LONGVIEW, WA WTP

PROJECT NO.: _____ DATE: 8/28/07 WRITTEN BY: SINDT

ALT. NO.: E17 - TREAT WELL WATER AT EXIST. PLANT COSTS FOR: (check one) ☐ Original. ☒ Alternative.

ITEM	QUANTITY		LABOR		L+ MATERIAL		TOTAL COST
	No. Units	Unit Meas.	Per Unit	Total	Per Unit	Total	
1. WELLS (6) (PAGE EST. 4.12)							2,670,000
2. RAW WATER PIPING AT WELLS (PAGE EST.)							450,000
3. RAW WATER TRANSMISSION LINE FROM WELLFIELD TO EXISTING WTP							
36" ϕ DIP, SURF. RESTOR.	19,400	LF			$ 396		7,680,000
4. REBUILD HIGH SERVICE PUMPS (PAGE EST. 3.3)							50,000
5. FORCED DRAFT AERATORS							
5 - 12'x10' UNITS (TONKA)							450,000
INSTALL AERATORS							300,000
6. REMOVE TUBE SETTLERS AND SLUDGE COLLECTORS							20,000
7. RESPAIR LIGHTING (PAGE EST. 3.11)							10,000
8. RECOAT PARKING AREA (PAGE EST. 3.14)							20,000
9. FILTER REPAIR (PAGE PAGE EST. 3.15)							800,000
10. REPLACE MMN SCADA SYSTEM (PAGE EST. 3.16)							597,000
11. RESPAIR EFFL. MANIFOLD (PAGE EST. 3.17)							144,000
12. REPAIR PIPE GALLERY (PAGE EST. 3.18)							1,274,000
13. IMPROVE BACKWASH PIPING (PAGE EST. 3.20)							150,000
14. REPLACE EXISTING POWER SUPPLY (PAGE EST. 3.21)							1,856,000
15. FINISHED WATER PIPELINE (PAGE EST. 3.22)							4,934,000
16. CHEMICAL FEED ($KMnO_4$) IS IN PLACE							40,000
				TOTAL			21,445,000

WORKSHEET

No. - DESCRIPTION: E17-

BY: SINOT

DETENTION TANK VOLUME (30 min HLT)

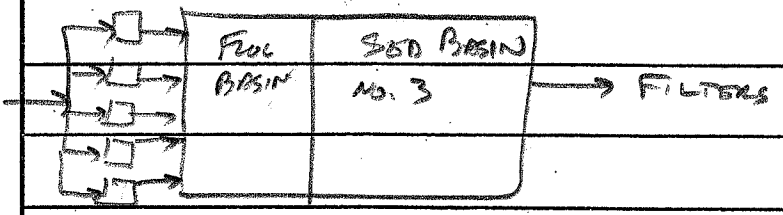
$\frac{20 \times 10^6}{d} \left| \frac{gal}{1440} \right| \frac{d}{min} \left| \frac{1}{34} \right| \frac{min}{gal} = 417{,}000$ GAL REQ'D.

REF: 1979 DWGS FLOC/SED BASIN No. 3 DIMENSIONS:

$41' \times 138' \times 11' \pm$ DEEP = 62,200 cf = 466,000 GAL ✓

FLOC BASIN VOLUME ALONE = (41)(58)(11) = 26,160 cf = 196,000 GAL

FLOC BASIN HRT ALONE = 14 MINUTES.



FOLLOW DRAFT REGULATIONS

USE FLOC/SED BASIN No. 2 OR No. 1 AS STANDBY DETENTION TANK FOR USE WHEN CLEANING DETENTION TANK

LONGVIEW VALUE ENGINEERING STUDY
WATER SUPPLY ALTERNATIVES

VE IDEA NUMBER: E21

DESCRIPTION: Add clearwell volume, reduce size of pipeline to Hillsdale Reservoir

EVALUATED BY: Culp

ORIGINAL CONCEPT:

36-inch pipeline from existing treatment plant to Hillsdale Reservoir (Kennedy Jenks report cites use of pipeline for providing contact time for disinfection)

PROPOSED ALTERNATIVE:

Provide equivalent volume contained in 36-inch vs 30-inch pipeline for contact time in expanded clearwell, use 30-inch pipeline to Hillsdale Reservoir

ADVANTAGES:

Easier, lower cost pipeline construction

DISADVANTAGES:

No capital cost savings
Added power cost to pump flows from plant to reservoir
Higher present worth costs

	ORIGINAL	ALTERNATIVE ONE	ALTERNATIVE TWO
INITIAL COST	$329,000	$365,000	
INITIAL SAVINGS	XXXXXXXXXXXXXXXXX	($36,000)	
ANNUAL COST			
ANNUAL SAVINGS	XXXXXXXXXXXXXXXXX	($13,000)	
PW SAVINGS	XXXXXXXXXXXXXXXXX	($185,000)	

WORKSHEET

No. - DESCRIPTION: E21 - Add clearwell volume, reduce size of pipe to Hillsdale Reservoir

BY: GL Culp

Length of transmission line to Hillsdale Reservoir = 6500 Ft

(Kennedy Jenks - 2005 Comp Plan, Table 8-2)

20 mgd = 13,900 gpm

Existing 16" & 20" mains

16" @ 4 fps = 2500 gpm 20" = 4000 gpm

13,900 - 6500 = 7,400 gpm 30" pipe = 3.79 fps

So, say 36" pipe is oversized vs 30" pipe

36" pipe = 7.06 SF 30" pipe 4.91 SF

Δ = 2.15 SF × 6,500 FT = 13,975 CF

= 104,500 gals

@ $11/in ft 36 × 11 × 6500 = $ 2,574,000

30" × 11 × 6500 = $ 2,145,000

Δ = $ 329,000

Current clearwell volume = 500,000 gals

Construct 104,500 gals added clearwell volume

New clearwell probably at least $3.50/gallon

= $ 365,000

Larger pipeline reduces power cost so 7.7' added HL @ 7400 gpm 40 HP = $13,000/yr @ 0.05/kwh

is lower or comparable in capital cost & lower in present worth

LONGVIEW VALUE ENGINEERING STUDY
WATER SUPPLY ALTERNATIVES

VE IDEA NUMBER: E22

DESCRIPTION: Provide new high service pumping facility

EVALUATED BY: Sindt

ORIGINAL CONCEPT:

Rebuild existing high service pumps

PROPOSED ALTERNATIVE:

Install new high service pumps at existing east (1979) clearwell
Abandon existing 16" and 20" yard piping and between old pumps and distribution system
(Note: existing 1979 clearwell is designed for future installation of three vertical turbine pumps)
Install new 30" yard piping from high service pumps to existing distribution system piping

ADVANTAGES:

Provides facility that is easier to operate and maintain
More reliable piping system
Reduced maintenance and power costs

DISADVANTAGES:

Increased capital cost

	ORIGINAL	ALTERNATIVE ONE	ALTERNATIVE TWO
INITIAL COST	$50,000	$410,000	
INITIAL SAVINGS	XXXXXXXXXXXXXXXXX	($360,000)	
ANNUAL COST	$160,000	$139,000	
ANNUAL SAVINGS	XXXXXXXXXXXXXXXXX	$21,000	
PW SAVINGS	XXXXXXXXXXXXXXXXX	($119,000)	

VALUE ENGINEERING

DEVELOPMENT PHASE

ESTIMATE WORKSHEET

PROJECT NAME: LONGVIEW, WA WTP

PROJECT NO.: _____ DATE: 8/29/07 WRITTEN BY: S. NOT

ALT. NO.: E22 - NEW HIGH SERVICE PUMPS COSTS FOR: (check one) ☐ Original. ☒ Alternative.

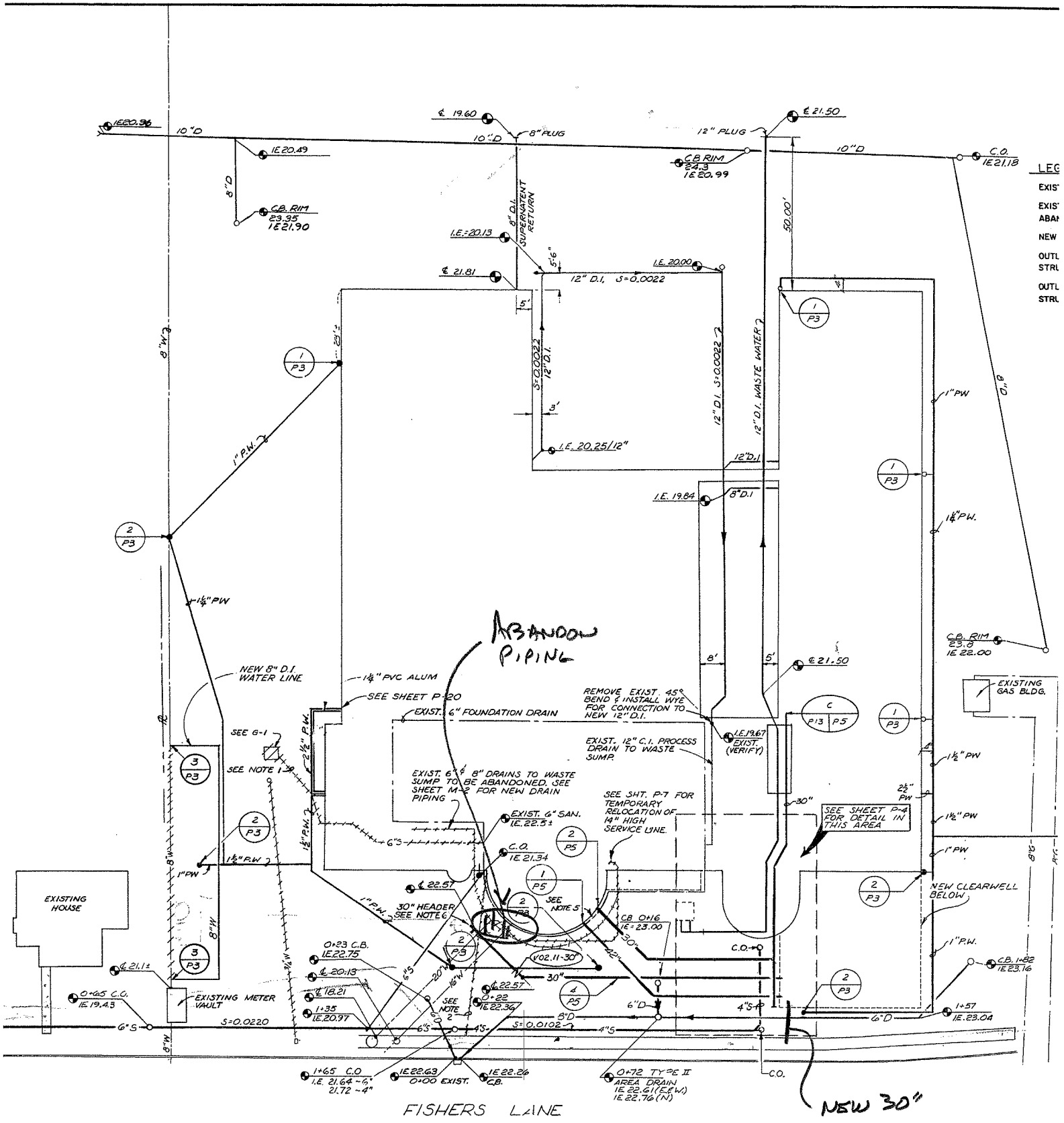
ITEM	QUANTITY		LABOR		MATERIAL		TOTAL COST
	No. Units	Unit Meas.	Per Unit	Total	Per Unit	Total	
PUMPS							
VERT. TURBINE, 250 HP	3	EA	PUMPS	(PEERLESS)			150,000
23CU GPM @ 295 FT TDH			INSTALLATION				20,000
20' DEEP CLEARWELL							
14" CHECK VALVE	3	EA.				5,500	15,000
12" BUTTERFLY VALVE	3	EA				2,500	7,500
AIR RELEASE VALVES	3	EA				1,500	4,500
24" YARD PIPING		(LS	EST.)				50,000
(CONNECT TO EXISTING	30"	PUMP	HEADER	IN CLEARWELL)			
ELECTRICAL ALLOWANCE		LS					50,000
• APPEARS PACE ESTIMATE INCLUDED NEW STARTERS AND							
CONDUCTORS (SEE PAGE 30 OF OCT 06 SOURCE ANALYSIS REPORT)							
SUBTOTAL							297,000
O.H., P., CONTINGENCY (38%)							113,000
					TOTAL		410,000

O & M COST ESTIMATE
($1,000/year)

No. E22

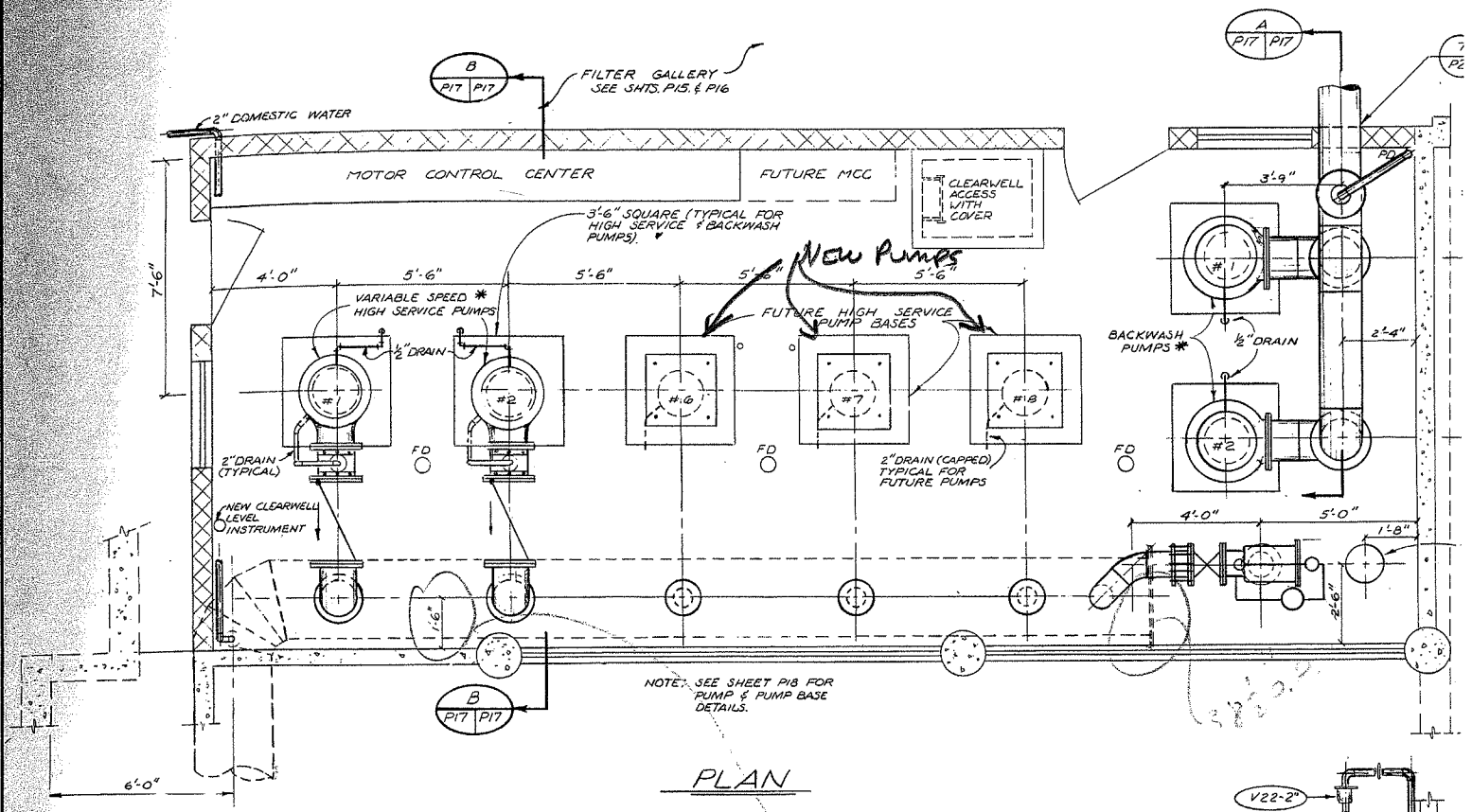
DESCRIPTION: New High Service Pumps

Item	Unit Cost	ORIGINAL DESIGN Quantity	ORIGINAL DESIGN Total	VE ALTERNATIVE Quantity	VE ALTERNATIVE Total
Labor MAINT ALLOWANCE			10,000		3,000
Electricity ASSUMES: ORIG DESIGN 75% EFF	$0.105/KWH	3,000,000	$ 150,000	2,700,000	136,000
ALT DESIGN 83% EFF.					
2 PUMPS, 2300 gpm, 295 ft TDH $0.105/KWH					
Fuel					
Material					
Chemicals					
Other					
TOTALS			160,000		139,000

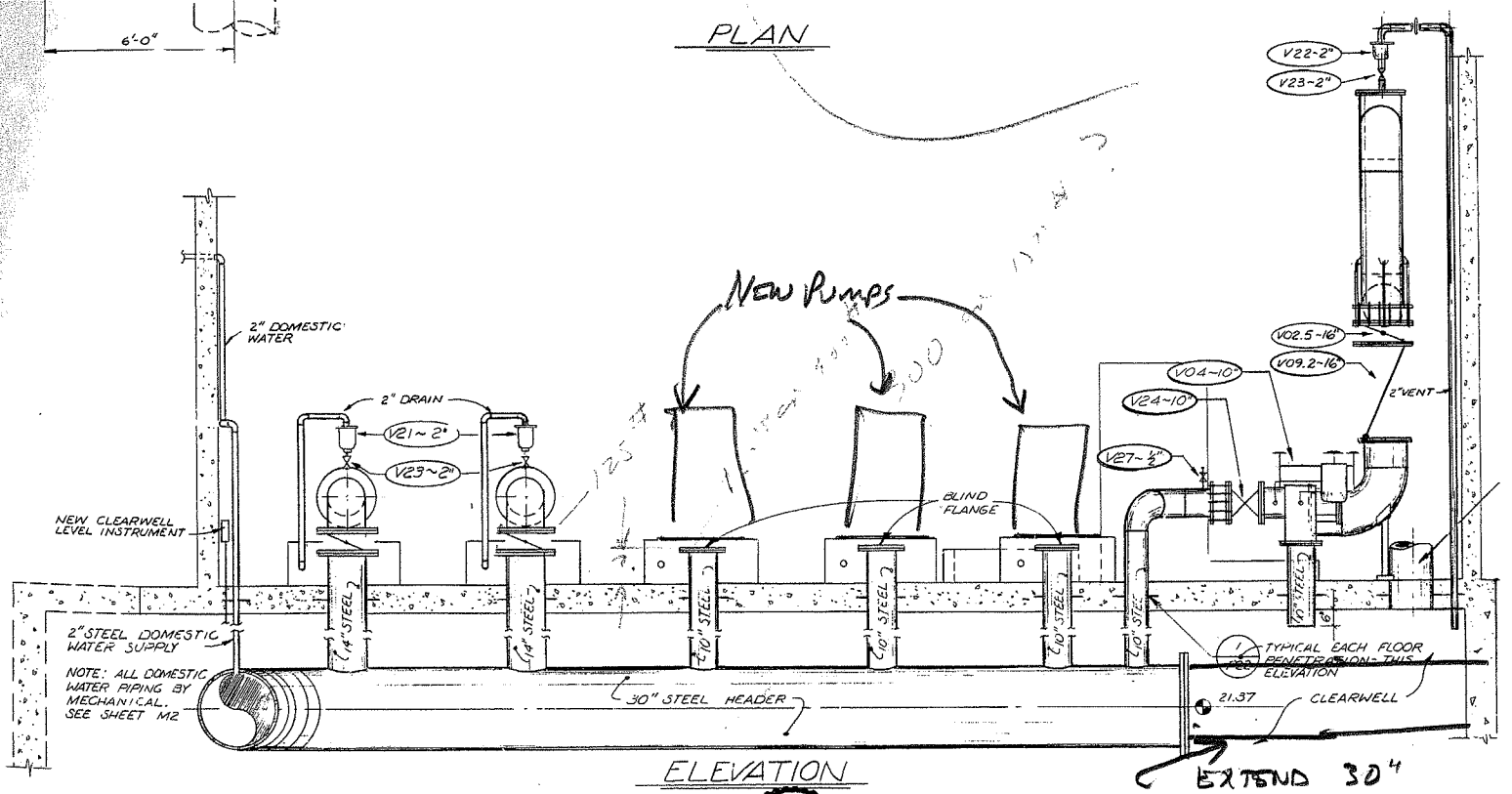


Robert E. Meyer Consultants 14250 S.W. Allen Blvd. Beaverton, Oregon 97005 (503) 643-7531	NO.	BY DATE	CONTRACT NO. 4 WATER TREATMENT PLANT EXPANSION CITY OF LONGVIEW, WASHINGTON
	REVISIONS		DESIGN NT/PHS DRAWN MM/JBT CHECKED PHS APPROVED LKA

THIS DRAWING HAS BEEN REDUCED APPRO



PLAN



ELEVATION

PHILIP H. SMITH STATE OF WASHINGTON REGISTERED PROFESSIONAL ENGINEER 7/23/79

REM

Robert E. Meyer Consultants
14250 S.W. Allen Blvd.
Beaverton, Oregon
97005 (503) 643-7531

NO.

REVISIONS

HIGH SERVICE PUMPS AND MOTORS

#1 PUMP	FLOWSERVE
	SERIAL # 0502CGC73623-1
	MODEL # 15FMM
2005	HEAD 10HM20
Installed	SPEED 1775
	GPM 2090
	FT 238

#1 MOTOR	US MOTORS
	CAT. # H0200Y2SLH
	L.E. BRG. 6215J
2005	U.E. BRG. 7322-BEM
Installed	FR H445TPA
	TYPE RUSI
	ENCL. WPI
	PH. 3
	AMB. 40 C
	ID # J03-200168-GT-01
	IN. CLASS F
	DUTY CONT.
	HP 200
	RPM 1785
	SF 1.15
	HZ 60
	VOLTS 460
	N.N. EFF. 96.2
	AMPS 228
	PF 85.4
	CODE G
	DES. B
	L.E. BRG. GREASE
	U.E. BRG. 5.5 QUT. OIL

#2 PUMP	CORNELL MANUFACTURING
	SERIAL # 14031 10 1/2
	MODEL # 5STG-14CC
1973	STAGES 5
Installed	IMP. DIA. 10 1/2
	HEAD 295
	SH. SIZE 1 11/16
	GPM 2300

#2 MOTOR	GENERAL ELECTRIC
	MODEL # 5K6278XH155A
	HP 200
1973	S.F. 1.15
Installed	TYPE K
	CODE G
	FRAME 8445TP20
	VOLTS 460
	FL AMPS 230
	FL SPEED 1770
	SERIAL # GJJ718118
	U.B. CAT 629A226G001
	L.B. CAT 5903493P016

#3 PUMP	CORNELL MANUFACTURING
	SERIAL # 20698
	MODEL # 4STG 14DC
1976	IM. DIA. 2-10 1/8 2-11
Installed	STAGES 4
	GPM 2300

#3 MOTOR	GENERAL ELECTRIC
	MODEL # 5K6278XH50A
	HP 200
1976	SF 1.15
Installed	TYPE K
	CODE G
	FRAME 8445TP16
	VOLTS 460
	CYCLES 60
	NEMA C.D. B
	PH 3
	FL AMPS 230
	FL SPEED 1770
	SERIAL # LLJ1105977