Appendix 6-3 Sewage Offsetting Calculation



	Job				Reference	
D.D. 104 Kam Pok Road Residential Development						
ALCOM						
		Sewerage	e impact Assessmen	1		
Consulting Engineers	Drawing Ref		Calculations by	Check by	Page	L 1
Tower 2, Grand Central Plaza						
138, Shatin Rural Committee Road	Subject				Date	
Shatin, New Territories, Hong Kong	Design	Calculation of Po	ollution Loads for KP	R Development	May-2	016
Poforonco Document						
(1) O Heline for Entire the One of Eline the						
(1) Guidelines for Estimating Sewage Flows, publ	isned by EPD (C	SESF)				
(2) Sewerage Manual, published by DSD (SM)						
(3) Wastewater Treatment Plants: Planning, Desi	gn and Operatio	n, by Syed R. Qa	sim (WTP)			
(4) Water Reuse - Issues, Technologies and App	lications, Metcal	f & Eddy, AECON	/l, 2007 (WR)			
(5) Wastewater Engineering Treatment and Reus	e. Metcalf & Edd	v. 2003 (WETR)				
(1) 11 3 1 3 1 1 1 1	-,	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,				
Accumptions for Coloulation of Design Sowage Flow						
Assumptions for Calculation of Design Sewage Flow					0-0	
(1) The housing type for the development is R4 and the Unit Fl	ow Factor for R4	1 type resident sh	all be 0.370 m [×] /head	l/day,	GESF Table 1-1	
which is extracted from Table T-1 of Guidelines for Estimat	ing Sewage Flov	ws (GESF) publis	shed by EPD.			
(2) The unit flow factors for commercial flows in the developme	ent are extracted	from Table T-2 c	of GESF, based on th	e unit flow	GESE Table T-2	
factor of Commercial Employee as 0.080 and Type J4 Con	nmercial Activity	(Wholesale & Re	etail) and J11 Comme	ercial	0201 10010 1 2	
Activity (Social & Personal Services) as 0.200 for estimatin	a the flow gener	ated from the em	plovee. The unit flow	w factor of		
0.280 m ³ /bead/day is adopted	0 0		. ,			
(2) Leberster testing results of writer complete at Nacy Tam N						
(3) Laboratory testing results of water samples at Ngau Tam IV	iei channei are a	dopted for asses	sment.			
Water Quality of Ngau Tam Mei Channel						
 The following average concentration are taken from the lab 	oratory testing re	esults between S	eptember 2012 to Se	eptember 2013, and		
between March 2015 to April 2015.						
Average Result from Water Quality	Sample					
BOD TN-N TP TSS	NH3-N	E. coli				
(ma/L) (ma/L) (ma/L) (ma/L)	(ma/L)	(no./100 ml)				
4 5.45 0.8 61	2.69	30,100				
0.0			1			
Water Quality of Treated Effluent from Kam Pok Road Dev	elopment					
Target						
Parameters Effluent						
Quality of STP						
BOD (ing/L) 3.0						
IN-N (mg/L) 4.0						
IP (mg/L) 0.5						
TSS (mg/L) 10						
NH3-N (mg/L) 2						
E. Coli						
(no./100 ml) 1,000						

A=COM	D.D. 104 Kam	Pok Road Residential Dev	elopment		
Consulting Engineers	Drawing Rof	Calculations by	Chock by	Page	1 2-1
Tower 2 Grand Central Plaza	Drawing Ref	Calculations by	Check by	Page	L 2-1
138, Shatin Rural Committee Road	Subject			Date	
Shatin, New Territories, Hong Kong	Design Calculation	of Pollution Loads for KPR	Development		May-2016
1) Design Calculation of Pollution Loads - Bo	<u>DD</u>				
1A) Condition of abannel and the Site before	the Development				
TA) condition of channel and the Site before					
Flow:-					
Average flow collected from the channel	200) m ³ /day			
Pollution Load:-		4			
Water sampling results for BOD	- 4 mg/L x 200	a mg/L			
BOD loading from channel	= 4 mg/L x 200) kg/dav			
		<u></u>			
Total pollution loads:-					
Total BOD load	BOD loading	from channel			
	= 0.800) kg/day			
1P) Condition of channel and the Older (to all	ha Davalanmart				
Condition of Channel and the Site after th	ne Development				
Proposed Residential Population:-					
Number of people in each house	3.5	5 heads			
Total number of house	32	2 houses			
Total Residential Population	= 32 houses x	3.5 heads			
	= 112	2 heads			
Sources reported by the Decidents					
The unit flow factor of housing	0.33	7 m ³ /bead/day			
Sewage generated	= 0.37 m3/hea	d/day x 112 heads			
	= 44	m³/day			
Proposed Employee in the Development	20) heads			
Sewage generated by the employee in the de	evelopment:-	m ³ /hoad/day			
The unit flow factor of its activities	0.00	2 m ³ /head/day			
The sum of unit flow factor	= 0.08 m3/hea	d/day + 0.2 m3/head/day			
	= 0.28	3 m ³ /head/day			
Sewage generated	= 0.28 m3/hea	d/day x 20 heads			
	=(s m³/day			
Sewage generated by the swimming pools:-	= 4	s m ³ /dav			
		, ,			
Total Residual Pollution Loads from On-Site	Treatment Plant				
		2			
Average flow collected from the channel	200) m³/day			
Total Sewage generated due to the develop	nent 6 m3/day + 4	11 m3/day + 4 3 m3/day			
Total Sewage generated due to the developh	= 51.3	3 m ³ /day			
Effluent Discharge Quality from the On-Site	Treatment Plant:-				
Effluent BOD Concentration	:	3 mg/L			
Pollution Loads in Effluent	- Volumo of F	ffluent v Effluent Concentr	ation		
Foliation Loads in Endent	= Volume of E = (200+51 3) r	niuenii x Eniuenii Conceniia n3/day x 3 mg/l	allon		
	= 0.754	1 kg/day			
Comparison between Condition before and a	after the Development				
I gading before the Development	0.80 kg/day				
	0.00 kg/uay	=			
Loading after the Development =	0.75 kg/day				
_ · ·		=			
Since the Loading after the Development is small	aller than the Loading be	fore the Development,			
the requirement of "No Net Increase in Pollution	Loading to Deep Bay" is	s achieved.			
				1	

	Job			Reference	
AECOM	D.D. 104	Kam Pok Road Residentia	al Development		
		Sewerage Impact Assess	ment		
Consulting Engineers	Drawing Ref	Calculations by	Check by	Page	L 2-2
10wer 2, Grand Central Plaza	Outrinet			Dete	
Shatin New Territories Hong Kong	Design Calcul	ation of Pollution Loads for	KPR Development	Dale	May-2016
Shadh, New Fernance, Heng Keng	Boolgii Galda				111ay 2010
2) Design Calculation of Pollution Loads -	<u>TN-N</u>				
2A) Condition of channel and the Site befo	re the Development	<u>-</u>			
Flow:-					
Average flow collected from the channel		200 m ³ /day			
Pollution Load:-		E AE mail			
TN-N loading from channel	= 5.45 m	5.45 mg/∟ ng/L x 200 m3/day			
	=	1.090 kg/day			
Total pollution loads:-					
Total TN-N load	TN-N I	oading from channel			
	=	1.090 kg/day			
2B) Condition of channel and the Site after	the Development				
Proposed Residential Population:-					
Number of people in each house		3.5 heads			
Total Residential Population	= 32 hou	ses x 3 5 heads			
	= 52 1100	112 heads			
Sewage generated by the Resident:-		3			
The unit flow factor of housing	- 0.27 -	0.37 m [°] /head/day			
Sewage generated	= 0.37 II	13/neau/uay x 112 neaus 41 m ³ /day			
		41 / awy			
Proposed Employee in the Development		20 heads			
Sewage generated by the employee in the	development:-				
The unit flow factor of employee		0.08 m ³ /head/day			
The unit flow factor of its activities		0.2 m ³ /head/day			
The sum of unit flow factor	= 0.08 m	3/head/day + 0.2 m3/head	/day		
Courses appointed	=	0.28 m [°] /head/day			
Sewage generated	= 0.28 m	6 m ³ /day			
Sewage generated by the swimming pools	:- =	4.3 m ³ /day			
Total Residual Pollution Loads from On-Si	te Treatment Plant				
Average flow collected from the channel		200 m³/day			
Total Sewage generated due to the develop	pment 6 m3/c	lay + 41 m3/day + 4.3 m3/c	day		
	=	51.3 m ³ /day			
	- Treatment Division				
Enruent Discharge Quality from the On-Sit	e rreatment Plant:-	4 ma/L			
		· · · · · · · · ·			
Pollution Loads in Effluent	= Volum	e of Effluent x Effluent Con	centration		
	= (200+5	51.3) m3/day x 4 mg/L			
	=	1.005 kg/day			
Comparison between Condition before and	d after the Developm	nent			
		<u>ion</u>			
oading before the Development	= <u>1.09 kg/day</u>				
oading after the Development	= <u>1 01 ka/da</u>				
Louding alter the Develophient					
				1	
Since the Loading after the Development is si	maller than the Loadi	ng before the Developmen	t,		

	Job				Reference		
AECOM	D.D. 104	Kam Pok Road Residentia	I Development				
	Sewerage Impact Assessment						
Consulting Engineers	Drawing Ref	Calculations by	Check by	Page	L 2-3		
Tower 2, Grand Central Plaza				_			
138, Shatin Rural Committee Road	Subject			Date			
Shatin, New Territories, Hong Kong	Design Calcul	ation of Pollution Loads for	KPR Development		May-2016		
R) Design Calculation of Pollution Loads - TP							
BA) Condition of channel and the Site before	the Development	-					
Flow:-							
Average flow collected from the channel		200 m³/day					
Pollution Load:-							
Nater sampling results for TP		0.8 mg/L					
IP loading from channel	= 0.8 mg	/L x 200 m3/day					
	=	0.160 kg/day					
Fotal pollution loads:-							
Fotal TP load	TP loa	ding from channel					
	=	0.160 kg/day					
	- David						
Condition of channel and the Site after th	e Development						
Proposed Residential Population:-							
Number of people in each house		3.5 heads					
I otal number of house	- 00 -	32 houses					
i otal Residential Population	= 32 hou =	ses x 3.5 neads					
	-	TE IICAUS					
Sewage generated by the Resident:-		0.07					
The unit flow factor of housing	0.07	0.37 m°/head/day					
Sewage generated	= 0.37 m	3/nead/day x 112 neads					
		-, /uuy					
Proposed Employee in the Development		20 heads					
Sewage generated by the employee in the de	velopment:-						
The unit flow factor of employee		0.08 m ³ /head/day					
The unit flow factor of its activities		0.2 m ³ /head/day					
The sum of unit flow factor	= 0.08 m	3/head/day + 0.2 m3/head/	day				
	=	0.28 m ³ /head/day					
Sewage generated	= 0.28 m	3/head/day x 20 heads					
	=	6 m /day					
Sewage generated by the swimming pools:-	=	4.3 m³/day					
Total Residual Pollution Loads from On-Site	Treatment Plant						
Average flow collected from the channel		200 m ³ /day					
Fotal Seware reperated due to the doucloom	ent 6 m ^{2/d}	$a_{1} + 41 m_{2} da_{2} + 4.3 m_{2} da_{3}$	av				
	=	<u>51.3 m³/day</u>	~, ,				
		<u> </u>					
Effluent Discharge Quality from the On-Site T	reatment Plant:-	0.5 mc/l					
		0.0 mg/∟					
Pollution Loads in Effluent	= Volum	e of Effluent x Effluent Cond	centration				
	= (200+5	1.3) m3/day x 0.5 mg/L					
		0.120 kg/day					
Comparison between Condition before and a	fter the Developn	<u>nent</u>					
_oading before the Development =	0.16 kg/day	, <u> </u>					
_oading after the Development =	0.13 kg/day						
Since the Loading after the Development is sma	ller than the Loadi	ng before the Development	,				

	lob			Reference	
AECOM					
/	Sew	erage Impact Assess	ment		
Consulting Engineers	Drawing Ref	Calculations by	Check by	Page	L 2-4
Tower 2, Grand Central Plaza					
138, Shatin Rural Committee Road	Subject	of Dollution Loado for		Date	May 2016
Shatin, New Territories, Hong Kong	Design Calculation		KFK Developitietit		Way-2010
4) Design Calculation of Pollution Loads - TS	S				
4A) Condition of channel and the Site before	the Development				
Flow					
FIOW:-	20	$0 m^3/day$			
Average now conected norm the channel	20	o ili /uay			
Pollution Load:-					
Water sampling results for TSS	6	1 mg/L			
TSS loading from channel	= 61 mg/L x 2	00 m3/day			
	= 12.20	0 kg/day			
Total pollution loads:					
Total TSS load	TSS loading	from channel			
	= 12.20	0 kg/dav			
		<u> </u>			
4B) Condition of channel and the Site after the	ne Development				
Proposed Residential Population:-					
Number of people in each house	3.	b heads			
Total number of nouse	- 32 houses x	2 nouses			
	= 52 houses /	2 heads			
Sewage generated by the Resident:-					
The unit flow factor of housing	0.3	7 m ³ /head/day			
Sewage generated	= 0.37 m3/hea	ad/day x 112 heads			
	= 4	1 m°/day			
Branagad Employee in the Development	2	0 haada			
Proposed Employee in the Development	2	u neaus			
Sewage generated by the employee in the de	evelopment:-				
The unit flow factor of employee	0.0	8 m ³ /head/day			
The unit flow factor of its activities	0.:	2 m ³ /head/day			
The sum of unit flow factor	= 0.08 m3/hea	ad/day + 0.2 m3/head	l/day		
	= 0.2	8 m³/head/day			
Sewage generated	= 0.28 m3/hea	ad/day x 20 heads			
	=	6 m /day			
Sewage generated by the swimming pools:-	= 4.3	3 m³/day			
Total Residual Pollution Loads from On-Site	Treatment Plant				
Average flow collected from the shares i		0 m ³ /day			
Average flow collected from the channel	20	u in /day			
Total Sewage generated due to the developm	nent 6 m3/dav +	41 m3/dav + 4.3 m3/	dav		
	= 51.	3 m ³ /day			
Effluent Discharge Quality from the On-Site	Treatment Plant:-				
Effluent SS Concentration	1	0 mg/L			
Pollution Loads in Effluent			contration		
	= volume of E = (200+51 3)	muent x Enident Cor m3/day x 10 mg/l			
	= 2.51	3 kg/day			
Comparison between Condition before and a	after the Development				
Loading before the Development =	12.20 kg/day	_			
l oading after the Development =	2.51 kg/day				
	2.01 Kg/uay	-			
Since the Loading after the Development is small	aller than the Loading b	efore the Developme	nt,		
the requirement of "No Net Increase in Pollution	Loading to Deep Bay"	is achieved.			

	Job	Reference			
A_COM	D.D. 104 Kam	Pok Road Residentia	I Development		
Consulting Engineers	Drawing Ref	Calculations by	Check by	Page	L 2-5
Tower 2, Grand Central Plaza	2 adming 1 tor	Calculations by	one of by	. ugo	
138, Shatin Rural Committee Road	Subject			Date	
Shatin, New Territories, Hong Kong	Design Calculation	of Pollution Loads for	KPR Development		May-2016
5) Design Calculation of Pollution Loads - N	<u>H3-N</u>				
	the Development				
5A) Condition of channel and the Site before					
Flow:-		3			
Average flow collected from the channel	20	iu m /day			
Pollution Load:-					
Water sampling results for NH3-N	2.6 = 2.69 mg/L	9 mg/L (200 m3/day			
	= <u>0.53</u>	8 kg/day			
Total pollution loads:-	NH3-N load	ling from channel			
	= 0.53	8 kg/day			
נאמן Condition of channel and the Site after t	ne Development				
Proposed Residential Population:-					
Number of people in each house	3.	5 heads			
Total Residential Population	= 32 houses:	x 3.5 heads			
	= 11	2 heads			
Sewage generated by the Resident:-					
The unit flow factor of housing	0.3	7 m ³ /head/day			
Sewage generated	= 0.37 m3/he	ad/day x 112 heads			
	= 4	n n /day			
Proposed Employee in the Development	2	0 heads			
Sewage generated by the employee in the de	evelopment-				
The unit flow factor of employee	0.0	18 m³/head/day			
The unit flow factor of its activities	0.	.2 m ³ /head/day			
The sum of unit flow factor	= 0.08 m3/he	ad/day + 0.2 m3/head/ 8 m ³ /head/day	/day		
Sewage generated	= 0.28 m3/he	ad/day x 20 heads			
	=	6 m³/day			
Sewage generated by the swimming pools:-	= 4	.3 m³/day			
Total Residual Pollution Loads from On-Site	Treatment Plant				
Average flow collected from the channel	20	10 m ³ /dav			
	20				
Total Sewage generated due to the develop	nent 6 m3/day +	41 m3/day + 4.3 m3/d	lav		
	=51	<u>.3 m³/day</u>			
Effluent Discharge Quality from the Or Site	Trootmont Plant				
Effluent NH3-N Concentration	rreaument Plant:-	2 mg/L			
Pollution Loads in Effluent	= Volume of I = (200+51 3)	Effluent x Effluent Con m3/day x 2 mg/l	centration		
	=0.50	3 kg/day			
Comparison between Condition before and	arter the Development	<u>r</u>			
Loading before the Development =	0.54 kg/day	_			
Loading after the Development =	0.50 kg/day	_			
		_			
Since the Loading after the Development is sm	aller than the Loading h	pefore the Developmer	nt.		
the requirement of "No Net Increase in Pollution	Loading to Deep Bay	is achieved.	,		

		Reference			
AECOM	D.D. 104 Ka	ewerage Impact Assessn	nent		
Consulting Engineers Tower 2, Grand Central Plaza	Drawing Ref	Calculations by	Check by	Page	L 2-6
138, Shatin Rural Committee Road	Subject			Date	
Shatin, New Territories, Hong Kong	Design Calculation	on of Pollution Loads for	KPR Development		May-2016
6) Design Calculation of Pollution Loads - E	<u>. coli</u>				
6A) Condition of channel and the Site before	e the Development				
Flow:-					
Average flow collected from the channel	:	200 m³/day			
Pollution Load:-					
<i>E. coli</i> loading from channel	30 , = 30100 no	100 no./100 ml ./100 ml x 200 m3/day			
	= <u>6.020E</u>	+10 no./day			
Total pollution loads:-					
Total <i>E. coli</i> load	E. coli loa = 6.020E	iding from channel +10 no./dav			
		<u>,</u>			
6B) Condition of channel and the Site after t	he Development				
Proposed Residential Population:-		3.5 boada			
Total number of house		32 houses			
Total Residential Population	= 32 house	s x 3.5 heads			
	-				
Sewage generated by the Resident:- The unit flow factor of housing	c).37 m ³ /head/day			
Sewage generated	= 0.37 m3/h	head/day x 112 heads			
	=	41 m /day			
Proposed Employee in the Development		20 heads			
Sewage generated by the employee in the d	evelopment:-	2			
The unit flow factor of employee The unit flow factor of its activities	C	0.08 m³/head/day 0.2 m³/head/day			
The sum of unit flow factor	= 0.08 m3/h	head/day + 0.2 m3/head/	′day		
Sewage generated	= u = 0.28 m3/h	nead/day x 20 heads			
	=	6 m³/day			
Sewage generated by the swimming pools:-	=	4.3 m ³ /day			
Total Residual Pollution Loads from On-Site	Treatment Plant				
Average flow collected from the channel	:	200 m³/day			
Total Sewage generated due to the develop	nent 6 m3/day	$+ 41 \text{ m}^{3}/\text{dav} + 4.3 \text{ m}^{3}/\text{d}$	av		
	=	51 m ³ /day	uy		
Effluent Discharge Quality from the On-Site	Treatment Plant:-				
Effluent E-coli Concentration	1,	000 no./100 ml			
Pollution Loads in Effluent	= Volume o	f Effluent x Effluent Cond	centration		
	= (200+51.3 = 2.51E	3) m3/day x 1000 no./100 +09 count/dav	0 ml		
Comparison between Condition before and	after the Developmen	<u>t</u>			
Loading before the Development	Loading from village b	ouses near developmen	t		
=	6.02E+10 no./day				
Loading after the Development	Loading after On-Site	Treatment Plant			
=	2.51E+09 no./day				
Since the Loading after the Development is sm	aller than the Loading	before the Development,	,		
the requirement of "No Net Increase in Pollution	n Loading to Deep Bay	is achieved.			

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